ERDC/CERL TR-17-38

US Army Corps
of Engineers®
Engineer Research and
Development Center

ERDC
INNOVATIVE SOLUTIONS
for a safer, better world

*Strategic Environmental Research and Development Program (SERDP)*

# Rotary Kiln Gasification of Solid Waste for Base Camps

Stephen D. Cosper

October 2017



Construction Engineering
Research Laboratory

Approved for public release; distribution is unlimited.

Strategic Environmental Research and Development Program (SERDP)

ERDC/CERL TR-17-38
October 2017

# Rotary Kiln Gasification of Solid Waste for Base Camps

Stephen D. Cosper

*U.S. Army Engineer Research and Development Center (ERDC)*
*Construction Engineering Research Laboratory (CERL)*
*2902 Newmark Dr.*
*Champaign, IL 61822*

Final Report

Approved for public release; distribution is unlimited.

Prepared for Strategic Environmental Research and Development Program (SERDP)
Arlington, VA 22203

Under SERDP Project No. WP-2211

# Rotary Kiln Gasification of Solid Waste for Base Camps

# SERDP Project Number WP-2211



**U.S. Army Engineer Research and Development Center**
**Construction Engineering Research Laboratory**
**2902 Newmark Drive, Champaign, IL 61822**

Lead Principal Investigator:
Stephen Cosper
USACE-ERDC-CERL

## May 2017
## Final Report

# REPORT DOCUMENTATION PAGE

*Form Approved*
*OMB No. 0704-0188*

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

| 1. REPORT DATE (DD-MM-YYYY) | 2. REPORT TYPE | 3. DATES COVERED (From - To) |
|---|---|---|
| 05-May-2017 | Final Report | |

**4. TITLE AND SUBTITLE**
Rotary Kiln Gasification of Solid Waste for Base Camps

**5a. CONTRACT NUMBER**

**5b. GRANT NUMBER**

**5c. PROGRAM ELEMENT**

**6. AUTHOR(S)**
Stephen D. Cosper

**5d. PROJECT NUMBER**
WP-2211

**5e. TASK NUMBER**

**5f. WORK UNIT NUMBER**

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**
U.S. Army Engineer Research and Development Center (ERDC)
Construction Engineering Research Laboratory (CERL)
PO Box 9005,
Champaign, IL 61826-9005

**8. PERFORMING ORGANIZATION REPORT NUMBER**
ERDC/CERL TR-14-DRAFT

**9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)**
Strategic Environmental Research and Development Program (SERDP)
901 North Stuart Street, Suite 303
Arlington, VA 22203

**10. SPONSOR/MONITOR'S ACRONYM(S)**
SERDP/OECIF

**11. SPONSOR/MONITOR'S REPORT NUMBER(S)**

**12. DISTRIBUTION / AVAILABILITY STATEMENT**
Approved for public release; distribution is unlimited.

**13. SUPPLEMENTARY NOTES**

**14. ABSTRACT**

This project was undertaken to design and construct a battalion-scale waste-to-energy (WTE) system based on the principle of gasification. This system was designed to convert 1 to 3 tons per day of mixed wastes to energy, with minimal pre-processing, and with a net-positive energy output (net of parasitic losses). The size of the system should be limited to two, 20-ft shipping containers. The rotary kiln WTE system was conceived to address the following criteria: (1) to accept and process mixed, unsorted municipal waste materials, (2) to minimize process energy required through careful heat management and use of hydraulics, and (3) to integrate into contingency utility systems by using standard diesel generators.

**15. SUBJECT TERMS**
Rotary Kiln, Gasification, Solid Waste, Waste Management, Contingency Base, Diesel Generator, Waste to Energy, Syngas

| 16. SECURITY CLASSIFICATION OF: | | | 17. LIMITATION OF ABSTRACT | 18. NUMBER OF PAGES | 19a. NAME OF RESPONSIBLE PERSON |
|---|---|---|---|---|---|
| | | | | | Stephen Cosper |
| a. REPORT | b. ABSTRACT | c. THIS PAGE | | | 19b. TELEPHONE NUMBER |
| Unclassified | Unclassified | Unclassified | SAR | 813 | 217-398-5569 |

# Table of Contents

**List of Figures** ..... **iv**

**List of Tables** ..... **vi**

**Acknowledgments** ..... **vii**

**Abstract** **viii**

**List of Acronyms** ..... **ix**

**1. Introduction** ..... **1**

1.1 Objectives ..... 1
1.2 Core Design Objectives ..... 1

**2. General Design** ..... **2**

2.1 Introduction ..... 2
2.2 Technology for the Project ..... 2
2.3 Feedstock Preparation ..... 2
2.4 Dewatering by Super-Compression ..... 3
2.5 Thermodynamic Process Design Approach ..... 3

**3. Indirect Flaming Pyrolysis Rotary Gasifier (IIFPRG) System Equipment Test Configuration for SERDP Mixes** ..... **7**

3.1 General Arrangement of Complete System ..... 7
3.2 Process Equipment ..... 10
3.3 Feedstock Handling System ..... 16
3.4 Rotary Gasifier ..... 17
3.5 Quencher ..... 19
3.6 Reflux Pump ..... 20
3.7 Aspiration Gas Mover ..... 20
3.8 Impingement Scrubber ..... 21
3.9 Condenser Cooler ..... 22
3.10 Polisher ..... 23
3.11 Gas Reheater ..... 24
3.12 Flow Orifice ..... 25
3.13 Syngas Sampling Port ..... 25
3.14 Trailer Interconnections ..... 26
3.15 Flammability Test Flare ..... 26
3.16 Syngas Fueling to Engine ..... 27
3.17 Diesel Engine-Driven Generator ..... 27
3.18 Fuel Consumption Measurement ..... 29
3.19 Hydraulic Power System ..... 30
3.20 Engine Exhaust System ..... 31
3.21 Automation System ..... 32

**4. Summary of Analytical Data and System Operation** ..... **34**

4.1 Overview ..... 34

4.2 Safety ..... 34
4.3 Waste Mixes Used in Testing ..... 35
4.4 Syngas Chemistry ..... 36
4.5 Unexpected Performance and Results Regarding Pyrolysis Oil ..... 37
4.6 Process Description Used for Waste Mix Testing ..... 40
4.7 Sampling Results ..... 42
4.8 Thermodynamics Discussion ..... 54

**5. Development of the IIFPRG ..... 61**

5.1 Engineering of the IIFPRG ..... 61
5.2 Compression Dewatering ..... 62
5.3 Gasification System Fabrication and Cold Testing ..... 63
5.4 Feedstock Handling System ..... 64
5.5 Feedstock Dewatering ..... 66
5.6 Hot Testing of the IIFPRG ..... 66
5.7 Corrective Action to the IIFPRG System in 2013 ..... 70
5.8 Summary Operations after 16 September 2013 ..... 75
5.9 Permitting Issues ..... 75

**6. CFD Modeling ..... 77**

6.1 Methodology ..... 77
6.2 Model Setup ..... 79
6.3 Geometric and CFD Modeling ..... 83
6.4 Equipment arrangement ..... 93

**7. Diesel Engine Efficiency Studies ..... 95**

7.1 EPA Tier 2 and Tier 3 Engines ..... 95
7.2 Feedstocks for EPA Tier 2 Engines Testing ..... 95
7.3 Test Configuration ..... 96
7.4 Baseline Factory Ratings ..... 97
7.5 Clip Test Procedure ..... 98
7.6 Clip Test Results ..... 98
7.7 Conclusions ..... 100

**8. Dewatering Waste via Mechanical Compression ..... 101**

8.1 Mechanical Compression to Reduce Moisture Content ..... 101
8.2 Mechanical Dewatering Tests Procedure ..... 101
8.3 Results of Compressions Tests ..... 103
8.4 Equipment and Procedures ..... 106
8.5 Conclusions ..... 107

**9. Conclusions and Implications for Future Research/Implementation ..... 109**

9.1 Conclusions from this Project ..... 109
9.2 Additional Research Needed ..... 109
9.3 Suggested Implementation ..... 110

**10. Bibliography ..... 111**

**Appendices ..... 113**

# List of Figures


Figure 2-1. Process Design of IIFPRG. ..... 3
Figure 3-1. View of Gasification Trailer #1. ..... 7
Figure 3-2. Schematic Showing Main Reactor and Gas Conditioning. ..... 8
Figure 3-3. Schematic Showing Power Generation. ..... 9
Figure 3-4. Gasification Trailer and Hot Diesel Exhaust Piped to the Gasifier Shell. ..... 10
Figure 3-5. Ram Feeder, Tag # RF-102. ..... 16
Figure 3-6. Plastic Bag of Mixed Waste Place in Feed Bin. ..... 16
Figure 3-7. Rotary Gasifier RG-103. ..... 18
Figure 3-8. Gasifier Nozzle, Spring Plate, and Syngas Discharge Pipe. ..... 18
Figure 3-9. Ash Discharge Pan. ..... 18
Figure 3-10. Diesel Exhaust Discharge Nozzle, Final Emission Point to Atmosphere. ..... 19
Figure 3-11. Quencher QC-104 Located to the Left of Rotary Gasifier RG-103. ..... 20
Figure 3-12. Roots 45 URAI-G Positive Displacement Rotary Lobe Blower PDB-105. ..... 21
Figure 3-13. Impingement Scrubber IS-106. ..... 21
Figure 3-14. Condenser Cooler C-107 – Hydraulic Cooler End with Hydraulic Driven Cooling Fan. ..... 23
Figure 3-15. BASCO Condensate separator CS-108. ..... 23
Figure 3-16. Gas Polisher GP-109 Direct Drive by Hydraulic Motor M-3. ..... 24
Figure 3-17. Polisher Separator PS-110. ..... 24
Figure 3-18. Gas Reheater RH-111, a Fabricated Heat Exchanger. ..... 25
Figure 3-19. Flow Orifice FO-112. ..... 25
Figure 3-20. Syngas Sampling Port SP-120. ..... 26
Figure 3-21. Interconnections between Trailers. ..... 26
Figure 3-22. Syngas Flammability Test Flare FL-230. ..... 27
Figure 3-23. 60kW Diesel Engine-Driven Electric Generator DG-220. ..... 28
Figure 3-24. Three-Phase Digital Power Meter PM-215. ..... 28
Figure 3-25. Load Center LC-216. ..... 29
Figure 3-26. Liquid Fuel Usage Monitoring System LFM-219. ..... 30
Figure 3-27. Gear Pump GP-235 Mounted to Engine Power Take off. ..... 31
Figure 3-28. Catalytic Converter ECC-234 Mounted Directly to Turbo Expansion Turbine Outlet. ..... 32
Figure 3-29. Diesel Exhaust Muffler and Pipe; Stainless Steel Exhaust Sampling Point SP-237. ..... 32
Figure 3-30. Main System Control Enclosure with Color Touch Screen Mounted on Gasifier Trailer. ..... 33
Figure 4-1. Energy Contribution from Organic Groupings. ..... 45
Figure 4-2. Average Dry Heating Value for Each Waste Mix. ..... 46
Figure 4-3. Average Heating Value of Each Mix as a Percentage of Natural Gas. ..... 46
Figure 4-4. Percent of Energy in Syngas Sample Standard Mix #1. ..... 48
Figure 4-5. Percent of Energy in Syngas Sample Standard Mix #2. ..... 48
Figure 4-6. Percent of Energy in Syngas Sample 100% Construction Mix #1. ..... 49
Figure 4-7. Percent of Energy in Syngas Sample 100% Construction Mix #2. ..... 49

Figure 4-8. Percent of Energy in Syngas Sample 50% Food Mix #1. 50
Figure 4-9. Percent of Energy in Syngas Sample 50% Food Mix #2. 50
Figure 4-10. Percent of Energy in Syngas Sample 33% POL Mix #1. 51
Figure 4-11. Percent of Energy in Syngas Sample 33% POL Mix #2. 51
Figure 4-12. Percent of Energy in Syngas Sample 40% Tire Mix #1. 52
Figure 4-13. Percent of Energy in Syngas Sample 40% Tire Mix #2. 52
Figure 4-14. Percent of Energy in Syngas Sample 50% Plastics Mix #1. 53
Figure 4-15. Moisture vs. Heating Value. 59
Figure 4-16. Estimated Loss in Engine Efficiency. 59
Figure 4-17. Energy Flow through the Entire System. 60
Figure 5-1. Gasifier Trailer during Fabrication. 63
Figure 5-2. Six-in. Hydraulic Ram Piston and Compression Chamber. 64
Figure 5-3. Feedstock Hopper. 65
Figure 5-4. Thirty-Five Ton Feedstock Ram. 65
Figure 5-5. Miter Joint. 66
Figure 5-6. Rotary Chain Drive 67
Figure 5-7. Various Syngas Exit Nozzle Geometries Tested. 68
Figure 5-8. Helical Lifter Uphill of Brick. 68
Figure 5-9. Feedstock Handling System at 22-Degree Inclination. 70
Figure 5-10. Feedstock Handling System and Gasifier at 40-Degree Inclination. 71
Figure 5-11. Hydraulic Rotational Direct Drive 72
Figure 5-12. Problem of Dropping Brick. 73
Figure 5-13. Thermal Imaging Cut-Out on Stationary Outer Shell. 74
Figure 5-14. Gasifier Fully Insulated with Stainless Steel Cladding and 65-kW Generator, Exhaust Connected to Shell 74
Figure 5-15. Sixty-kW Generator Exhaust Connected to Gasifier. 74
Figure 5-16. Lighting Gasifier with Hand Torch. 75
Figure 6-1. Geometry of the Initial Design Requirements. 79
Figure 6-2. Mesh of the Initial Design Requirements. 80
Figure 6-3. Close up View of Meshed Geometry. 80
Figure 6-4. Meshed Geometry of Other Design Requirements, 360 Degrees. 81
Figure 6-5. Geometry of the Last Design Requirements. 81
Figure 6-6. Mesh of the Last Design Requirements. 82
Figure 6-7. Air Entrance Gap between Rotating and Nonrotating Plate. 82
Figure 6-8. Representative Reaction Chamber Regions 84
Figure 6-9. May 2013 Configuration. 85
Figure 6-10. July 2013 Configuration. 85
Figure 6-11. September 2013 Configuration. 86
Figure 6-12. October 2013 Configuration. 87
Figure 6-13. October 2013 Configuration with “Pin-Fin” Heat Transfer Surface Extensions. 87
Figure 6-14. Nominal Exhaust Manifold Geometry. 88

Figure 6-15. Rotor Surface Heat Flux Distribution. ..... 89
Figure 6-16. Rotor Surface Heat Flux Distribution with “Pin-Fins.” ..... 90
Figure 6-17. Representative Flow Patterns – Vertical Cross-Section. ..... 91
Figure 6-18. Representative Flow Patterns – Plan View. ..... 91
Figure 6-19. Representative Pressure Distributions without Chemical and Particle Dynamics. ..... 92
Figure 6-20. Representative Temperature Distributions without Chemical and Particle Dynamics. ..... 92
Figure 6-21. Side view of gasfier equipment in TRICONs. ..... 93
Figure 6-22. Top View of Gasifier System in TRICONs. ..... 94
Figure 7-1. Equipment Configuration for Clip Tests. ..... 96
Figure 7-2. Fuel Consumption. ..... 97
Figure 7-3. Brake Fuel Consumption. ..... 97
Figure 7-4. Thermodynamic Efficiency. ..... 98
Figure 7-5. Clip Test Efficiency and Fuel Savings. ..... 99
Figure 8-1. Compression Dewatering of Paper Samples. ..... 104
Figure 8-2. Compressed Paper Test Slugs. ..... 105
Figure 8-3. Results of Switch Grass Compression Test. ..... 105
Figure C-1. Syngas Fuel Feed System into a Naturally Aspirated Diesel Engine. ..... 166
Figure C-2. Feeding Syngas into a Turbo Charged Diesel Engine. ..... 168
Figure C-3. Minimum Controls to Feed Ultra-Low Energy Syngas into and I/C Spark Ignition. Engine. ..... 171
Figure C-4. Hybrid Diesel-Otto Generating System for Ultra-Low Energy Syngas. ..... 172

## List of Tables

Table 3-1. Equipment and Instrument Tag List. ..... 10
Table 4-1. Expected Syngas Chemistry. ..... 37
Table 4-2. Compounds Analyzed in Syngas Samples. ..... 44
Table 4-3. Summary of Syngas Samples. ..... 47
Table 4-4. Total RCRA Metals in Ash. ..... 4-55
Table 4-5. TCLP RCRA Metals in Ash. ..... 4-55
Table 4-6. Selected PAH Concentration in Quencher Oil. ..... 4-55
Table 4-7. BTEX and PAH Concentrations in Polisher Fluid. ..... 4-56
Table 4-8. BTEX and PAH Concentrations in Condensate. ..... 4-56
Table 7-1. Clip Test Feedstocks. ..... 96
Table 7-2. Clip Test Results. ..... 99
Table 8-1. Paper Dewatering Data. ..... 104
Table 8-2. Switch Grass Samples for Compression. ..... 105
Table B-1. GC Data Summary. ..... 114
Table C-1. Diesel vs. Spark Operating Conditions. ..... 165

## Acknowledgments

Funding for this demonstration was provided by the Strategic Environmental Research and Development Program (SERDP) under Weapons Platform (WP) Project 2211 and Operational Energy Capability Improvement Funds, “Rotary Kiln Gasification of Solid Waste for Base Camps.”

To date, this project has featured many individuals and organizations, providing direct support or crucial advice and guidance.

The following persons and organizations are gratefully acknowledged (among other contributors):

- David Waage and Dr. Paul Amodeo, SUNY Cobleskill
- Phil Darcy and Frank Campo, Benét Laboratories
- COL Russell Lachance, USMA
- David Ferguson, USEPA
- Leigh Knowlton, Natick Soldier Center.

# Abstract

## Objectives

The objective of this project was to develop a battalion-scale waste-to-energy (WTE) system based on the principle of gasification. More specifically, the goal the WTE system was to convert 1 to 3 tons per day of mixed wastes to energy, with minimal pre-processing, and with a net-positive energy output (net of parasitic losses). Also, the size of the system was to be limited to two, 20-ft shipping containers.

## Technical Approach

The research team took the approach of developing an entire working prototype, rather than analyzing a portion of the waste gasification process. The rotary kiln WTE system was conceived to address the Statement of Need (SON) criteria, with the following design principles:

- accept and process mixed, unsorted municipal waste materials
- minimize process energy required through careful heat management and use of hydraulics
- integrate into contingency utility systems by using standard diesel generators.

The main gasification reactor is a novel design, based on an updraft gasifier, but rotating with new techniques for introducing waste, and removing syngas. This system was tested on multiple waste mixtures, representative of reported, in-theater waste composition.

## Results

The rotary gasification system was successfully developed and testing. The syngas produced was energy rich, mirroring commercial liquid fuels in composition. The resulting ash test non-hazardous for heavy metals. Perhaps most importantly, researchers showed that waste could be consumed with a net-positive energy output.

## Benefits

If this technology were to be further developed, demonstrated, and fielded, it could solve the problem of contingency waste disposal, eliminating burn pits, or the need for hauling outside the perimeter of the camp. Additionally, this system outputs net-positive energy, tens of kilowatts at the target scale, thereby displacing a modest fuel requirement.

# List of Acronyms

| Term | Definition |
|---|---|
| AC | alternating current |
| AFT | Auxiliary Fuel Tank |
| AIChE | American Institute of Chemical Engineers |
| ASME | American Society of Mechanical Engineers |
| BGGE | Billion Gallons of Gasoline Equivalent |
| BHP | brake horsepower |
| BTU | British Thermal Unit |
| CB | Contingency Bases |
| CCG | Certified Calibration Gas (Standard) |
| CEA | Chemical Equilibrium with Applications (NASA computer program) |
| CERL | Construction Engineering Research Laboratory |
| CEST | Center for Environmental Science and Technology |
| CF | Cubic Feet |
| CFD | Computational Fluid Dynamics |
| CFR | Code of the Federal Regulations |
| CGMA | Cylinder Gas Metering Apparatus |
| CI ICE | Compression Ignition (Diesel) Internal Combustion Engines |
| CO | Carbon Monoxide |
| CONUS | Continental United States |
| CSIRO | Australia's Commonwealth Scientific and Industrial Research Organization |
| DC | Direct Current |
| DoD | US Department of Defense |
| DOE | US Department of Energy |
| DPM | Discrete Phase Model |
| ECM | Electronic Control Module |
| EG | Ethylene Glycol |
| EPA | Environmental Protection Agency |
| ERDC | Engineer Research and Development Center |
| FC | Fixed Carbon |
| FID | Flame Ionization Detector |
| FPD | Flame Photometric Detector |
| GC | Gas Chromatograph |
| GPM | Gallons Per Minute |
| HCL | hydrogen chloride |
| HDPE | High-Density Polyethylene |
| HHV | Higher Heating Value |
| HP | Horsepower |
| HV | Hand Valve |
| HVAC | Heating, Ventilating, and Air-Conditioning |
| I/C | Internal combustion |
| IFPD | Indirect Flaming Pyrolysis Downdraft |
| IIFPRG | Indirect Flaming Pyrolysis Downdraft |

| Term | Definition |
|---|---|
| IPR | In Progress Review |
| LHV | Lower Heating Value |
| METC | Morgantown Energy Technology Center |
| MFT | Main Fuel Tank |
| MGAS | METC Gasifier Advanced Simulation |
| MIG | Gas Metal Arc Welding |
| MSW | Municipal Solid Waste |
| NASA | National Aeronautics and Space Administration |
| NITS | National Technical Information Services |
| NOX | Generic term for mono-nitrogen oxides NO and $NO_2$ (nitric oxide and nitrogen dioxide]) |
| NSPS | New Source Performance Standards |
| NYDEC | New York State Department of Environmental Conservation |
| OMB | Office of Management and Budget |
| OS | Oil Separator |
| OSB | Oriented Strand Board |
| PDB | Positive Displacement Blower |
| PG | Propylene Glycol |
| PID | Proportional Integral Derivative |
| PLC | Programmable Logic Controller |
| PM | particulate matter |
| PRV | pressure reducing valve |
| psi | Pounds per Square Inch |
| PSR | Polisher |
| PVC | Polyvinyl Chloride |
| R&D | research and development |
| RANS | Reynolds Averaged Navier- Stokes (RANS) |
| RDECOM | Research, Development, and Engineering Command |
| RF | Ram Feeder |
| RH | Reheater |
| RPC | Relative Power Capacity |
| RPM | revolutions per minute |
| SAR | Same As Report |
| SBR | Sequencing Batch Reactor |
| SC | Scrubber |
| SCADA | Supervisory Control And Data Acquisition |
| SCF | Standard Cubic Feet |
| SCFH | standard cubic feet per hour |
| SCFM | standard cubic feet per minute |
| SEP | Separator |
| SERDP | Strategic Environmental Research and Development Program |
| SLHV | Specific Low Heating Value (SLHV) |
| SON | Statement of Need |
| SOX | Sulfur Oxides |
| SRI | Statistical Research, Inc. |

| Term | Definition |
|---|---|
| TCD | Thermal Conductivity Detector |
| TIG | Gas Tungsten Arc Welding |
| TR | Technical Report |
| UHP | Ultra-High Purity |
| UPH | Ultra-High Purity |
| US | United States |
| USA | United States of America |
| USACE | US Army Corps of Engineers |
| USEPA | US Environmental Protection Agency |
| USMA | US Military Academy |
| VAC | Volt AC |
| VDC | volt DC |
| VM | Volatile Matter |
| WS | Water Separator |
| WTE | Waste-to-Energy |

# 1. Introduction

## 1.1 Objectives

The statement of need (SON) to which this project responds, calls for a battalion-scale waste-to-energy (WTE) system based on the principle of gasification. The goal is to convert 1 to 3 tons per day of mixed wastes to energy, with minimal pre-processing, and with a net-positive energy output (net of parasitic losses). Also, the size of the system was required to be limited to two, 20-ft shipping containers.

While the SON states to not focus on engineering an entire WTE system, the research team believed that a holistic approach was really necessary to achieve the performance desired, rather than trying to make incremental improvements to existing technology.

The rotary kiln WTE system was conceived to address the SON criteria, with the following design principles:

- accept and process mixed, unsorted municipal waste materials
- minimize process energy required through careful heat management and use of hydraulics
- integrate into contingency utility systems by using standard diesel generators.

## 1.2 Core Design Objectives

The Inclined Indirect Flaming Pyrolysis Rotary Gasifier (IIFPRG) was invented and developed by researchers at SUNY Cobleskill in coordination with USACE-ERDC-CERL, Benét Laboratory, and USEPA. The intent was to develop a simple and reliable WTE system that could actually be used by the military, at forward operating bases, thereby meeting the challenge posed by the SON.

System design focused on the following core design objectives:

1. Ensure system safety as the highest priority.
2. Develop a portable, small, simple, and reliable 60 kW trailer-mounted system that can be military containerized in the future.
3. Process a wide variety of waste types with minimal or no feedstock preparation.
4. Handle feedstock only once. Avoid equipment prone to blockages such as multiple conveyors, storage bins, grinders, etc.
5. Dry wet wastes to less than 50% moisture content by squeezing under high compressive stress.
6. Use creative thermodynamic concepts to move heat where needed and recover lost heat to enable the processing of excessively wet feedstock.
7. Inert items such as glass, metals, soil, rocks, etc., must pass through the gasifier easily and discharge with the ash.

## 2. General Design

### 2.1 Introduction

The process developed by SUNY Cobleskill and research partners uses a unique form gasification to convert any flammable solid waste into to a synthetic fuel gas (syngas). A 60 kW diesel engine-driven generator operates in dual-fuel mode to generate electricity. The engine operates primarily on gaseous synthetic fuel created from wastes with supplemental liquid fuel.

The prototype system is mounted on two trailers and is fully portable. The system currently processes up to 1.25 tons of wet waste per day and generates between 50 and 60 kW of usable electrical power. Research focuses on how to reliably process mixed stream wastes with minimal requirements for sorting.

### 2.2 Technology for the Project

The technology uses a simple and robust means of precision thermodynamic energy management to process dripping wet waste into thermal and electrical energy. The energy to sustain the process is provided by the feedstock. SERDP funds were used to further develop and test the concept of IIFPRG.

The IIFPRG is a hybrid rotary gasifier that combines the properties of cross draft, updraft, downdraft, and indirect rotary gasification into one reactor. The thermal energy to sustain thermochemical reactions is provided by the following sources:

1. The combustion of fixed carbon at 1900 to 2100 °F within the reactor at the downhill end.
2. Combustion of a small portion of syngas to raise the temperature of engine exhaust.
3. Indirect thermal energy transfer from heated engine exhaust to process equipment.
4. Exothermic chemical reactions, primarily combustion and water shift reactions.

Sufficient thermal energy exists to process dripping wet wastes.

### 2.3 Feedstock Preparation

A significant advantage of the IIFPRG system is the ability to process as-received dripping wet wastes. The system is best suited for mixed homogenous wastes. Grinding or shredding of feedstock is required only if the waste will not physically fit into the feed system. A simple ram arrangement pushes feedstock into the gasifier. The ram has sufficient force to shear and break larger materials to allow passage through the feed system. Excessive amounts of fine particles are not a process problem and separation by screening is not required.

Small inert items, such as metals, glass, stones, soils, nails, etc., do not require separation. These items are introduced into the gasifier with the feedstock and discharge with the ash. Combustion temperatures in the downhill end of the gasifier are between 1900 and 2100 °F. The formation of slag may occur as ash and inert items are exposed to extreme temperatures before discharge. Fine bottom ash freely discharges during operation from the downhill end of the gasifier. Clinkers and

slag periodically discharge through an ash door. Large inert items such as structural steel, appliances, drywall, etc. should be separated from the feedstock before processing.

The system is designed to handle dripping wet wastes. Separation and pre-drying of waste is not required. The energy to process excessively wet waste is provided by the feedstock. Additional feedstock must be processed to compensate for excessive moisture. Although the system can process dripping wet wastes, care should be taken to keep feedstock as dry as possible before processing. Wastes should be protected from excessive moisture absorption during heavy weather.

## 2.4 Dewatering by Super-Compression

The IIFPRG system is designed to process dripping wet wastes, with moisture contents greater than 80% on a wet basis (20% solids / 80% liquids). The super-compression dewatering ram mechanically squeezes dripping wet feedstock, to both densify and remove excessive free liquids as feedstock enters the gasifier. Sufficient bulk chunks must exist in the feedstock to provide an active surface for the dewatering ram to push against. Slurries must be mixed with bulk for dewatering to occur.

The design target of the ram feeder is to lower the average moisture content of the feedstock entering the gasifier to less than 50%. The resulting liquids are captured and stored. Waste liquids are later disposed by injecting into the gasifier when processing excessively dry feedstock, such as wastes high in dry paper and cardboard content.

## 2.5 Thermodynamic Process Design Approach

The IIFPRG does numerous functions in one reactor vessel as illustrated in Figure 2-1.

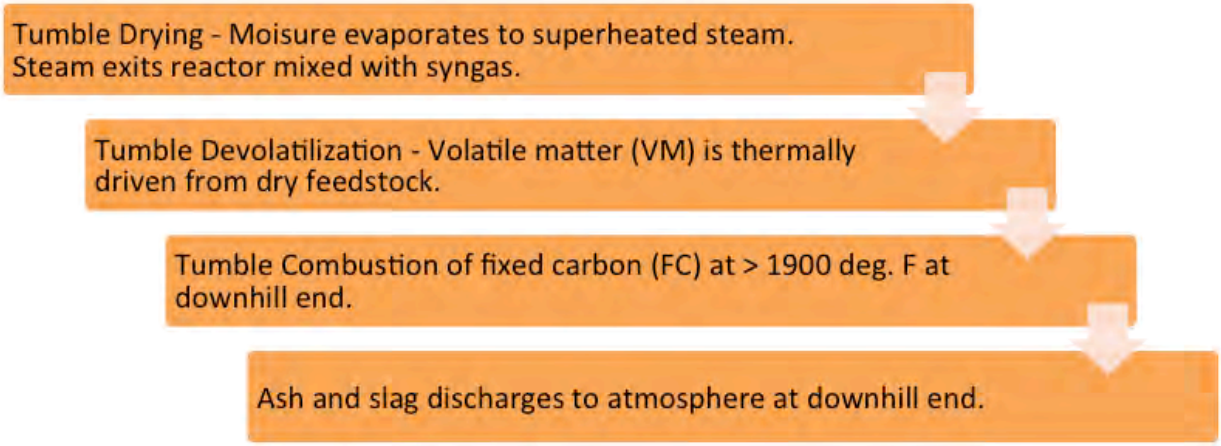



**Figure 2-1. Process Design of IIFPRG.**

### 2.5.1 Tumble Reactions

The entire gasifier vessel rotates, allowing raw and partially reacted feedstock to freely tumble within the reactor. Tumbling action allows continual exposure to drying, de-volatilization, and

combustion at different temperature zones within the reactor. The rotary action also helps ash and slag to freely discharge from the downhill end.

### 2.5.2 Proximate Analysis of Feedstock

The performance of the gasifier is based on the proximate analysis of the feedstock. Feedstock moisture varies dramatically, requiring the evaluation on a dry basis. Feedstock must be categorized on a moisture free percent mass basis as follows:

1. Higher Heating Value (HHV) of the composite feedstock
2. Percent volatile matter (VM)
3. Percent fixed carbon (FC)
4. Percent ash.

### 2.5.3 Simplified Thermochemical Reactions Using Proximate Analysis

The IIFPRG operates on the following core concepts:

1. All feedstock is first dried when entering the gasifier. Moisture is flashed to superheated steam. Steam exits the gasifier with the syngas.
2. Steam does not contact or pass through the burning char bed, preventing the highly endothermic water-gas reaction (H20 + C -> CO + $H_2$) from occurring.
3. The slightly exothermic water shift reaction ($H_2O$ + CO -> $CO_2$ + $H_2$) does not freely occur within the gasifier due to the lack of a catalyst.
4. Dry feedstock is devolatilized using heat. All gaseous VM is driven out of the feedstock, leaving carbon rich FC.
5. Thermal heat within the gasifier is provided by burning FC at 2100 °F with air that enters the reactor on the far downhill end. Additional heat for drying is provided to the rotating gasifier shell using energy from the diesel exhaust.
6. FC burns fully to ash. Ash discharges from the gasifier at 1900 to 2100 °F.

### 2.5.4 IIFPRG System Thermodynamics

The operating concept and related thermodynamics of the IIFPRG system are summarized as follows:

1. Bagged and bulk feedstocks are stored in a staging area near the gasifier.
2. Super-compression ram feeder.
    a. Compression dewatering reduces moisture content from dripping wet to < 50% moisture (wet basis).
    b. Feedstock densifies under heat and pressure into a briquette when entering the gasifier.
    c. Compressed feedstock forms an airlock seal.
3. Densified dewatered feedstock enters the gasifier.
    a. Feedstock enters a few inches uphill of the > 1900 °F burning char bed.
    b. Densified feedstock fully dries and breaks apart.
    c. Moisture vaporizes to superheated steam using indirect heat from diesel exhaust.
        (1) Liquid heats from ambient to boiling.

(2) Latent heat of vaporization transforms liquid water into vapor.
(3) Steam is superheated to the gasifier exit temperature.

4. Feedstock heats from ambient to volatilization temperature.
5. Feedstock flash gasifies and devolatilizes into FC as it approaches the burning FC zone. Feedstock devolatilizes into carbon monoxide rich syngas.
6. FC combusts with air at 14,093 BTU/lb. Combustion temperature is between 1900 to 2100 °F at 1.0 equivalence ratio at the downhill end of the gasifier. Ash and inert materials are exposed to high combustion temperatures to thermally decompose all dioxins and furans.
7. The combustion products from burning FC (carbon dioxide and nitrogen) mix with exiting syngas and steam at 500 to 700 °F. These inert gases dilute the energy level of the syngas.
8. Syngas enters the super-heater (indirect exposure to the burning char layer) where the gas mixture is heated to 2100 °F (1150 °C) using direct heat transfer from diesel exhaust heated in the afterburner. This helps to thermally crack larger molecular weight materials.
9. Syngas enters the oil filled quencher-scrubber. This scrubber uses waste motor pool lubricants as the scrubbing liquid. Syngas is cooled from 2100 to 210 °F in less than 1 millisecond to minimize dioxin and furan formation.
10. High dewpoint tars and heavy particulates are removed in the oil scrubber. Syngas at 210 °F exits the quencher-scrubber and enters the condenser. The condenser cools the gas to within 20 °F of the ambient temperature. All remaining steam is condensed to liquid condensate.
11. Hydrogen-rich syngas enters the oil filled quencher-scrubber. This scrubber uses waste motor pool lubricants as the scrubbing liquid. Syngas is cooled from 2100 to 210 °F in less than 1 millisecond to minimize dioxin and furan formation.
12. High dewpoint tars and heavy particulates are removed in the oil scrubber. Syngas at 210 °F exits the quencher-scrubber and enters the condenser. The condenser cools the gas to within 20 °F of the ambient temperature. All remaining steam is condensed to liquid condensate. The majority of steam in the syngas reacts to hydrogen in the water shift reactor, minimizing the formation of condensate downstream of the condenser. Any condensate that forms is removed from the syngas using a cyclonic separator.
13. The flow of scrubbed and filtered syngas is fed both into the diesel engine and into the afterburner. Syngas is fed into the engine intake air stream. The engine speed increases with the presence of gaseous fuel and the governor reduces the injection rate of liquid fuel.
14. Syngas enters the reheater, where it is heated to about 20 °F above the dewpoint.
15. Syngas enters the fluid bed sorbent absorber, where various dry sorbents are used for SOx and heavy metals removal. Sorbents include a mixture of lime (CaO and hydrated), sodium bicarbonate, trona, and activated carbon. Sorbents are replaced based on experimentation. Syngas is filtered using Nomex cartridge filters at the outlet of the dry fluid bed scrubber.
16. The flow of scrubbed and filtered syngas is fed both into the diesel engine and into the afterburner. Syngas is fed into the engine intake air stream. The engine speed increases with the presence of gaseous fuel and the governor reduces the injection rate of liquid fuel.
17. Diesel exhaust, with about 11% excess oxygen enters the afterburner. Syngas mixes with the diesel exhaust and combusts using the excess oxygen in the exhaust stream. The afterburner raises the diesel exhaust temperature from 900 °F to 2400 °F (1316 °C). Automation limits the combustion temperature at 2400 °F to minimize NOx formation and oxygen content. All remaining CO and all dioxins are expected to be destroyed at this temperature (above 1200 °C), although this was not verified experimentally.

18. The heated diesel exhaust exits the afterburner and enters the super-heater to provide sufficient heat to crack raw syngas. Diesel exhaust at approximately 900 °F exits the super-heater and enters the indirect gasifier, where heat is transferred through the rotating gasifier shell to vaporize feedstock moisture. Diesel exhaust exits the gasifier shell to atmosphere at approximately 450 °F.

# 3. Indirect Flaming Pyrolysis Rotary Gasifier (IIFPRG) System Equipment Test Configuration for SERDP Mixes

## 3.1 General Arrangement of Complete System

The configuration of the gasification system used on SERDP mix testing was consolidated on two 7x18-ft equipment trailers. The purpose of this was to mimic the size and layout of two, 20-ft shipping containers.

Trailer #1 contained the feedstock handling system, rotary gasifier reactor, the complete syngas scrubbing system, and the master Allen Bradley automation system. Figure 3-1 shows the rotary gasifier in the center, and the waste feed bin on the right, and syngas cooling and cleanup on the left.

Trailer #2 contained a 60 kW generator driven by a John Deere 5030HF270 diesel engine (this is similar to a Tactical Quiet Generator), a 63 kW, 480 VAC, three-phase load center to electrically load the generator, a liquid fuel consumption measurement system, main hydraulic drive system components, DC power conversion system, and a local control panel for load control and data acquisition.

The equipment configuration for all testing of SERDP mixes is shown in Figure 3-2 and Figure 3-3. Full size drawings can be provided upon request. Figure 3-4 shows the main gasifier reactor and the horizontal pipe which carries hot diesel exhaust from the generator to the reactor shell.



**Figure 3-1. View of Gasification Trailer #1.**

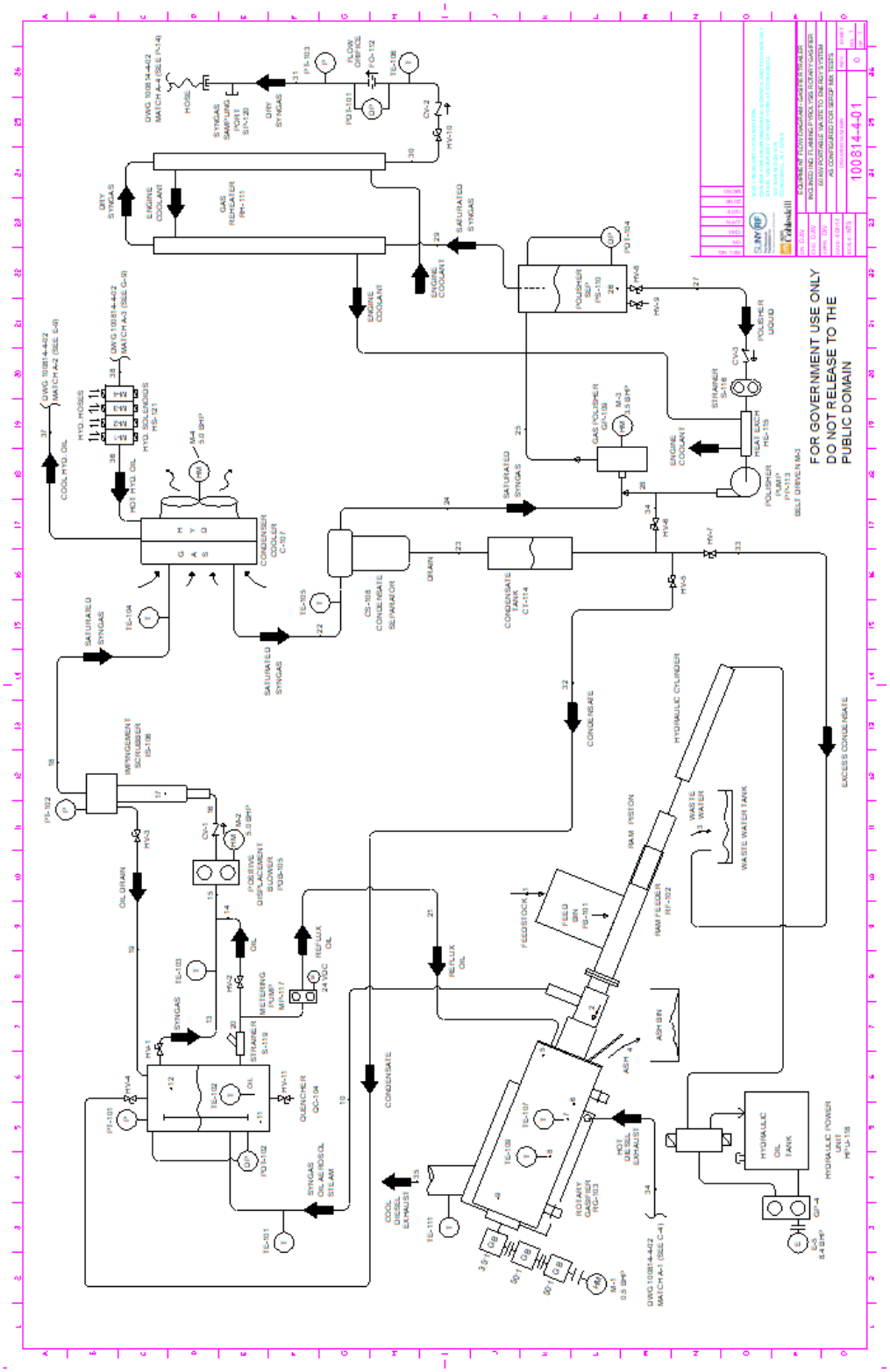



**Figure 3-2. Schematic Showing Main Reactor and Gas Conditioning.**

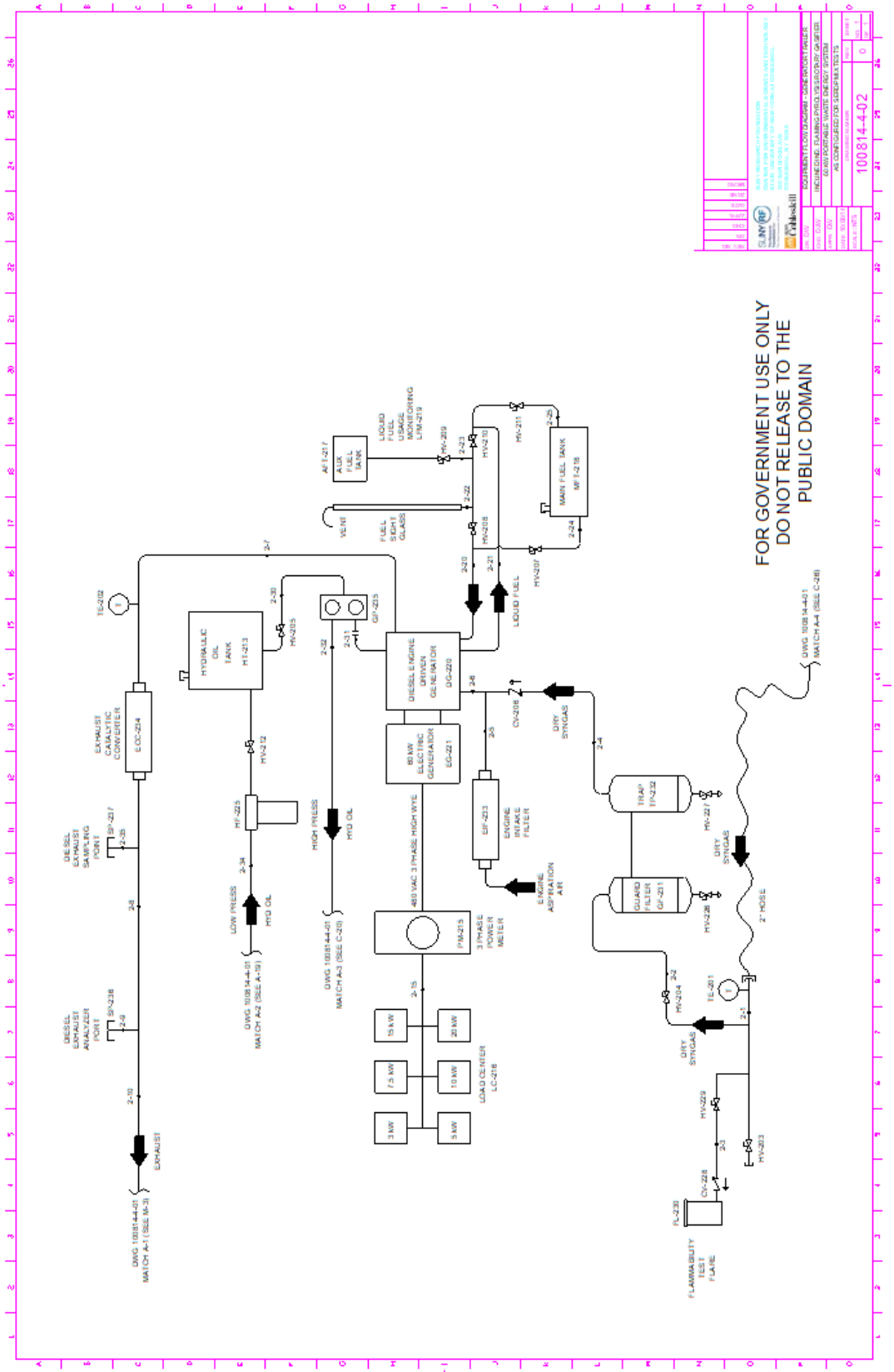



**Figure 3-3. Schematic Showing Power Generation.**



**Figure 3-4. Gasification Trailer and Hot Diesel Exhaust Piped to the Gasifier Shell.**

## 3.2 Process Equipment

Figure 3-2 and Figure 3-3 give the schematic layout of the entire system. These figures are labeled with each part, or "tag number." A description of each part follows in Table 3-1.

**Table 3-1. Equipment and Instrument Tag List.**

| Tag Number | Device | Description | Function | Notes |
|---|---|---|---|---|
| AFT-217 | Aux Fuel Tank | 5 Gallon Auxiliary Diesel Fuel Tank | Refills fuel sight glass for fuel consumption measurement | Research purposes only |
| C-107 | Condenser Cooler | Combination syngas condenser and hyd. cooler | Cools syngas to remove moisture and cools hydraulic oil | Hydraulic oil overheats (> 140 F) when attempting to raise dew point by slowing fan speed |
| CS-108 | Condensate Separator | Liquid Separator | Removes liquids from syngas | Only required when condenser is used |
| CT-114 | Condensate Tank | Condensate storage tank | Stores accumulating condensate | 6 gallon tank, manual drain |
| CV-1 | Check Valve | Main aspiration non-return check valve | Prevents backflow of syngas if blower stops | Swing check |
| CV-2 | Check Valve | Main syngas non-return check valve | Flashback preventer | Swing check |

| Tag Number | Device | Description | Function | Notes |
|---|---|---|---|---|
| CV-206 | Check Valve | Swing check - flapper lifts up | Prevents backflow of air into gasification system | Safety device |
| CV-228 | Check Valve | Swing check | Prevents backflow of air into gasification system | Safety device |
| CV-3 | Check Valve | Polisher Liquid non-return check valve | Prevents syngas from flowing thru polisher pump PP-113 | Swing check |
| DG-220 | Generator | 60 kW Diesel Engine-Driven Generator | Dual fueled on liquid diesel fuel and gaseous synthetic fuel | No bypass flare used - syngas fed to engine during startup and shut down |
| E-5 | Gasoline Engine | Ram Feeder Drive Engine | Engine to drive separate hydraulic pump GP-4 | 8.4 BHP, intermittent use, hand start |
| ECC-234 | Exhaust Catalyst | Exhaust Catalytic Converter | Burns remaining hydrocarbons in exhaust stream | Significant reduction in unburnt hydrocarbons |
| EG-221 | Electrical Generator Head | 60 kW Marelli Generator Head | Generates AC Electricity | 4 Pole Synchronous Generator - Wired 480 VAC 3 phase High Wye |
| EIF-233 | Filter | Engine Air Intake Filter | Filters engine aspiration air | |
| FB-101 | Feed Bin | Feed Point | Feedstock handling | Holds raw feedstock |
| FL-230 | Flammability Test Flare | 6 in. diameter micro-flare | Used to test syngas flammability at startup and shut down | Research Purposes |
| FO-112 | Flow Orifice | Syngas flow measurement orifice | Measures syngas flow to engine | 1.380-in. ID Cd=0.83 |
| GF-231 | Guard Filter | Guard Filter with Polypropylene Filter Bag | 2, 5, 10, 20, and 50 micron rating tested | 20 and 50 micron work well |
| GP-109 | Gas Polisher | Gas Cleaner | Removes low dew point tars and particulates from syngas | Rotary mechanical gas cleaner - virtually no particulates |
| GP-235 | Hydraulic Pump | Constant displacement hydraulic gear pump | Provides system power | Driven by engine mechanical power take off |
| GP-4 | Hydraulic Pump | Ram Feeder Engine-Driven Hydraulic Pump | Pump for ram feeder RF-102 | 16 GPM, two-stage 4:1 ratio pump |
| HE-115 | Heat Exchanger | Polisher liquid heat exchanger | Uses hot engine coolant to heat polisher liquid | Heat polishing liquid to avoid significant gain or loss |
| HF-225 | Hydraulic Filter | Hydraulic return filter | Filters hydraulic oil returning to tank | 10 micron |

| Tag Number | Device | Description | Function | Notes |
|---|---|---|---|---|
| HPU-118 | Hydraulic Power Unit | Hydraulic power unit for ram feeder | Provides power to drive ram feeder RF-102 | Self-contained engine-driven unit |
| HS-121 | Hydraulic Solenoids | 24 volt DC (VDC) Hydraulic Solenoid Bank | Reversing, closed center | Dual Coil with manual over-rides |
| HT-213 | Hydraulic Tank | Main Hydraulic Oil Tank | 37 gallon steel oil tank | With 100 mesh suction strainer. Oil heating required when operating below 50 °F (oil foams) |
| HV-1 | Hand Valve | Syngas Exhaust from Quencher | Maintenance valve | Ball valve |
| HV-10 | Hand Valve | Syngas shut off valve | Maintenance valve | Ball valve |
| HV-11 | Hand Valve | Quencher QC-104 liquid drain valve | Maintenance valve | Ball valve with plug |
| HV-2 | Hand Valve | Scrubber liquid flow control valve | Throttles scrubber liquid to impingement scrubber IS-106 | Ball valve |
| HV-203 | Valve | Hand Valve | Syngas shut off valve | Used to bypass syngas to external flare - early testing |
| HV-204 | Valve | Hand Valve | Syngas shut off valve | Stops flow of syngas to engine - forces flow to flammability test flare F-230 |
| HV-205 | Valve | Hand Valve | Hydraulic suction shut off | Maintenance valve |
| HV-207 | Valve | Hand Valve | Fuel shut off valve | Close HV-207 and HV-211 simultaneously to measure fuel usage |
| HV-208 | Valve | Hand Valve | Fuel shut off valve | Maintenance valve |
| HV-209 | Valve | Hand Valve | Fuel shut off valve | Normally closed - open to refill sight glass before fuel usage test |
| HV-210 | Valve | Hand Valve | Fuel shut off valve | Maintenance valve |
| HV-211 | Valve | Hand Valve | Fuel shut off valve | Close HV-207 and HV-211 simultaneously to measure fuel usage |
| HV-212 | Valve | Hand Valve | Hydraulic return shut off | Maintenance valve |
| HV-226 | Valve | Hand Valve | Drain condensate from guard filter | Liquid placed in QC-104 |
| HV-227 | Valve | Hand Valve | Drain condensate from Trap TP-232 | Liquid placed in QC-104 |

| Tag Number | Device | Description | Function | Notes |
|---|---|---|---|---|
| HV-229 | Valve | Hand Valve | Syngas shut off valve | Normally closed - open to momentary test flammability in flare FL-230 |
| HV-3 | Hand Valve | Scrubber drain valve | Throttles scrubber liquid draining from imp. scrubber IS-106 | Gate valve |
| HV-4 | Hand Valve | Condensate feed valve | Maintenance valve | Ball valve |
| HV-5 | Hand Valve | Condensate drain valve to quencher QC-104 | On-Off to manually drain tank CT-114 as needed | Ball valve |
| HV-6 | Hand Valve | Polisher liquid drain valve | On-Off to manually drain polisher separator PS-110 as needed | Ball valve |
| HV-7 | Hand Valve | Condensate drain valve to wastewater tank | On-Off to manually drain tank CT-114 as needed | Ball valve, emergency drain |
| HV-8 | Hand Valve | Polisher separator PS-110 liquid discharge valve | Maintenance valve | Ball valve |
| HV-9 | Hand Valve | Polisher separator PS-110 drain valve | Maintenance valve | Ball valve with plug |
| IS-106 | Impingement Scrubber | Gas Cleaner | Removes high dew point tars and particulates from syngas | High velocity exchange gas cleaner - Debris drains into quencher QC-104 |
| LC-216 | Load Center | Three-Phase AC Load Center | Places electrical load on generator | 480 VAC 60 Hz Three-phase forced convection resistance type |
| LFM-219 | Liquid Fuel Usage Monitor | Sight glass style liquid fuel metering | Measures liquid fuel consumption | Research purposes only - measures liquid fuel consumption over 1 minute intervals |
| M-1 | Hydraulic Motor | Rotary Gasifier Drive Motor | Drive motor that rotates reactor vessel RG-103 | 0.5 BHP motor power, total gear reduction is 8750:1, 1 rot/4 min., manual speed adj., manual rev. |
| M-2 | Hydraulic Motor | Positive Displacement Blower Drive Motor | Drive motor for main gas blower PDB-105 | 5.0 BHP, automated variable speed, non-reversing |
| M-3 | Hydraulic Motor | Polisher Drive Motor | Drive motor for gas polisher GS-109 and Polisher Pump PP-113 | 3.5 BHP, direct drive to GS-109, synchronous belt drive to PP-113, manual speed adj., manual rev. |
| M-4 | Hydraulic Motor | Cooling Fan Drive Motor | Drive motor for condenser cooler C-107 | 5.0 BHP, manual speed adjustment, manual reversing |

| Tag Number | Device | Description | Function | Notes |
|---|---|---|---|---|
| MFT-218 | Main Fuel Tank | 100 Gallon Main Diesel Fuel Tank | Main fuel tank for dual fueling | |
| MP-117 | Metering Pump | Reflux oil metering pump | Meters reflux oil back into the gasifier | 24 VDC brushless variable speed gear pump, 150 Watt |
| PDB-105 | Positive Displ. Blower | Gas Mover | Main aspiration blower | Roots 45URAI-G, rotary lobe positive displacement, variable speed using hydraulic motor |
| PDT-101 | Diff. Press. Transmitter | Flow Orifice Diff. Pressure | Instrument | Measures syngas flow to engine using flow orifice FO-112 |
| PDT-102 | Diff. Press. Transmitter | Quencher Liquid Level | Instrument | Indicates liquid level in quencher QC-104 |
| PDT-104 | Diff. Press. Transmitter | Polisher Separator Liquid Level | Instrument | Indicates liquid level in polisher separator PS-110 |
| PM-215 | Power Meter | Three-Phase AC Electrical Power Meter | Measures AC power produced by generator | Digital |
| PP-113 | Polisher Pump | Circulates polisher liquid | Feeds polisher liquid to polisher, belt driven motor M-3 | |
| PS-110 | Polisher Separator | Liquid - Gas Separator | Removes polisher liquids from syngas | Gas exits separator saturated |
| PT-101 | Pressure Transmitter | Quencher Static Pressure | Instrument | Quencher vacuum, represents differential pressure over Rotary Gasifier RG-103 |
| PT-102 | Pressure Transmitter | Static Pressure - Impingement Scrubber | Instrument | Syngas pressure at scrubber IS-106 outlet |
| PT-103 | Pressure Transmitter | Downstream Orifice Static Pressure | Instrument | Static downstream pressure of sub critical flow orifice FO-112 |
| QC-104 | Quencher | Syngas Quencher | Quenches syngas temperature to 165 °F | Cools and cleans syngas, extinguishes flaming embers, removes particulates, condenses organics |
| RF-102 | Ram Feeder | Hydraulic Ram Feeder | Feedstock handling | Compresses and pushes raw feedstock into the rotary reactor |
| RG-103 | Rotary Gasifier | Thermal Reactor | Thermally converts solids and liquids to flammable gas | |

| Tag Number | Device | Description | Function | Notes |
|---|---|---|---|---|
| RH-111 | Reheater | Heats syngas above dew point | Uses engine antifreeze heat to heat syngas above dew point | Gas exits reheater about 10-15 °F above saturation point |
| S-116 | Strainer | Polisher liquid strainer | Strains debris from polisher liquid | 100 mesh baskets |
| S-119 | Strainer | Scrubber liquid strainer | Removes large debris | 50 mesh |
| SP-120 | Sample Point | Syngas Sampling Point | Filling point for sample bags and Summa containers | Contains condensate moisture trap |
| SP-236 | Sample Port | Diesel exhaust analyzer port | Used for exhaust analyzer | Port in 4-in. diameter exhaust pipe |
| SP-237 | Sample Port | Diesel exhaust sampling port | Used for exhaust sampling to fill Summa canisters | Stainless Steel 304 sampling train in 4-in. diameter exhaust pipe |
| TE-101 | Type K Thermocouple | Temp of Syngas Exiting Reactor | Instrument | Mixture of syngas, organic vapor, and superheated steam - Normal 350 to 400 °F |
| TE-102 | Type K Thermocouple | Temp of Quencher Liquid | Instrument | Mixture of pyrolysis oil and water - Normal 165 °F |
| TE-103 | Type K Thermocouple | Temp of Syngas Exiting Quencher | Instrument | Saturated syngas with organic vapors - Normal 165 °F |
| TE-104 | Type K Thermocouple | Temp of Syngas Entering Condenser | Instrument | Saturated syngas with organic vapors - Normal 155 °F |
| TE-105 | Type K Thermocouple | Temp of Syngas Exiting Condenser | Instrument | Saturated syngas with organic vapors - Normal 90 to 100 °F |
| TE-106 | Type K Thermocouple | Temp of Syngas Exiting Reheater | Instrument | Syngas heated 10 to 15 °F above dew point |
| TE-107 | Type K Thermocouple | Temp of Reactor Charge 4-in. Uphill of Feed Point | Instrument | Reactor charge - normal operating temperature < 350 °F |
| TE-109 | Type K Thermocouple | Temp of Reactor Charge 20-in. Uphill of Feed Point | Instrument | Reactor charge - normal operating temperature < 350 °F |
| TE-111 | Type K Thermocouple | Temp of Final Diesel Exhaust at Release Point | Instrument | Temperature of diesel exhaust at final exhaust point |
| TE-201 | Type K Thermocouple | Syngas Temperature at Engine Intake | Instrument | |
| TE-202 | Type K Thermocouple | Exhaust Temperature at Turbo Discharge | Instrument | |

| Tag Number | Device | Description | Function | Notes |
|---|---|---|---|---|
| TP-232 | Trap | Condensate Trap | Final moisture removal before introduction to engine | < 1 cup after full day run |

## 3.3 Feedstock Handling System

Garbage bags containing waste feedstock are placed into feed bin FB-101. Ram feeder RF-102 uses a 35 ton hydraulically driven ram piston to shear, compress, dewater, and push the feedstock uphill into Rotary Gasifier RG-103. If the feedstock contains more than 40% moisture (wet basis), wastewater drains past the ram piston as the feedstock is compressed.

Ram feeder RF-102 is powered by hydraulic power unit HPU-118. For simplicity during research, hydraulic pump GP-4 is driven by an 8.5 horsepower gasoline engine M-5. Pump GP-4 is a two-stage 4:1 ratio gear pump rated for 16 GPM at 1000 psi and 4 GPM at 4000 psi. The pump automatically shifts from high flow-low pressure to low flow-high pressure as the resistance to compress and push the feedstock increases.



**Figure 3-5. Ram Feeder, Tag # RF-102.**



**Figure 3-6. Plastic Bag of Mixed Waste Place in Feed Bin.**

### 3.4 Rotary Gasifier

Cold and wet feedstock enters the Rotary Gasifier RG-103. Two thermocouples indicate the level of feedstock within the reactor. Thermocouple TE-107 is 4-in. uphill from the feedpoint and thermocouple TE-109 is 20-in. uphill from the feedpoint. The syngas exit is at the far uphill point within the gasifier.

The cold wet feedstock dries as the hot gases pass through the tumbling bed. Feedstock moisture evaporates to water vapor, which mixes with the syngas and exits the gasifier. Thermocouple TE-101 indicates the exit temperature of the syngas mixture. Dry feedstock devolatilizes on a very narrow layer of intense temperature gradient just downhill of the feed point. The remaining fixed carbon burns in the downhill section of Rotary Gasifier RG-103. The temperature at the downhill end where the aspiration air enters the reactor to burn the fixed carbon remains constant at 2000 to 2200 °F.

During steady state operation, the level of feedstock charge within the gasifier is maintained between 4 and 20 in. from the feed point. Thermocouples TE-107 and TE-109 indicate the level of feedstock as follows:

1. If TE-109 is about the same temperature as TE-101, the feedstock charge level is below 20-in. uphill of the feed point.
2. If the temperature of TE-109 is lower than TE-101, the feedstock charge level is above 20-in. uphill of the feed point, indicating the gasifier is over-full.
3. If the temperature of TE-107 is lower than TE-109, the feedstock charge level is between 4-in. and 20-in. uphill of the feed point.
4. If the temperature of TE-107, TE-109, and TE-101 are all about the same, the feedstock charge level is less than 4-in. uphill of the feed point, indicating the gasifier requires feeding.

The normal steady state operating temperatures are as follows:

1. TE-107 normally less than 250 °F.
2. Twenty inches uphill of the feedpoint at TE-109 and in the syngas exit pipe at TE-101 are approximately the same and normally operate between 250 to 350 °F.
3. Burning char zone about 1-in. uphill of the stationary spring plate operates consistently between 1800 to 2200 °F.

The gasifier thermally converts the raw feedstock completely into flammable syngas and ash. Any inert items mixed in with the feedstock, such as glass, metals, stones, soils, etc. discharge with the ash. The ash discharges through a narrow gap between the fixed spring plate and the rotating shell. The discharge arrangement naturally grinds clinkers to fine ash. An ash discharge door opens periodically to pass large items, such as metals, stones, glass, etc.

Hydraulic motor M-1 drives the gasifier to rotate slowly at about one rotation every 4 minutes. A variety of gear boxes are used to achieve a reduction ratio of 8750:1. The gasifier rotates reliably and without restriction or jamming during testing.

Hot diesel exhaust at a temperature between 800 to 1100 °F enters the gasifier shell at the downhill end. Exhaust heat transfers indirectly into the reactor through the rotating gasifier shell.

Cool diesel exhaust, at a temperature less than 450 °F, discharges through a nozzle located at the top of RG-103. Indirect heat provides sufficient energy to process exceptionally wet feedstocks (up to 70% moisture content – wet basis).



**Figure 3-7. Rotary Gasifier RG-103.**



**Figure 3-8. Gasifier Nozzle, Spring Plate, and Syngas Discharge Pipe.**



**Figure 3-9. Ash Discharge Pan.**



**Figure 3-10. Diesel Exhaust Discharge Nozzle, Final Emission Point to Atmosphere.**

## 3.5 Quencher

A mixture of syngas, oil aerosols, and water vapor flows through the gasifier exit pipe into quencher vessel QC-104. The mixture bubbles though a layer of liquid pyrolysis oil and water. The quencher immediately drops the syngas temperature to about 165 °F and extinguishes any flaming embers that may be entrained in the syngas stream exiting the gasifier. Thermocouple TE-102 indicates the temperature of the pyrolysis oil mixture. Pressure transmitter PT-101 indicates the aspiration vacuum and differential pressure transmitter PDT-102 indicates the liquid level in the vessel.

Oil aerosols condense into liquid pyrolysis oil within the quencher vessel. Water mixed in with the pyrolysis oil evaporates, saturating the syngas with moisture in the cavity above the liquid layer. Additional condensate water (32) is fed directly into the quencher vessel through hand valve HV-5, to provide sufficient moisture to maintain evaporative cooling.

The liquid temperature within the quencher is self-regulating and remains between 160 and 170 °F, regardless of the temperature and flow of the syngas entering the quencher. The normal temperature of the syngas mixture entering the quencher remains less than 350 °F, but may exceed 1200 °F when burning the gasifier totally out during a shut down. A liquid temperature in excess of 170 °F at TE-102 indicates water must be added to the quencher.



**Figure 3-11. Quencher QC-104 Located to the Left of Rotary Gasifier RG-103.**

### 3.6 Reflux Pump

Oil aerosols mixed with the syngas condense within the quencher, consistently raising the liquid level within the vessel during operation. Hot pyrolysis oil mixed with water at a temperature of about 165 °F exits quencher vessel QC-104, passes through strainer S-119, and enters metering pump MP-117. Variable speed metering pump MP-117 feeds pyrolysis oil back into the reactor vessel to maintain a constant liquid level in quencher vessel QC-104.

The liquid mixture enters the reactor through a dedicated conduit at the point of line flash gasification. This mixture is thermally cracked into lower molecular weight hydrocarbons. The cracking cycle continues until the molecular weight of the resulting hydrocarbons is low enough and the vapor pressure is high enough to evaporate as organic vapors into the syngas flow stream (C12 organics or less).

### 3.7 Aspiration Gas Mover

Saturated syngas exits the quencher, mixes with strained pyrolysis oil, and enters the intake of the rotary lobe positive displacement blower PDB-105. Hand valve HV-2 throttles the flow of the pyrolysis oil passing through the blower. This oil helps to seal the clearances within the blower, prevent the built up of tars on the rotary lobes, removes heat of compression, and is used as the primary scrubbing liquid within impingement scrubber IS-106.

Blower PDB-105 is driven by an infinitely adjustable variable speed hydraulic motor M-2. This blower aspirates gasifier RG-103 and directly varies the syngas production rate. A minimum aspiration rate of 7 standard cubic feet per minute (SCFM) of syngas is required to provide positive aspiration, which prevents syngas leakage from the air intake of gasifier RG-103.

The entire gasification system was designed for a syngas flow of 85 SCFM. The gasifier was tested to 60 SCFM, with insufficient hydraulic horsepower to drive aspiration blower PDB-105 being the limiting factor. The normal feed rate to the engine was between 20 and 25 SCFM for most feedstock mixes. The maximum flow of syngas into the engine was half to one third of the design flow, because the energy level of the gas was 2 to 3 times higher than expected. As a

result, the gasifier was significantly oversized for the engine-driven generator that was tested. The system could easily fuel an engine with twice the horsepower tested.

The mixture of saturated syngas and pyrolysis oil enter positive displacement blower PDB-105 at a vacuum of about 30 to 40 inches of water column. Thermocouple TE-103 measures the gas temperature at the blower inlet, which remains the about the same as the scrubbing liquid temperature TE-102, or about 160 to 170 °F. The blower isothermally compresses the gas to about 3 to 5 pounds per square inch (psi) pressure at the blower outlet. Check valve CV-1 prevents backflow into the quencher vessel if the blower were to stop.



**Figure 3-12. Roots 45 URAI-G Positive Displacement Rotary Lobe Blower PDB-105.**

### 3.8 Impingement Scrubber

The mixture of syngas and pyrolysis oil exit the blower and enter the impingement scrubber IS-106. The scrubber uses fresh oil mixed with recirculating oil to clean the syngas by high momentum exchange. A separator removes oil from the syngas stream and excess oil with high dew point tars drains back to quencher QC-104. Saturated syngas, free of pyrolysis oil and high dew point tars, exits the scrubber IS-106 at pressure PT-102. This oil, mixed with high dew point tars and ash, eventually gasifies as reflux and thermally cracks to low molecular weight hydrocarbons and ash. Any remaining organics in the oil ash fully burns with air within the burning char zone at temperatures between 1800 and 2200 °F. Oil ash mixes with feedstock ash, which discharges at the downhill end of the gasifier and falls into the main ash bin.



**Figure 3-13. Impingement Scrubber IS-106.**

### 3.9 Condenser Cooler

Syngas free of high dew point tars, exits the impingement scrubber saturated at temperature TE-104. The normal operating temperature of the syngas at TE-104 is about the same as TE-102 and TE-103, about 160 to 170 °F.

Condenser cooler C-107 is a combined syngas condenser and hydraulic cooler. A single fan, driven by variable speed hydraulic motor M-4, provides cooling air to both the syngas condenser and hydraulic oil cooler.

The syngas enters condenser cooler C-107 to remove moisture by reducing the dew point temperature by removing heat. Syngas mixed with liquid condensate discharge from the condenser. Liquid condensate is removed from the syngas using condensate separator CS-108. The condensate water, mixed with gasoline / diesel range organics drains from CS-108 and accumulates in condensate tank CT-114. The condensate tank periodically empties into quencher QC-104 (using hand valve HV-105), to provide sufficient free water for evaporative cooling and thermal cracking as reflux.

Hot hydraulic oil returning from hydraulic motors drains from hydraulic solenoid bank HS-214. Hot hydraulic oil passes through hydraulic cooler C-107 and cools to maintain a steady state operating temperature of 125 to 135 °F in tank HT-213. A thermostatically controlled hydraulic bypass valve (not shown) diverts oil from entering the cooler to maintain the target operating temperature if the fan is operating too fast. Cool oil exits hydraulic cooler C-107 and filters to 10 micron using hydraulic filter HF-225, before returning to hydraulic oil tank HT-213.

The objective is to vary the speed of the fan using hydraulic motor M-4, to condense the minimum amount of liquid required for quencher QC-104. The remaining moisture present in the syngas eventually passes through the engine as vapor. Removing excess liquid condensate, by excessively cooling the syngas at thermocouple TE-105, results in the removal of gasoline and diesel range organics. Condensing these organics can make the condensate water highly flammable and lowers the energy level of the syngas. Gasoline and diesel range organics should remain as vapor in the syngas mixture.

The shared fan creates operating problems. The fan must operate at a minimum speed to maintain a maximum hydraulic oil temperature of 135 °F. In most cases, this excessively cooled the syngas, providing excess condensate which had to be drained from the system. Reversing the fan to force heat from the hydraulic oil into the syngas condenser was occasionally necessary, especially in cold weather.



**Figure 3-14. Condenser Cooler C-107 – Hydraulic Cooler End with Hydraulic Driven Cooling Fan.**



**Figure 3-15. BASCO Condensate separator CS-108.**

### 3.10 Polisher

The primary purpose of the polisher is to remove low dew point tars and any remaining particulates from the syngas before fueling the engine. Saturated syngas mixes with polishing liquid at the gas polisher GP-109 intake. The polisher liquid is a mixture of ethylene glycol, water, and gasoline range liquids.

Gas polisher GP-109 mechanically transfers any remaining low dew point tars and particulates into the polishing liquid by high momentum exchange. The polishing liquid accelerates using an impeller driven by hydraulic motor M-3. The mixture of syngas and polishing liquid exit gas polisher GP-109 and enter the polisher separator PS-110, where the liquid separates cyclonically from the syngas.

Differential pressure transmitter PDT-104 indicates the level of the polishing liquid reservoir. Polishing liquid circulates through the polishing system by polisher pump PP-113. This pump is synchronously belt driven from hydraulic motor M-3. Polishing liquid exits the polisher separator PS-110 and enters strainer S-116, which contains 100 mesh baskets. S-116 baskets rarely required cleaning (once every 30 to 50 operating days). Check valve CV-3 prevents the backflow of syngas if pump PP-113 stops.

Heat exchanger HE-115 uses engine coolant to heat the polishing liquid to about the same temperature as TE-105. HE-115 regulates the temperature of the polishing liquid to avoid condensation or evaporation to maintain a constant liquid level in polisher separator PS-110. Heating the polishing liquid allows gasoline range organics to vaporize into the syngas, greatly increasing the heating value. Excess condensation in PS-110 occurs when the temperature of the polishing liquid is lower than TE-105. In this case, HE-115 heats the polisher liquid to a temperature 10 to 20 °F higher than TE-105 to evaporate polishing liquid into the syngas stream, lowering the liquid level in PS-110.

The polishing liquid constantly regenerates similar to the quencher liquid. Excess polishing liquid drains from the system using hand valve HV-6 and flows into quencher QC-104, where the liquid naturally fractions and cracks into additional hydrocarbons as reflux.



**Figure 3-16. Gas Polisher GP-109 Direct Drive by Hydraulic Motor M-3.**



**Figure 3-17. Polisher Separator PS-110.**

### 3.11 Gas Reheater

Syngas exits polisher separator PS-110 saturated and enters the gas reheater RH-111, which heats the syngas to 10 to 15 °F above the saturation dew point temperature using hot engine coolant. Dry gas at a relative humidity less than 80% exits the reheater to fuel the engine.



**Figure 3-18. Gas Reheater RH-111, a Fabricated Heat Exchanger.**

### 3.12 Flow Orifice

Flow orifice 112 measures the mass flow of syngas using thermocouple TE-106, differential pressure transmitter PDT-101, and downstream static pressure PT-103. The automation system constantly varies the speed of positive displacement blower PDB-105 to insure the actual flow of syngas measured at FO-112 remains equal to the required set point flow. Check valve CV-2 serves as a safety non-return valve if positive displacement blower PDB-105 stops.

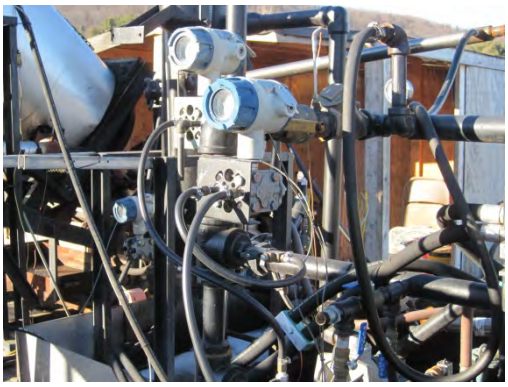


**Figure 3-19. Flow Orifice FO-112.**

### 3.13 Syngas Sampling Port

All syngas samples were taken using sampling port SP-120, located directly downstream of the flow orifice. SP-120 was used to fill all sample bags and Summa containers. The sample train was fabricated of stainless steel 304. The piping contained a drop out container to remove any liquids that condense when sampling. The piping was purged with syngas for 60 seconds before filling sampling containers.



**Figure 3-20. Syngas Sampling Port SP-120.**

### 3.14 Trailer Interconnections

The following connections are required between the two trailers:

1. 1-1/4-in. Hydraulic supply hose.
2. 1-1/4-in. Hydraulic return hose.
3. ¾-in. Hydraulic case drain hose.
4. 2-in. syngas hose.
5. ¾-in. Hot engine coolant supply hose.
6. ¾-in. Cool engine coolant return hose.
7. 4-in. Insulated diesel exhaust pipe.
8. 24 VDC power supply cable from engine charging system.
9. Ethernet data communication cable.



**Figure 3-21. Interconnections between Trailers.**

### 3.15 Flammability Test Flare

Syngas is not flared during startup or shut down. All of the syngas produced passes through the diesel engine. Flare FL-230 is a small flare cup that allows the momentary testing of syngas flammability during startup and shut down. Hand valve HV-229 throttles a small flow of syngas to flare FL-230, from the main syngas flow to the engine. Testing sustained combustion at startup indicates the gas is of sufficient energy to provide appreciable liquid fuel savings. The loss of combustion permits the engine to shut down when stopping the system.



**Figure 3-22. Syngas Flammability Test Flare FL-230.**

### 3.16 Syngas Fueling to Engine

Dry syngas enters 50µm guard filter GF-231 to remove any foreign debris, such as dirt from handling the 2-in. syngas hose connection when connecting the two trailers. Diesel engine DG-220 is a considerable distance (about 30 feet) from gas reheater RH-111, resulting in significant cooling in cold weather conditions. The piping and hose act as a heat exchanger, allowing the syngas to drop below the dew point and causing condensation. GF-231 also serves as a moisture trap to capture any liquids that may have condensed between the reheater and the engine. Future systems should locate the engine adjacent to the reheater to prevent condensation issues.

Trap TP-232 acts as a final guard to remove any remaining liquid from the syngas. In practice, very little water accumulates within this vessel (2 tablespoons per day).

Check valve CV-206 prevents air from entering the system in the event positive displacement blower PDB-105 suddenly stops and serves as a flashback preventer. Engine intake filter EIF-233 provides filtered aspiration air to mix with raw syngas at the inlet of the turbo charger compressor.

### 3.17 Diesel Engine-Driven Generator

Diesel engine-driven generator DG-220 drives a 60 kW synchronous electric generator EG-221. The generator produces 3-phase alternating current electrical power at 480 VAC and 60 Hz frequency. Power meter PM-215 monitors the voltage, current, frequency, power factor, and power generated. Load center LC-216 consumes the electrical power generated at varying loads set by the operator.



**Figure 3-23. 60kW Diesel Engine-Driven Electric Generator DG-220.**



**Figure 3-24. Three-Phase Digital Power Meter PM-215.**



**Figure 3-25. Load Center LC-216.**

### 3.18 Fuel Consumption Measurement

Syngas fueling reduces liquid fuel consumption. Liquid fuel usage monitoring system LFM-219 volumetrically monitors the amount of liquid fuel being consumed by the engine. Under normal conditions, liquid fuel (2-24) flows out of the main fuel tank and flows (2-20) to the engine fuel injection system. The engine uses an open fuel circuit allowing unused fuel (2-21) to return to the main fuel tank MFT-218 (2-25).

A 60 second duration “Clip test” is used to measure the volumetric consumption of liquid fuel using the following procedure:

1. Isolate main fuel tank MFT-218 by simultaneously closing hand valves HV-207 and HV-211.
2. Open hand valve HV-209 to fill the fuel sight glass using auxiliary fuel tank AFT-217. Close HV-209 when the fuel glass is adequately full.
3. All of the liquid fuel entering the engine withdraws from the fuel sight glass. The volumetric flow of fuel entering the engine (2-22) is measured over a 60 second duration using a dry erase marker.
4. The calculated volumetric flow rate of fuel into the engine is the product of the cross sectional area of the sight glass and the drop in fuel over a 60 second period.



**Figure 3-26. Liquid Fuel Usage Monitoring System LFM-219.**

### 3.19 Hydraulic Power System

The gasification system is mechanically driven by hydraulic powered components. The engine is equipped with a mechanical power take off that is separate from the crankshaft, which drives constant displacement hydraulic gear pump GP-235. A low pressure (< 1800 psi) and constant flow system was selected due to safety, simplicity, and economics.

Hydraulic oil from tank HT-213 provides suction flow to the gear pump. A heater was added to tank HT-213 to prevent foaming when the oil temperature is less than 50 °F. Pressurized oil at 1700 psi flows from the generator trailer to the gasification trailer. Hydraulic solenoid bank HS-121 uses dual coil three-position closed center hydraulic valves to control each hydraulic motor on the gasification trailer. Blower PDB-105 uses proportional hydraulic control valve downstream of the solenoid to vary shaft speed. Block mounted relief valves regulate the maximum system pressure at 1700 psi by allowing unused oil to return to hydraulic oil tank HT-213.

Low pressure oil exits HS-214 at about 25 psi and flows to hydraulic cooler C-107. A thermostatic control valve set at 130 °F (not shown) allows cool oil to bypass the cooler. This valve uses a thermal element to open, forcing hot hydraulic oil (over 130 °F) to flow through cooler C-107. Cool oil exits cooler C-107, flows to the generator trailer, filter HF-225, and tank HT-213.



**Figure 3-27. Gear Pump GP-235 Mounted to Engine Power Take off.**

### 3.20 Engine Exhaust System

Engine exhaust from the outlet of the turbo charger expander flows into exhaust catalytic converter ECC-234. Thermocouple TE-202 indicates the exhaust temperature at the inlet of converter ECC-234. This temperature varies from 900 to 1300 °F, depending on the gaseous fueling rate and engine load. ECC-234 is an after-market platinum based catalytic converter, which burns remaining hydrocarbons in the exhaust stream.

Engine exhaust exits converter ECC-234 and flows through an insulated 4-in. diameter pipe that interconnects the generator trailer to the gasification trailer. The onsite diesel exhaust analyzer was connected directly to diesel exhaust sampling point, located on the gasification trailer. Summa canisters were filled using diesel exhaust sampling point SP-237 for off-site analysis by Wadsworth Labs. The sample location was directly adjacent to the generator, 24 in. downstream of the discharge port of ECC-234, before muffler entrance. The Summa containers were certified cleaned and pre-evacuated to perfect vacuum before sampling. The stainless steel sampling lines were allowed to thermally stabilize and purge before filling. An inline particulate filter was not used, allowing diesel particulate matter to freely enter the Summa container.

Hot diesel exhaust, at approximately 800 °F flows into the annulus between the insulated stationary outer shell and the rotating inner shell at the downhill end of the gasifier. The rotating shell absorbs exhaust heat, which is primarily used to dry the feedstock within the reactor. Cool diesel exhaust discharges to atmosphere through the nozzle located at the uphill location on reactor RG-103. Thermocouple TE-111 indicates the diesel exhaust temperature, which is normally less than 450 °F.



**Figure 3-28. Catalytic Converter ECC-234 Mounted Directly to Turbo Expansion Turbine Outlet.**



**Figure 3-29. Diesel Exhaust Muffler and Pipe; Stainless Steel Exhaust Sampling Point SP-237.**

### 3.21 Automation System

The system was controlled by an Allen Bradley Micrologix 1600 programmable logic controller (PLC) and a Panel View Plus 1000 color touch screen located in a NEMA 4 electrical enclosure mounted on the gasifier trailer. Rockwell Automation Factory Talk software was used as a Supervisory Control And Data Acquisition (SCADA) system for data logging and collection.

A separate control panel was mounted on the generator trailer. This panel contained an Allen Bradley Micrologix 1100 programmable logic controller that communicated data with the gasifier PLC by Ethernet.

The system was operated remotely from a control room located within the Center for Environmental Science and Technology using the Factory Talk SCADA software running on a laptop computer. A wireless Ethernet router that is located within the generator trailer control panel was used to provide a wireless link between the gasifier control system and the control room.

All of the electrical components on the system and the entire automation system operate on 24 volts DC. Each trailer is powered by a 12 VDC to 24 VDC step up power converter located on the generator trailer to provide regulated 24 VDC power. The entire system is powered using the 12 VDC charging system and alternator mounted on the generator engine.



**Figure 3-30. Main System Control Enclosure with Color Touch Screen Mounted on Gasifier Trailer.**

# 4. Summary of Analytical Data and System Operation

## 4.1 Overview

Gasification testing on six different feedstock mixes that are representative of wastes encountered on forward operating bases was completed successfully. The system converted all of these waste mixes into usable electricity at a significant net energy gain.

A 60 kW diesel engine-driven generator operated at approximately 66% to 75% crankshaft load for 244 hours operating on syngas derived from the six SERDP waste mixes. The average liquid diesel fuel savings during the majority of these tests varied between 50 and 65%, with 81% being the maximum savings measured.

The engine operated a total of 472 hours on various waste derived syngas. Engine disassembly and inspection commenced at the conclusion of hot testing. The engine was disassembled, inspected, and reassembled to factory rebuilt specifications. No internal wear, loss of compression, or cylinder damage occurred due to operating on waste derived syngas.

The rotary gasification system has numerous unique advantages when compared to other WTE technologies, including small size, reliability, simplicity, and safety. The exhaust emissions when operating dual fueled are significantly lower than when operating on 100% liquid diesel fuel.

## 4.2 Safety

A significant advantage of the IIFPRG system is safety. A key design philosophy was simplicity and operator safety.

A significant finding from the research was the natural production of pyrolysis oil within the rotary gasifier dramatically improves overall safety of the system. Various changes to the system were required to handle the pyrolysis oil production and reformation. These changes resulted in the highest level of safety possible from any gasification system.

The production of free hydrogen can be very dangerous. Hydrogen has a high flame propagation speed, which greatly increases the risk of violent explosions within process vessels by direct ignition by a flaming ember or by flashback, where the combustion of syngas initiates at the engine and travels backwards through the scrubbing system towards the gasifier. The rate of combustion during flashback is so violent, the flame within the pipe acts as a jet pump, drawing air by Venturi action back into the scrubbing system and providing sufficient oxygen for a violent explosion.

The overall design of the system effectively addresses flashback by various mechanical design features and by intentionally preventing the production of free hydrogen. The gasifier design forces free hydrogen to react and reform into less volatile hydrocarbons, which evaporate into the syngas stream as gasoline and diesel range liquids.

The system implements the following safety features:

1. The rotary gasifier operates at slightly negative pressure.
2. The gasifier vessel is continuously welded and does not require any mechanical seals to prevent air from leaking into the system.
3. The syngas piping and scrubbing system is continuously welded with minimal joints, limiting the risk of leaks in the system.
4. The scrubbing system can be hermetically sealed, preventing the leakage of gas and liquids to atmosphere and preventing human exposure.
5. Syngas must be bubbled through a bed of liquid pyrolysis oil.
6. Immediately extinguishes any flaming embers entrained with the syngas.
7. Acts as a liquid flame stop if flashback occurs.
8. The amount of free hydrogen produced by the system is very low compared to other gasification technologies. Free hydrogen reforms into less volatile hydrocarbon gases and vapors.
9. Unreacted feedstock moisture causes the syngas to dilute with water vapor, which greatly reduces gas volatility with virtually no effect on engine performance.
10. Volume in process vessels are kept to a minimum and are designed with stirring velocities to prevent oxygen accumulation.
11. Gas residence time in entire system from gas production to engine combustion is less than 500 milliseconds. Gas is not stored and is immediately consumed.
12. The reactor operates at very low internal temperatures (less than 350 °F) preventing auto-ignition at the point where feedstock enters the gasifier.
13. The gasifier design prevents air from entering the system during an unexpected loss of aspiration due to a mechanical failure. Syngas flows backwards and gently combusts at the ash withdrawal point until aspiration is restored or the system cools.
14. Able to automatically adjust gas production to demand over a wide range of flows, providing a dramatic turn down ratio.
15. Gasifier naturally regulates the flow of aspiration air into the reactor based on thermal demands, which stops oxygen from entering the system at all times, preventing the need for the automation system to regulate the flow of blowing air to maintain safe oxygen levels during upset conditions.
16. Syngas is fed into the engine from startup through shut down. A combustion flare is not required or used.

### 4.3 Waste Mixes Used in Testing

Multiple field waste studies have been conducted by DoD agencies. Six synthetic mixes that either closely represent the actual waste content observed or are of significant military interest for disposal were developed for prototype testing as follows:

1. **Standard long term mix** consisting of 15% (by weight) corrugated cardboard (OCC), 15% office, news, and mixed clean paper, 6% HDPE plastic, 6% PET plastic, 6% PP plastic, 20% wet food waste, 24% wood waste, 4% inerts (metals, glass, stones, soils), and 4% textiles (polyester and cotton).
   a. The moisture content of the mix is 28% (wet basis).
   b. The HHV (dry basis) of the mix is 9559 BTU/lb.

c. Proximate analysis of the mix (dry basis) is 80.3% VM, 10.0% ash, 9.6% FC.

2. **50% Plastics** consisting of 15% HDPE plastic, 15% PET plastic, 15% PP plastic, 20% wet food waste, 15% wood waste, and 20% chopped rubber (mostly sequencing batch reactor [SBR]).
   a. The moisture content of the mix is 21.7% (wet basis).
   b. The HHV (dry basis) of the mix is 13787 BTU/lb.
   c. Proximate analysis of the mix (dry basis) is 80.3% VM, 10.0% ash, 9.6% FC.

3. **33% Petroleum, Oil, Lubricants (POL)** consisting of 15% corrugated cardboard (OCC), 5% office, news, and mixed clean paper, 15% wet food waste, 20% wood waste, 2% textiles (polyester and cotton), and 10% chopped rubber (mostly SBR).
   a. The moisture content of the mix is 18.3% (wet basis).
   b. The HHV (dry basis) of the mix is 12080 BTU/lb.
   c. Proximate analysis of the mix (dry basis) is 84.3% VM, 5.4% ash, 10.1% FC.

4. **50% Food** consisting of 20% corrugated cardboard (OCC), 15% office, news, and mixed clean paper, 3% HDPE plastic, 3% PET plastic, 3% PP plastic, 50% wet food waste, 5% wood waste, and 1% inerts (metals, glass, stones, soils).
   a. The moisture content of the mix is 44.3% (wet basis).
   b. The HHV (dry basis) of the mix is 8264 BTU/lb.
   c. Proximate analysis of the mix (dry basis) is 80.3% VM, 10.0% ash, 9.6% FC.

5. **100% Construction** consisting of 15% corrugated cardboard (OCC), 5% office, news, and mixed clean paper, 2% HDPE plastic, 2% PET plastic, 2% PP plastic, 10% wet food waste, 50% wood waste, and 14% inerts (metals, glass, stones, soils).
   a. The moisture content of the mix is 29.2% (wet basis).
   b. The HHV (dry basis) of the mix is 7095 BTU/lb.
   c. Proximate analysis of the mix (dry basis) is 65.3% VM, 23.5% ash, 10.6% FC.

6. **40% Tires** consisting of 8% (by wt.) corrugated cardboard (OCC), 8% office, news, and mixed clean paper, 5% HDPE plastic, 5% PET plastic, 5% HIPS (high index polystyrene) plastic, 8% wet food waste, 7% wood waste, 5% inerts (metals, glass, stones, soils), 5% textiles (polyester and cotton), and 40% chopped rubber (mostly SBR).
   a. The moisture content of the mix is 14.8% (wet basis).
   b. The HHV (dry basis) of the mix is 10374 BTU/lb.
   c. Proximate analysis of the mix (dry basis) is 67.3% VM, 17.2% ash, 15.7% FC.

### 4.4 Syngas Chemistry

The IIFPRG reactor was originally to produce synthetic gas chemistry similar to updraft gasifiers. The percent volume of each component gas was expected to vary between the low energy and the high energy chemistry shown in Table 4-1.

The expected HHV of the gas was between 81 and 144 BTU per standard cubic foot (BTU/scf). Syngas of similar chemistry marginally sustains combustion (with significant flame separation)

at a HHV greater than 110 BTU/scf in an open burn cup. A HHV greater than 140 BTU/scf is required for reliable sustained combustion. The projected syngas mixture was to have marginal flammability sufficient to co-fuel a diesel engine.

The intent of gasification is to devolatilize solid and liquid feedstock using thermal energy to the lowest molecular weight component gases possible, which are primarily hydrogen, carbon monoxide, and a small amount of methane gases. The chemical equilibrium of these reactions is well established and understood. As shown in Table 4-1, the energy content (HHV) of pure hydrogen and carbon monoxide gas are similar (326 and 323 BTU/scf), which is about 1/3$^{rd}$ the energy content of natural gas.

A mixture of fixed carbon and ash remain after the feedstock is fully devolatilized. The IIFPRG reactor uses flaming pyrolysis, which burns the remaining fixed carbon with air to provide the heat necessary to sustain the thermochemical reaction. The combustion of fixed carbon dilutes the syngas with carbon dioxide and nitrogen, which are inert and contribute no energy value.

The traditional syngas mixture consists of hydrogen, carbon monoxide, carbon dioxide, nitrogen, and a small amount of methane. The design of the IIFPRG reactor is to handle exceptionally wet feedstocks by preventing the highly endothermic water-gas reaction, which converts water into additional hydrogen and carbon monoxide gases. The design prevents the water shift reaction, which converts water and carbon monoxide to additional hydrogen and carbon dioxide. The reactor design limits hydrogen production to less than 9% by volume in the syngas mixture, primarily to conserve the highly endothermic process of converting water to hydrogen gas.

**Table 4-1. Expected Syngas Chemistry.**

| | HHV | Low Energy | Component | High Energy | Component |
|---|---|---|---|---|---|
| Component | BTU/scf | % Volume | BTU/scf | % Volume | BTU/scf |
| Hydrogen | 326 | 5% | 16.3 | 10% | 32.6 |
| Carbon Monoxide | 323 | 17% | 54.91 | 25% | 80.75 |
| Methane | 1011 | 1% | 10.11 | 3% | 30.33 |
| Carbon Dioxide | 0 | 9% | 0 | 15% | 0 |
| Nitrogen | 0 | 68% | 0 | 47% | 0 |
| | | HHV Total = | 81 | HHV Total = | 144 |

## 4.5 Unexpected Performance and Results Regarding Pyrolysis Oil

Before the interim report issued in March 2014, the IIFPRG gasifier was successfully tested on various cafeteria waste, wood chips, and biomass, which produced small quantities of liquid "biocrude" pyrolysis oil that condensed out of the gas and accumulated at dry points in the gas cleanup system. The production rate of biocrude oil was relatively low (1 to 2 gallons per hour) and was difficult to measure due to the design of the gas cleanup system. Excess oil was drained from the system at the conclusion of testing each day.

Testing on various SERDP waste mixes commenced during the summer of 2014. Gasifying representative Forward Operating Base (FOB) waste mixes containing paper, cardboard, plastic, rubber, textiles, and POL greatly increased the production of pyrolysis oil to amounts that were 4 to 6 times greater than previous observations. ***This event dramatically changed the entire progression of this project.***

Various attempts to adjust process conditions to reduce oil generation failed (temperatures, flows, feeding methods, rotational speed, etc.). As a next step, multiple mechanical changes to the internals of the gasifier were also tested. Trials were unsuccessful and the gasifier did not produce flammable gas due to uncontrolled combustion of gas within the reactor when attempting to crack the oil into synthetic gas at higher temperatures.

### 4.5.1 Research on External Cracking Methods

Various methods were considered to crack the pyrolysis oil and tars after the syngas exited the reactor. The following methods were investigated:

1. Use plasma or carbon element electric arc to heat the mixture of syngas, oil vapor, and steam to a temperature of 2200 °F for at least 10 milliseconds retention on a platinum catalyst. The energy just to raise the temperature of the syngas mixture to the reaction temperature is over 200,000 BTU/hr. ***The amount of thermal energy just to heat the mixture will require 60 kW of electricity, which is all of the power generated, making an electrical powered cracking*** concept a net energy loss.
2. Energy recovery from exothermic cracking (partially burning on a catalyst) would be nearly impossible from a practical standpoint due to the lack of heat exchanger survival at the required operating temperatures and fouling.
3. Cracking the oil on a red-hot bed of burning carbon fueled by coal or coke. Researchers determined about 25 to 50 pounds per hour of coal or coke is required to sustain this reaction, since significant thermal energy is required for cracking the steam mixed with the syngas (not possible to prevent the water-gas and water shift reactions). This option has numerous safety issues, greatly increases complexity, significantly reduces the energy level of the syngas, and was determined not practical for use on FOB's.

Researchers at SUNY Cobleskill decided the best way to thermodynamically crack the pyrolysis oil would be to separate the liquids from the syngas and then use the burning char layer within the reactor for thermal cracking by pumping the liquids back into the reactor as reflux.

### 4.5.2 Development of Reflux Concept

The gasifier operates on the concept of "tumbling line flash gasification", where cold wet feedstock directly contacts the burning layer of red-hot char on a narrow line within the reactor. The temperature gradient is in excess of 1300 °F over a distance the length of which is less than 2-in. Feedstock devolatilizes by "flash pyrolysis" at a small interface area within the reactor.

Flash pyrolysis is well understood in other gasification technologies and is commonly used to generate high amounts of liquid pyrolysis oil. Researchers at SUNY Cobleskill eventually accepted the fact that it would be impossible to stop the production of liquid pyrolysis oil and it is not practical to crack these liquids external to the reactor.

The amount of oil production created numerous problems and serious safety concerns with the original scrubbing system that had to be resolved before further testing could occur. Safety issues included the elimination of the dust cyclone and numerous vessels with large volume, which could allow air to leak into the system and oxygen to accumulate in dead spaces. The original

scrubbing system also used waste crankcase oil as the scrubbing liquid, which quickly diluted with pyrolysis oil.

The quantity of pyrolysis oil produced required consistent draining from the system during operation and became a liquid waste disposal problem. A 5-hour test run could easily produce 30 to 40 gallons of pyrolysis oil, quickly filling 55 gallon storage drums. Researchers felt that the only way to complete the SERDP run testing was to develop a way to re-gasify the high quantities of pyrolysis oil as an effective means of disposal.

The pyrolysis oil was originally viewed as a problem, but was quickly found to be an asset if it could be used scrub the gas of tars and particulates, and then meter the “dirty” oil back into the reactor as reflux for disposal by re-gasification within the 2200 °F burning carbon layer. The implementation of this concept required major modifications to both the reactor and the entire scrubbing system, but dramatically improved the entire performance of the system while enhancing simplicity and optimizing safety.

Significant research was required to modify the reactor and develop a scrubbing system that could work reliably using the pyrolysis oil created by the reactor as the scrubbing liquid. This work was completed throughout 2014.

Numerous advantages to this concept quickly became apparent to researchers as follows:

1. The scrubbing system removes tars and particulates from the syngas and forces contaminates into the pyrolysis oil.
2. Pumping pyrolysis oil back into the reactor as reflux dramatically improves the energy value of the synthetic fuel gas (by a factor of five), which is significantly different than traditional syngas from gasification.
3. Dial-in energy value possible. The pumping rate directly affects the heating value of the syngas mixture. The heating value of the gas dramatically changes when the operator adjusts the speed of the reflux pump.
4. Particulates in the pyrolysis oil separate within the reactor and discharge with the normal feedstock ash.
5. Removing moisture by thermally cooling syngas also condenses significant amounts of gasoline and diesel range liquids. These compounds crack within the gasifier by mixing condensate with the reflux flow.
6. Unreacted oil naturally oxidizes near the air entry, greatly increasing the thermal energy within the reactor.
7. Significant improvement in overall system safety and reliability.
8. Ease of operation. The reactor gravitates to a natural thermal operating point where the aspiration air self-varies based on equilibrium energy of the chemical reactions, without the need of automation and controls.

Another observation after the pyro oil was added back to the gasifier was a dramatic reduction in liquid diesel fuel consumptions at lower gas flows, indicating a much greater energy value within the syngas;

### 4.5.3 Additional Gaseous Hydrocarbons

The above observations indicate there are additional flammable hydrocarbons within the syngas contributing to the excess energy. Researchers initially felt these hydrocarbons were limited to the gaseous C2, C3, and C4 family of organics (as is the case with downdraft gasification). The GC located at SUNY Cobleskill was calibrated during the summer and fall of 2014 to indicate C2 through C4 organics, but tests continued to indicate the GC analysis was missing significant hydrocarbons that were contributing to the energy level of the gas. In many cases, the energy level predicted by the GC chemistry was under-predicted by over 100% when compared to the combustion based gas analyzer.

The combustion based analyzer predicted wet gas energy values in excess of 280 BTU/scf, when the GC predicted a dry energy content of 130 BTU/scf. The combustion based analyzer was very close to the thermodynamic energy balance around the engine, further raising the suspicion of additional C5+ hydrocarbon vapors within the syngas.

In the fall of 2014, it was decided to do further analysis of both syngas and diesel exhaust samples to the New York State Dept. of Health, Wadsworth Labs. This lab has very extensive capabilities, and can provide a full organic range analysis.

### 4.5.4 Vapor Phase Organics

Organic psychrometric analysis indicates a significant amount of liquid organics can evaporate into the syngas mixture in the form of organic humidity, similar to how gasoline vapors evaporate into air at the intake of a spark ignition internal combustion engine. The ability of the liquids to evaporate into the gas depends on the molecular weight and vapor pressure of the liquid, as well as the temperature of the syngas. Analytical analysis indicated significant amounts of C5 through C9+ organic liquids can evaporate into the gas, contributing to the energy value of the gas mixture.

## 4.6 Process Description Used for Waste Mix Testing

Rotary reactor RG-103 fully dries and devolatilizes each feedstock mix using thermal energy from diesel engine exhaust (indirect heat transfer) and from burning the remaining fixed carbon in the feedstock using air. Feedstock moisture flashes to superheated steam that mixes with the syngas before exiting the reactor. Condenser C-107 removes the majority of moisture from the syngas before sampling point SP-120 using condensate separator CS-108, but the condensate obtained during early tests (Jan/Feb 2015) was highly flammable (similar to gasoline). All subsequent tests after Feb. 2015 operate with the lowest possible condenser fan speed (hydraulic motor M-4) to avoid producing excessive condensate while providing adequate cooling to the hydraulic system. Excess condensate was transferred to quencher QC-104. Heat from the engine cooling system was added to polisher GP-109 liquid using heat exchanger HE-115 to obtain an equilibrium liquid level in the polisher separator PS-110 (no condensation or evaporation). Excess condensate was drained from condensate tank CT-114 into a wastewater drum only when temperature conditions could not be maintained to evaporate all condensate produced due to weather conditions or equipment limitations. The objective for each test was to evaporate all of the condensate liquid into the syngas, producing a wet gas and recovering the energy value of

any organics mixed in the liquids. The resulting moisture content in the syngas at the sampling point was less than 15% by mass for all tests.

The reactor flash gasifies feedstock, which creates significant amounts of pyrolysis oil. The production of oil varies based on the feedstock and was in excess of 25% of the thermal energy in the unreacted feedstock. Oil aerosols mixed with the syngas condense into a liquid within quencher vessel QC-104, which scrubs the gas of high dew point tars at an equilibrium temperature of 165 °F. The quencher naturally operates consistently at 165 °F by evaporative cooling due to the presence of steam and water mixed in the pyrolysis oil.

Variable speed reflux metering pump MP-117 regulates the flow of reflux, which is a mixture of oil and condensate from quencher vessel QC-104 and into the reaction zone within the gasifier RG-103. The speed of the pump was manually set by the operator during each test to maintain a constant level within the quencher vessel QC-104. Condensate mixed with pyrolysis oil thermo-chemically cracks within the reactor into lighter organics (C12 or less) at temperatures approaching 2200 °F. The reflux mixture continually circulates and cracks until the combination of molecular weight and vapor pressure allow these organics to fully evaporate and leave the process as vapor with the syngas. Reflux pump MP-117 was adjusted each time feedstock was added to maintain a consistent liquid level in quencher QC-104 for the test duration tests.

Feedstock devolatilizes to fixed carbon within the reactor. Air enters the bottom of the reactor to burn this fixed carbon fully to ash. The combustion products (mostly carbon dioxide and nitrogen) mix with the syngas and exit the reactor. The reactor operated naturally aspirated on air for all tests.

Low dew point tars are removed downstream of condenser C-107 by polisher GP-109. The polisher uses a mixture of ethylene glycol and water at high momentum exchange to scrub the gas. The temperature of the polisher liquid was manually adjusted by the operator to maintain the same temperature or slightly higher than the condenser outlet, minimizing the gain or loss of polishing liquid. The ethylene glycol consistently evaporates into the syngas mixture and was not replaced. The polisher operates on 100% condensate, which has a high gasoline range liquid content and did not freeze during the cold weather tests. The polisher liquid regenerates when excess condensate accumulates in polisher separator PS-110 due to the loss of temperature control (manual adjustment or equipment limited), requiring the transfer of liquid to quencher QC-104 at least once per test run, where the tars in this liquid are eventually re gasified as reflux.

Reheater RH-111 uses excess thermal energy from the engine block to heat the syngas mixture about 15 °F above the pressure dew point. The syngas sampling point was directly downstream of the reheater.

Syngas is mixes with intake air and combusts in 60 kW diesel engine-driven generator DG-220. The engine governor automatically adjusts the liquid fueling rate based on the gaseous fueling rate. As the gaseous fueling rate increases, the liquid diesel fuel consumption decreases, with a maximum possible liquid fuel savings of about 81%.

## 4.7 Sampling Results

### 4.7.1 Syngas Sampling Procedure

A single feedstock mix was run for each test day. One syngas sample and one diesel exhaust sample was obtained at the midpoint of each test. A 4-hour test normally takes 6 to 8 hours from engine on until engine off.

The syngas sample is obtained downstream of the reheater at sampling port SP-120. Gas was allowed to flow through the sampling train for at least 60 seconds to allow full purging and thermal stabilization. A moisture trap at the sampling point removes liquid condensate. The sampling bag or Summa container was connected with syngas flowing through the sampling train to minimize the risk of air contamination.

Syngas is normally a mixture of carbon monoxide, hydrogen, nitrogen, carbon dioxide, and a slight amount of methane. Multiple samples were analyzed on site using a GC and combustion based calorimeter. Prior research on downdraft gasification indicated a close match in HHV between the GC and combustion based calorimeter when analyzing for these components.

A significant difference in heating value was observed between the GC and combustion based calorimeter when testing the rotary reactor. Researchers felt the mismatch was the difference of gaseous range organics (C2 to C4). The GC was re-calibrated to include C2 to C4 organics, which reduced the mismatch of HHVs between the two methods. A significant mismatch still occurs, especially when feeding reflux oil into the reactor, indicating the presence C5+ organic vapors in the syngas mixture. The main objective of Wadsworth Labs was to identify the type and content of these higher level organics that are in the syngas mixture.

The main objective of the syngas sampling is to determine the presence of gaseous organics (C2 to C4) and vapor organics (C5 to C9+). Even in small amounts, these organics were found to greatly increase the gross heating value of the syngas.

The following objectives were for the syngas analysis at Wadsworth Labs:

- Identify all significant organic compounds in the syngas.
- Measure each significant compound to the best possible accuracy.
- Determine the percentages of total hydrocarbons in each group. The group being determined by the number of carbon atoms (C2, C3, C4, C5, through C9). This percentage includes significant peaks, as well as insignificant peaks.
- Group hydrocarbons present based on their structures, i.e., alkanes, alkenes, aromatics, etc.
- Provide chromatograph outputs sheets.
- Summarize data in tables with compound names and percentages, as appropriate.
- Compare the chromatograph footprint to standard commercially available fuels.
- Provide a brief written summary of the method, equipment, dilution amount, findings, concerns, conclusions, and recommendations.

A full day test was conducted on each SERDP waste mix, with the exception of the 50% plastics run. High plastics content did not create a problem during testing, but increased the viscosity of

the pyrolysis oil used in quencher QC-104 after the test was complete and the system cooled overnight. The pyrolysis oil solidified in QC-104 and in all adjoining equipment where the pyrolysis oil contacts. A second duplicate test at 50% plastics content was cancelled to avoid a repeat of the problems experienced. The plastics content should be limited to less than 30% by mass to avoid this problem in the future.

Syngas samples for each waste mix were obtained after the system stabilized for at least 2 hours at steady state operation. Samples were obtained in certified pre-evacuated Summa containers for analysis at Wadsworth Labs. The results of the Wadsworth report are contained in Appendix A[*] to this report.

### 4.7.2 Syngas Components Analyzed

Each syngas sample was analyzed by Gas Chromatograph-Mass Spectrometer at Wadsworth Labs for a total of 35 compounds as shown in Table 4-2.

[*] Note that the Appendices to this report are included in a separate volume entitled, *Rotary Kiln Gasification of Solid Waste for Base Camps: Appendices A-D.*

**Table 4-2. Compounds Analyzed in Syngas Samples.**

| Organic Compound | Formula | MW | Specific Gravity | Heat of Combustion kJ/mol | HHV Heat of Combustion BTU/scf | LHV Heat of Combustion BTU/scf |
|---|---|---|---|---|---|---|
| Carbon Dioxide | $CO_2$ | 44 | 1.52 | 0 | 0 | 0 |
| Nitrogen | $N_2$ | 28 | 0.97 | 0 | 0 | 0 |
| Hydrogen | $H_2$ | 2.016 | 0.069 | 290 | 326 | 274 |
| Carbon Monoxide | CO | 28.01 | 0.967 | 285 | 323 | 323 |
| Methane | $CH_4$ | 16.04 | 0.5543 | 890 | 1011 | 909 |
| Ethane | $C_2H_6$ | 30.07 | 1.05 | 1560 | 1791 | 1619 |
| Propane | $C_3H_8$ | 44.09 | 1.56 | 2220 | 2582 | 2315 |
| n-Butane | $C_4H_{10}$ | 58.12 | 2.07 | 2874 | 3365 | 3101 |
| Propene | $C_3H_6$ | 42.08 | 1.4 | 1911 | 2332 | 2181 |
| 1,3-Butadiene | $C_4H_6$ | 54.09 | 1.9 | 2540 | 2933 | 2729 |
| Isoprene | $C_5H_8$ | 68.12 | 2.35 | 3157 | 3580 | 3410 |
| Acetone | $C_3H_6O$ | 58.08 | 2 | 1772 | 2006 | 1862 |
| n-Hexane | $C_6H_{14}$ | 86.169 | 2.97 | 4202 | 4761 | 4404 |
| Methyl Ethyl Ketone | $C_4H_8O$ | 72.11 | 2.5 | 2444 | 2786 | 2590 |
| Cyclohexane | $C_6H_{12}$ | 84.16 | 2.98 | 3920 | 4563 | 4180 |
| n-heptane | $C_7H_{16}$ | 100.2 | 3.45 | 4817 | 5452 | 5100 |
| Benzene | $C_6H_6$ | 78.107 | 2.69 | 3315 | 3753 | 3591 |
| Methylcyclohexane | $C_7H_{14}$ | 98.19 | 3.39 | 4565 | 5181 | 4200 |
| Toluene | $C_7H_8$ | 92.132 | 3.176 | 3955 | 4482 | 4206 |
| n-Nonane | $C_9H_{20}$ | 128.26 | 4.41 | 6125 | 6923 | 6494 |
| Ethylbenzene | $C_8H_{10}$ | 106.17 | 3.66 | 4564 | 5172 | 4970 |
| M,P-Xylene | $C_8H_{10}$ | 106.158 | 3.662 | 4559.8 | 5171 | 4956 |
| O-Xylene | $C_8H_{10}$ | 106.158 | 3.662 | 4552 | 5162 | 4958 |
| Styrene | $C_8H_8$ | 104.15 | 3.6 | 4394 | 4993 | 4830 |
| Isopropylbenzene | $C_9H_{12}$ | 120.19 | 4.1 | 5260 | 5899 | 5661 |
| n-Decane | $C_{10}H_{22}$ | 142.28 | 4.9 | 6778 | 7674 | 7190 |
| n-Propylbenzene | $C_9H_{12}$ | 120.19 | 4.14 | 5260 | 5956 | 5661 |
| 1,3,5-Trimethylbenzene | $C_9H_{12}$ | 120.19 | 4.1 | 5241 | 5878 | 5584 |
| 1,2,4-Trimethylbenzene | $C_9H_{12}$ | 120.19 | 4.15 | 5195 | 5897 | 5602 |
| d-Limonene | $C_{10}H_{16}$ | 136.24 | 4.7 | 6167 | 6994 | 6644 |
| p-Isopropyltoluene | $C_{10}H_{14}$ | 134.22 | 4.62 | 5860 | 6631 | 6300 |
| 1,2,3-Trimethylbenzene | $C_9H_{12}$ | 120.19 | 4.15 | 5198 | 5900 | 5605 |
| n-Undecane | $C_{11}H_{24}$ | 156.3 | 5.4 | 7429 | 8438 | 7846 |
| n-Dodecane | $C_{12}H_{26}$ | 170.3 | 5.96 | 7901 | 9090 | 8650 |
| Naphthalene | $C_{10}H_8$ | 128.2 | 4.421 | 5156 | 5845 | 5552 |

### 4.7.3 Syngas Chemistry – Executive Summary of Results

Figure 4-1 shows the average syngas chemistry broken down into flammable component groups as follows:

1. Traditional Syngas – Mixture of hydrogen, carbon monoxide, and methane.
2. Gas Phase – Grouping of gaseous C2 through C4 organics at standard conditions.
3. Gasoline Range – Grouping of liquid C5 through C9 organics at standard conditions.
4. Diesel Range – Grouping of liquid C10 and higher organics at standard conditions.

Figure 4-1 shows the dry syngas energy distribution of each flammable component group contributes to the total energy within the syngas mixture. The total energy of non-traditional

syngas components (C2 and higher) contributed more than 65% of the total energy within the gas sample. The data validates the theory C2 through C4 gaseous organics and C5+ liquid organics significantly enrich the energy content of the syngas. Gasoline and diesel range liquids evaporate into the syngas as vapor in the form of organic humidity.

Figure 4-2 shows the average dry heating value for each waste mix tested. The HHV is the gross energy (BTU per standard cubic foot) recovered if the water vapor from the hydrogen component portion is fully condensed within the exhaust. The low heating value is the net energy recovered if the exhaust remains hot, preventing the recovery of latent heat from condensing water vapor. The low heating value is used for all engine calculations, since the water vapor in the exhaust is not condensed.

Figure 4-3 shows the heating value of each waste mix as a percentage of natural gas. Table 4-3 summarizes the syngas mixtures tested at Wadsworth Labs.

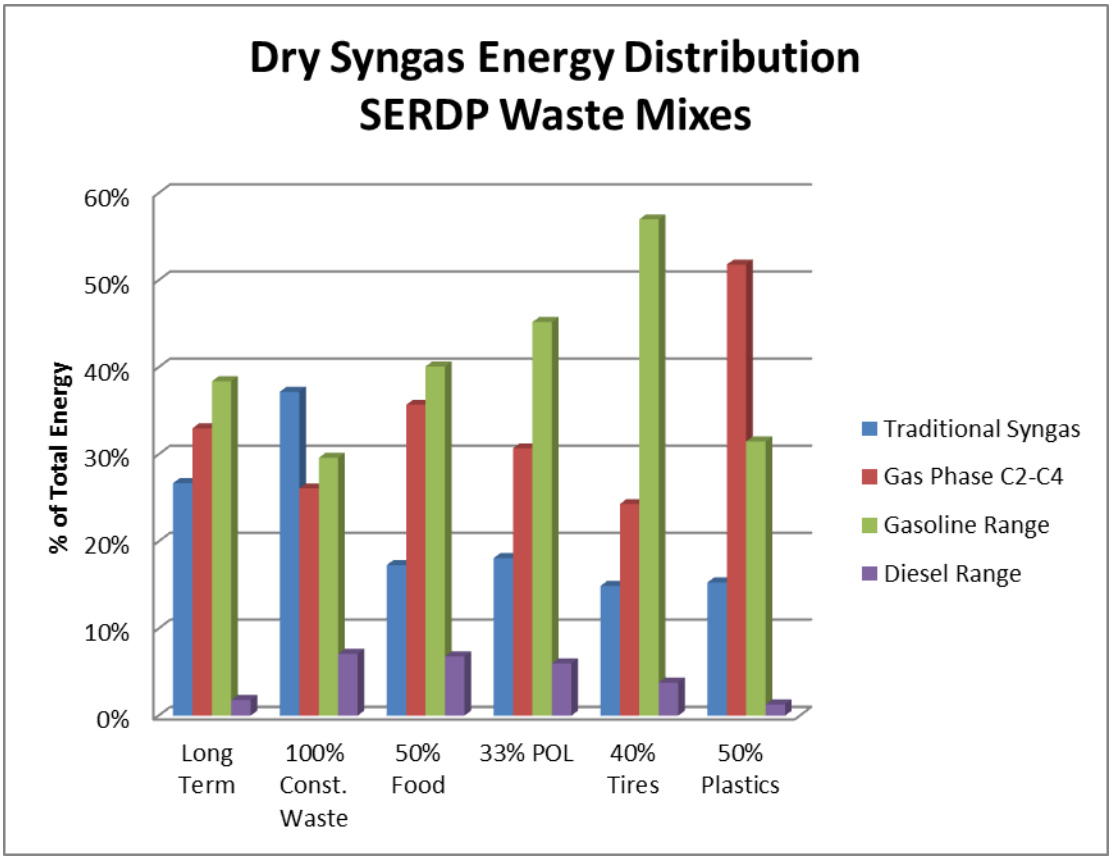



**Figure 4-1. Energy Contribution from Organic Groupings.**

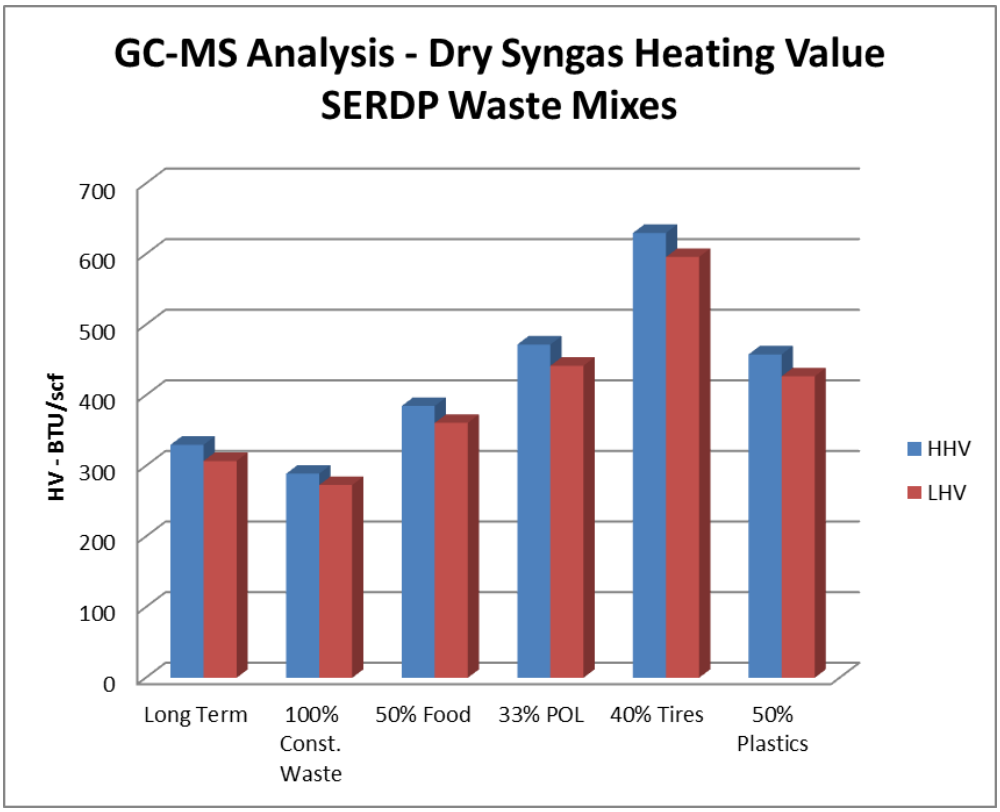



**Figure 4-2. Average Dry Heating Value for Each Waste Mix.**

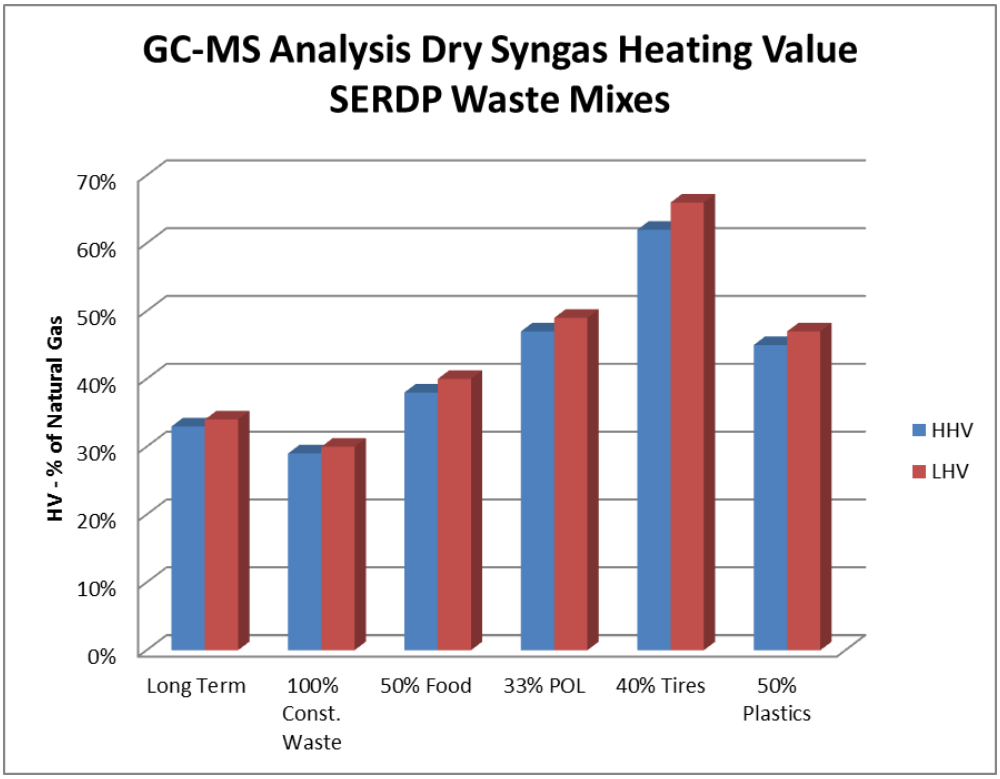



**Figure 4-3. Average Heating Value of Each Mix as a Percentage of Natural Gas.**

**Table 4-3. Summary of Syngas Samples.**

| | Long Term Mix #1 | Long Term Mix #2 | Long Term AVG | 100% Constr. Mix #1 | 100% Constr. Mix #2 | 100% Constr. AVG | 50% Food Mix #1 | 50% Food Mix #2 | 50% Food AVG | 33% POL Mix #1 | 33% POL Mix #2 | 33% POL AVG | 40% Tire Mix #1 | 40% Tire Mix #2 | 40% Tire AVG | 50% Plastics Mix #1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HHV BTU/scf | 361 | 298 | 330 | 353 | 225 | 289 | 351 | 418 | 385 | 357 | 587 | 472 | 607 | 653 | 630 | 458 |
| HHV % NG | 36% | 29% | 33% | 35% | 22% | 29% | 35% | 41% | 38% | 35% | 58% | 47% | 60% | 64% | 62% | 45% |
| LHV BTU/scf | 339 | 275 | 307 | 332 | 213 | 273 | 329 | 392 | 361 | 336 | 547 | 442 | 574 | 617 | 596 | 427 |
| LHV % NG | 37% | 30% | 34% | 37% | 23% | 30% | 36% | 43% | 40% | 37% | 60% | 49% | 63% | 68% | 66% | 47% |
| | | | | | | | | | | | | | | | | |
| Energy Totals | | | | | | | | | | | | | | | | |
| H2 | 5.69% | 7.23% | 6.5% | 5.72% | 8.33% | 7.0% | 4.37% | 5.08% | 4.7% | 6.24% | 4.50% | 5.4% | 2.93% | 2.74% | 2.8% | 3.34% |
| C1 | 18.46% | 22.08% | 20.3% | 21.90% | 38.51% | 30.2% | 14.43% | 10.75% | 12.6% | 15.73% | 9.82% | 12.8% | 11.94% | 12.16% | 12.1% | 11.94% |
| C2 | 5.45% | 7.22% | 6.3% | 2.64% | 4.38% | 3.5% | 4.89% | 6.51% | 5.7% | 3.11% | 13.13% | 8.1% | 3.72% | 1.81% | 2.8% | 9.82% |
| C3 | 27.86% | 15.83% | 21.8% | 21.31% | 12.90% | 17.1% | 21.23% | 23.70% | 22.5% | 10.99% | 18.09% | 14.5% | 8.42% | 23.29% | 15.9% | 30.43% |
| C4 | 5.31% | 4.36% | 4.8% | 6.65% | 4.28% | 5.5% | 7.07% | 8.07% | 7.6% | 5.92% | 10.08% | 8.0% | 6.47% | 4.89% | 5.7% | 11.59% |
| C5 | 12.61% | 3.98% | 8.3% | 5.70% | 2.53% | 4.1% | 7.70% | 14.42% | 11.1% | 23.75% | 17.09% | 20.4% | 30.85% | 31.41% | 31.1% | 13.82% |
| C6 | 18.01% | 10.90% | 14.5% | 12.19% | 8.45% | 10.3% | 18.77% | 9.39% | 14.1% | 7.65% | 12.81% | 10.2% | 10.37% | 6.90% | 8.6% | 13.84% |
| C7 | 4.30% | 16.46% | 10.4% | 5.00% | 4.37% | 4.7% | 5.38% | 4.29% | 4.8% | 3.68% | 3.77% | 3.7% | 6.24% | 4.22% | 5.2% | 2.47% |
| C8 | 1.01% | 6.67% | 3.8% | 3.22% | 6.46% | 4.8% | 3.62% | 9.64% | 6.6% | 3.16% | 4.07% | 3.6% | 7.65% | 7.08% | 7.4% | 0.58% |
| C9 | 0.70% | 2.21% | 1.5% | 7.58% | 3.77% | 5.7% | 3.82% | 3.18% | 3.5% | 12.05% | 2.37% | 7.2% | 7.27% | 2.04% | 4.7% | 0.82% |
| C10 | 0.50% | 2.46% | 1.5% | 5.98% | 3.75% | 4.9% | 5.58% | 4.15% | 4.9% | 5.12% | 3.24% | 4.2% | 2.80% | 2.42% | 2.6% | 0.91% |
| C11 | 0.07% | 0.48% | 0.3% | 1.83% | 1.91% | 1.9% | 2.73% | 0.67% | 1.7% | 2.32% | 0.88% | 1.6% | 1.13% | 0.90% | 1.0% | 0.31% |
| C12 | 0.02% | 0.13% | 0.1% | 0.27% | 0.35% | 0.3% | 0.41% | 0.14% | 0.3% | 0.27% | 0.15% | 0.2% | 0.21% | 0.14% | 0.2% | 0.13% |
| | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| % of Energy | | | | | | | | | | | | | | | | |
| Trad Syngas | 24.1% | 29.3% | 26.7% | 27.6% | 46.8% | 37.2% | 18.8% | 15.8% | 17.3% | 22.0% | 14.3% | 18.1% | 14.9% | 14.9% | 14.9% | 15.3% |
| C2 Thru C4 | 38.6% | 27.4% | 33.0% | 30.6% | 21.6% | 26.1% | 33.2% | 38.3% | 35.7% | 20.0% | 41.3% | 30.7% | 18.6% | 30.0% | 24.3% | 51.8% |
| Gasoline Range | 36.64% | 40.22% | 38.4% | 33.68% | 25.59% | 29.6% | 39.29% | 40.94% | 40.1% | 50.29% | 40.11% | 45.2% | 62.38% | 51.65% | 57.0% | 31.53% |
| Diesel Range | 0.59% | 3.07% | 1.8% | 8.09% | 6.02% | 7.1% | 8.73% | 4.96% | 6.8% | 7.72% | 4.27% | 6.0% | 4.14% | 3.46% | 3.8% | 1.34% |

### 4.7.4 Results from Waste Mixes

Figures 4-4 to 4-14 show the percent of energy each group contributes to the syngas sample. The sum of these groups equal 100%. The majority of energy in the plastic mix was from gaseous phase components, indicating polyethylene breaks down to ethylene, polypropylene breaks down to propylene, etc. These gases may be further cracked or reformed into other hydrocarbons due to the presence of free hydrogen.

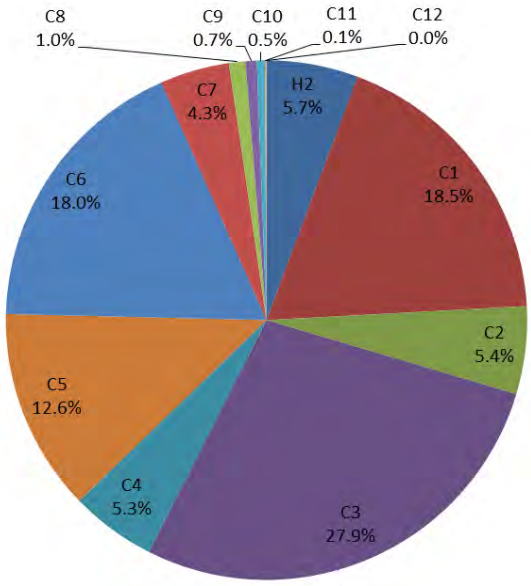



**Figure 4-4. Percent of Energy in Syngas Sample Standard Mix #1.**

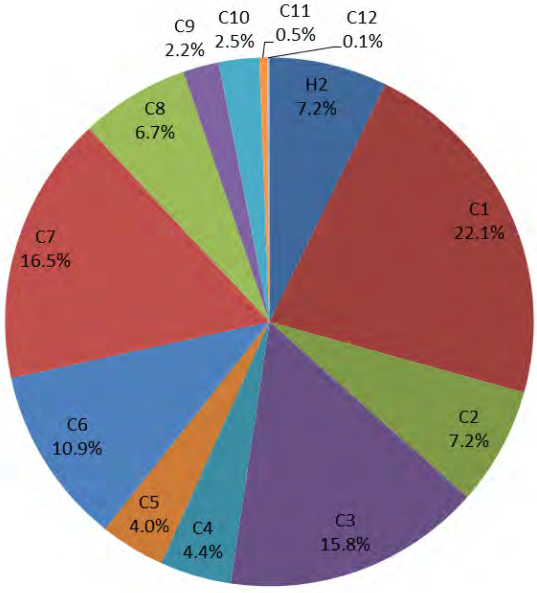



**Figure 4-5. Percent of Energy in Syngas Sample Standard Mix #2.**

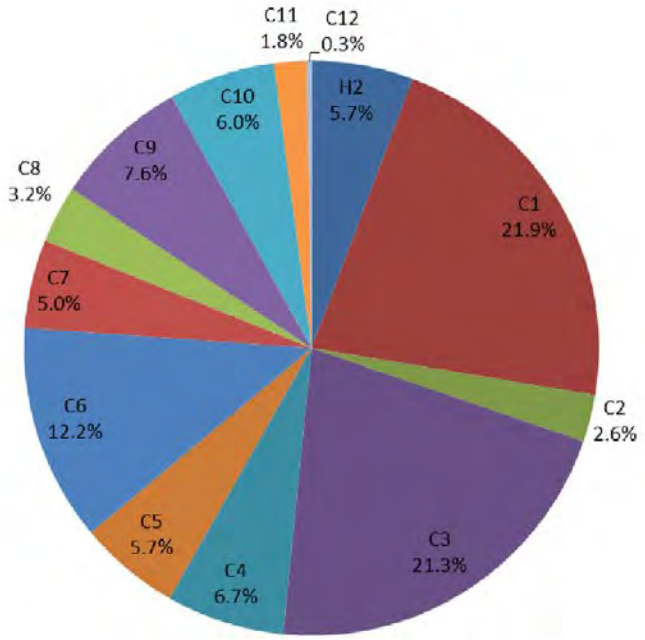



**Figure 4-6. Percent of Energy in Syngas Sample 100% Construction Mix #1.**

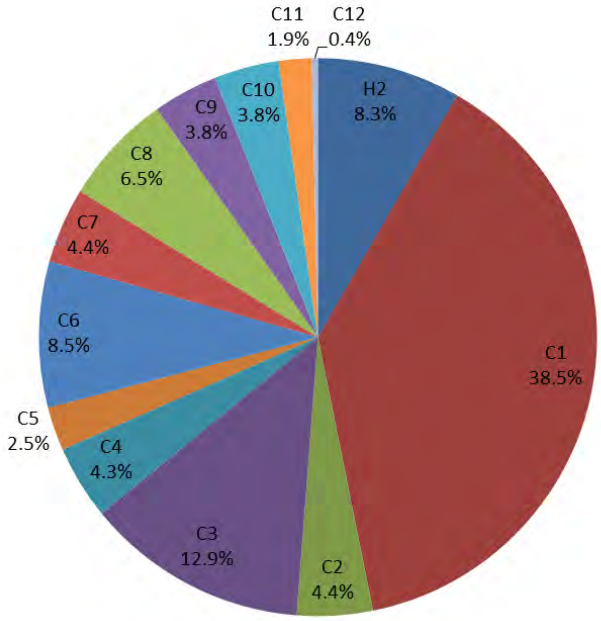



**Figure 4-7. Percent of Energy in Syngas Sample 100% Construction Mix #2.**

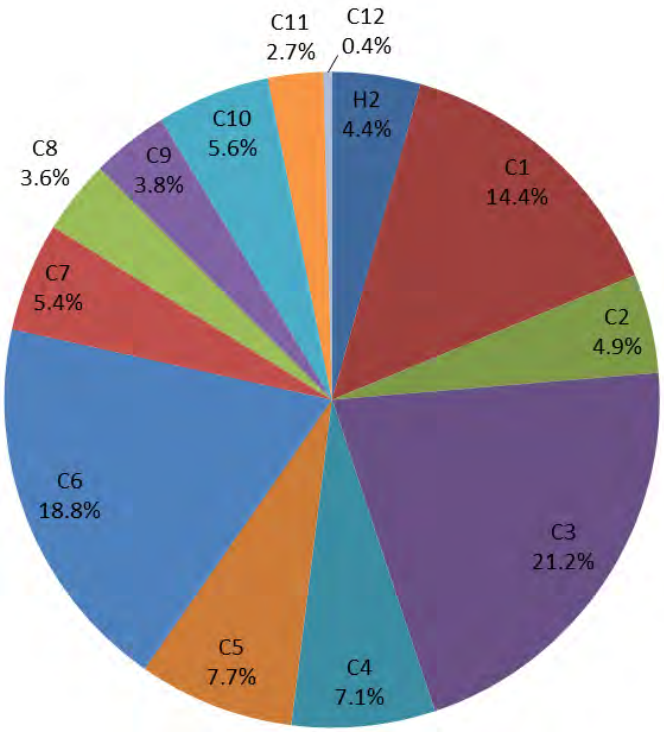



**Figure 4-8. Percent of Energy in Syngas Sample 50% Food Mix #1.**

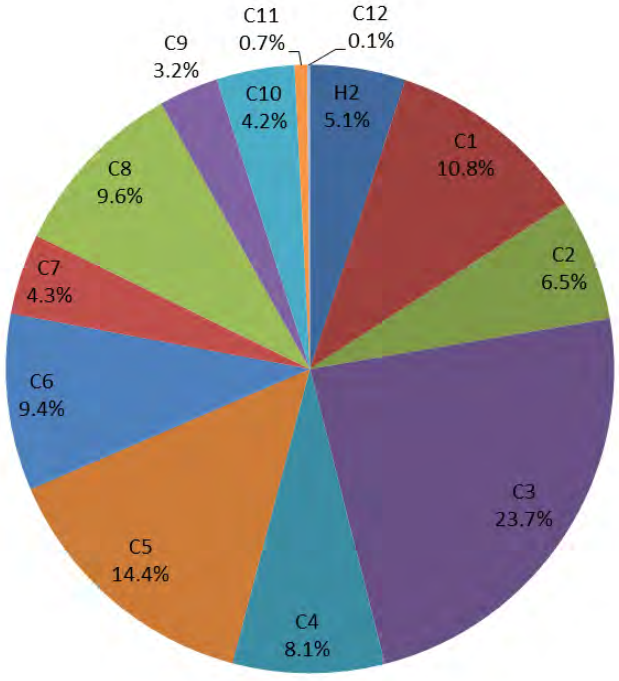



**Figure 4-9. Percent of Energy in Syngas Sample 50% Food Mix #2.**

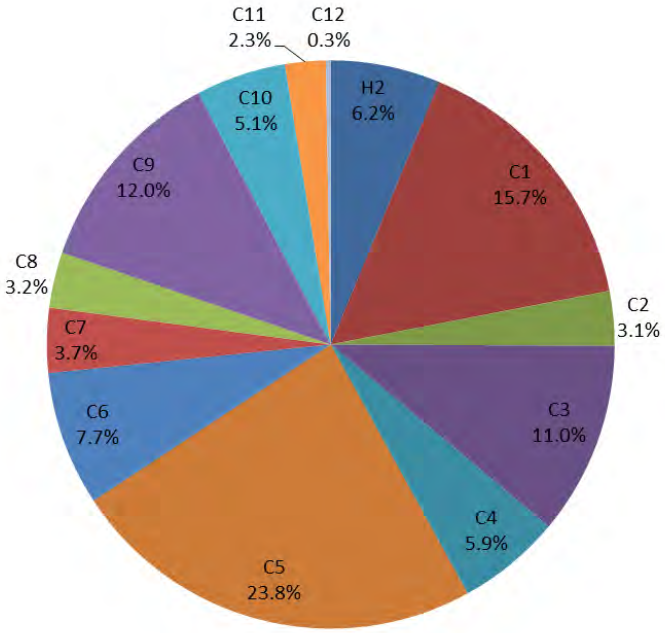



**Figure 4-10. Percent of Energy in Syngas Sample 33% POL Mix #1.**

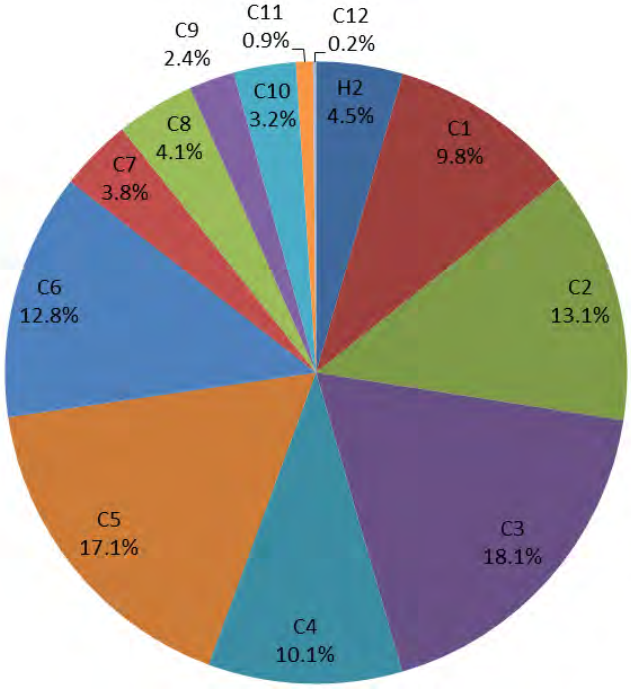



**Figure 4-11. Percent of Energy in Syngas Sample 33% POL Mix #2.**

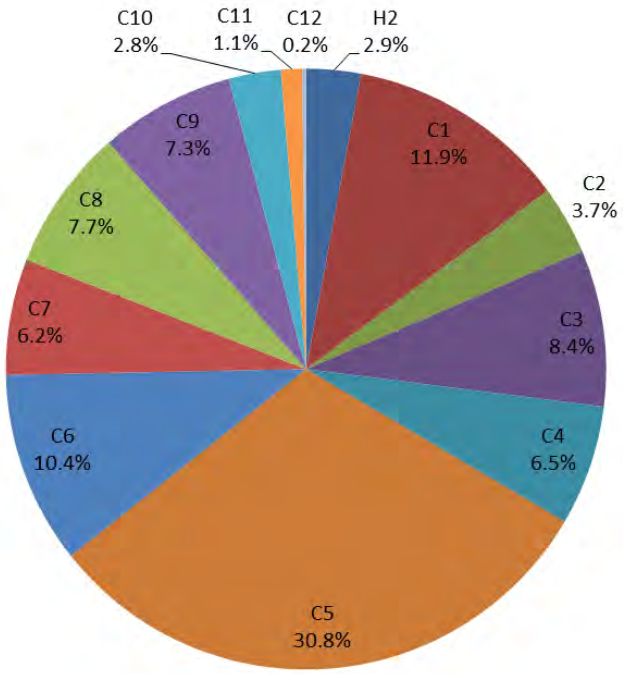



**Figure 4-12. Percent of Energy in Syngas Sample 40% Tire Mix #1.**

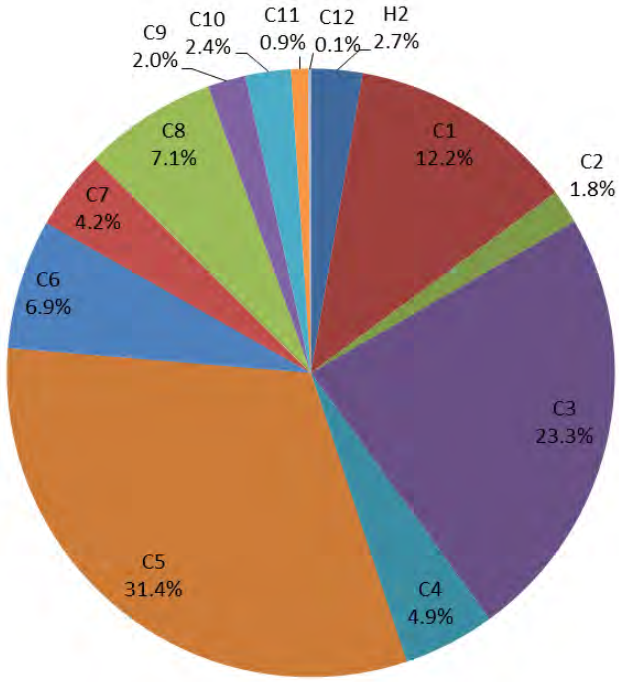



**Figure 4-13. Percent of Energy in Syngas Sample 40% Tire Mix #2.**

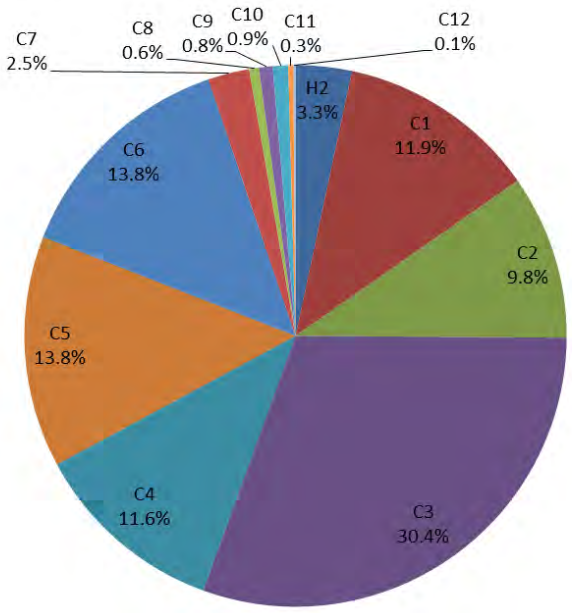



**Figure 4-14. Percent of Energy in Syngas Sample 50% Plastics Mix #1.**

### 4.7.5 Sampling of Residual By-products

There are four types of residuals generated as a by-product of the gasification process:

- Ash that is periodically removed from the main reactor
- Quencher oil
- Condensate which is generated through cooling hot syngas
- Polisher fluid (ethylene glycol and water)

Of these four, ash is the only inevitable, recurring residue – the inorganics in the waste stream become ash. Quencher oil begins as standard petroleum motor oil, but then becomes replaced over time by pyrolysis oils produced in the reactor. The pyro oils continue to perform tar removal from the syngas. Therefore the quencher oil would be replaced only when doing significant maintenance, and not routinely. Researchers determined that condensate can be eliminated by carefully managing system heat transfer to vaporize it, although it might be produced in transitory phases. Finally, the polisher (secondary scrubber) will occasionally have to be changed as it saturates with light fraction tars that get past the quencher.

Samples of each of these materials were sent to commercial labs to measure metals in the ash, and organics in the other three. The full analytical reports are attached as Appendixes B and C. Table 4-4 gives only the detects for Resource Conservation and Recovery Act (RCRA) total metals in four ash samples. Table 4-5 shows Toxicity Characteristic Leaching Procedure (TCLP) metals results for those same samples. Only three metals were detected via TCLP extraction, and these values were orders of magnitude below the limits for characteristic hazardous waste determination: Ba limit is 100 mg/l; Cr = 5 mg/l; and Pb = 5 mg/l.

Table 4-6 shows concentrations of selected Polycyclic Aromatic Hydrocarbons (PAHs) in the oil quench tank. These higher concentrations are expected because this is where almost all the

pyrolysis oils accumulate. As these oils accumulate, they are fed back into the gasifier for cracking.

Table 4-7 shows concentrations of BTEX compounds and total PAH in the polisher fluid. BTEX was selected because it was expected that lighter fraction organics would end up in this fluid. Note that the units for PAH concentration are three orders of magnitude lower than in the quencher oil

Table 4-8 shows concentrations of BTEX compounds and total PAH in condensate.

## 4.8 Thermodynamics Discussion

### 4.8.1 Syngas Condensate

The original design concept was to prevent the water-gas and water shift chemical reactions within Rotary Gasifier RG-103. The intent was to force all of the moisture entering the reactor with the feedstock to exit the reactor as superheated steam mixed with the syngas. Condenser C-107 cooled the gas as close to atmospheric temperature, essentially condensing 95% of the moisture in the syngas. This condensate was captured in condensate separator CS-108.

The original design concept works exactly as intended, but the following observations occurred:

1. The condensate water contained a high level of highly volatile “clean” (clear slight yellow color) organic liquids, which have a high vapor pressure and a strong odor.
2. The condensate water would separate in the wastewater tank after draining from the system. The top layer was highly flammable, with flammability similar to gasoline.
3. The condensate takes months to fully vaporize volatile organic compounds.

Researchers felt intentionally condensing this liquid creates a disposal problem and is not desirable.

To avoid creating this condensate, researchers were able to minimize condensate by reducing the speed of hydraulic motor M-4, which drives the cooling fan on condenser C-107. Heat exchanger HE-115 was added to heat the polishing liquid to the same temperature as the condenser discharge temperature. Excess liquid condensate was transferred into quencher QC-104.

**Table 4-4. Total RCRA Metals in Ash.**

| Sample Date | Waste Feed | Sample ID | As (mg/ kg) | Ba (mg/ kg) | Cd (mg/ kg) | Cr (mg/ kg) | Ag (mg/ kg) | Pb (mg/ kg) | Se (mg/ kg) | Hg (mg/ kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| 4-Feb-2015 | Long Term Mix | A-01-020415-1600 | 3.6 | 382 | 0.065 | 663 | 0.21 | 0.7 | nd | nd |
| 19-Mar-2015 | Long Term Mix | A-01-031915-1600 | 3.3 | 350 | nd | 636 | 0.15 | 0.76 | 0.44 | nd |
| 2-Apr-2015 | Constr. Mix | A-01-040215-1505 | 3.3 | 517 | 0.042 | 337 | 0.12 | 1.0 | nd | nd |
| 8-May-2015 | Long Term Mix | A-01-050815-1600 | 1.9 | 351 | nd | 197 | 0.11 | 2.5 | nd | 0.011 |

**Table 4-5. TCLP RCRA Metals in Ash.**

| Sample Date | Waste Feed | Sample ID | Ba (mg/l) | Cr (mg/l) | Pb (mg/l) |
|---|---|---|---|---|---|
| 4-Feb-2015 | Long Term Mix | A-01-020415-1600 | 3.2 | nd | 0.0040 |
| 19-Mar-2015 | Long Term Mix | A-01-031915-1600 | 1.9 | 0.029 | nd |
| 2-Apr-2015 | Construction Mix | A-01-040215-1505 | 3.7 | 0.015 | 0.0040 |
| 8-May-2015 | Long Term Mix | A-01-050815-1600 | 3.8 | nd | 0.0074 |

**Table 4-6. Selected PAH Concentration in Quencher Oil.**

| Waste Feed Type | Sample ID | Acenapthylene (mg/kg) | Fluoranthene (mg/kg) | Fluorene (mg/kg) | Naphthalene (mg/kg) | Phenanthrene (mg/kg) | Pyrene (mg/kg) | Total PAH (mg/kg) |
|---|---|---|---|---|---|---|---|---|
| Long Term Mix | OS-01-101514-0910 | 470 | 190 | 300 | 1,200 | | 200 | 2,360 |
| 40% Tires Mix | OS-01-031815-1530 | 930 | 400 | 770 | 2,300 | 270 | 560 | 5,660 |
| 33% POL Mix | OS-01-042415-1600 | 1,400 | 410 | 590 | 3,600 | 1,200 | 580 | 8,856 |
| Long Term Mix | OS-01-042815-1600 | 610 | 270 | 420 | 1,100 | | 450 | 3,070 |
| Long Term Mix | OS-01-050715-1630 | 980 | 610 | 590 | 1,200 | 410 | 750 | 4,830 |

**Table 4-7. BTEX and PAH Concentrations in Polisher Fluid.**

| Sample date | Waste feed type | Sample ID | Benzene (µg/l) | Toluene (µg/l) | Ethylbenzene (µg/l) | m,p-Xylene (µg/l) | BTEX total (µg/l) | Total PAH (µg/l) |
|---|---|---|---|---|---|---|---|---|
| 8-Oct-2014 | Long Term Mix | P-01-100814-1120 | 18 | | | | 18 | |
| 15-Oct-2014 | Long Term Mix | P-01-101514-0910 | | | | | | 20 |
| 22-Jan-2015 | Long Term Mix | P-01-012215-0948 | 160 | 7.9 | | 6.8 | 175 | |
| 30-Jan-2015 | Long Term Mix | P-01-013015-0915 | | | | | | 1,837 |
| 5-Mar-2015 | 50% Plastics Mix | P-01-030515-1557 | | | | | | 160 |
| 13-Mar-2015 | 33% POL Mix | P-01-031315-1531 | 2,400 | 260 | | 110 | 2,770 | |
| 1-Apr-2015 | Long Term Mix | P-01-040115-1600 | 14,000 | 5,500 | 3,700 | 7,700 | 30,900 | |
| 6-May-2015 | Long Term Mix | P-01-050615-1552 | 1,400 | 120 | | 50 | 1,570 | |
| 13-May-2015 | Long Term Mix | P-01-051315-1530 | | | | | | 28 |

**Table 4-8. BTEX and PAH Concentrations in Condensate.**

| Sample Date | Waste Feed Type | Sample ID | Benzene (µg/l) | Toluene (µg/l) | Ethylbenzene (µg/l) | m,p-Xylene (µg/l) | o-Xylene (µg/l) | BTEX, total (µg/l) | PAH total (µg/l) |
|---|---|---|---|---|---|---|---|---|---|
| 15-Oct-2014 | Long Term Mix | WW-01-101514-1120 | 320 | 11 | | | | 331 | |
| 5-Mar-2015 | 50% Plastics Mix | WW-01-030515-1352 | | | | | | | 15 |
| 5-Mar-2015 | 50% Plastics Mix | WW-02-030515-1557 | | | | | | | 34 |
| 13-Mar-2015 | 33% POL Mix | WW-01-031315-1531 | 12 | 1.4 | | | 3.7 | 17 | |
| 19-Mar-2015 | Long Term Mix | WW-01-031915-1600 | 1,500 | 240 | | 75 | | 1,815 | |
| 14-Apr-2015 | 40% Tires Mix | WW-01-041415-1640 | 1,800 | 890 | 450 | 300 | | 3,440 | |
| 28-Apr-2015 | Long Term Mix | WW-01-042815-1600 | | | | | | | 1,917 |
| 6-May-2015 | Long Term Mix | WW-01-050615-1552 | 1,900 | 1,400 | 890 | 2,200 | | 6,390 | |
| 7-May-2015 | Long Term Mix | WW-01-050715-1600 | | | | | | | 2,188 |
| 20-May-2015 | Long Term Mix | WW-01-052015-1500 | 670 | 87 | | 55 | 160 | 972 | |

The following observations were the result of this change:

1. The cooling fan on cooler C-107 provides cooling to both the condenser and the main hydraulic drive system. Excessive slowing of the fan speed caused the hydraulic oil to overheat at temperatures above 135 °F.
2. The cooling fan on C-107 was reversed, to force heat from the hydraulic cooler into the condenser. This had a significant positive result on temperatures, but the fan vibrated excessively at certain speeds, limiting functionality.
3. Transferring condensate water from condensate tank CT-114 to quencher QC-104, allows water to form an emulsion with the pyrolysis oil. Reflux metering pump MP-117 doses this emulsion back into Rotary Gasifier RG-103 for reprocessing.
4. Organics mixed with the water either crack into hydrocarbon chains or vaporize into the syngas.
5. A portion of the water in the reflux cracks into hydrocarbons by the water-gas and water shift reactions. Additional thermal energy to sustain these reactions is provided by liquid organics (pyrolysis oil) partially burning with air in the burning char layer at 2200 °F.
6. Unreacted water exits as superheated steam.
7. All of the water in the feedstock can be processed without the formation of condensate when controlling the temperatures properly.
8. Additional condensate water from previous tests was pumped into quencher QC-104 for processing and disposal by thermal cracking. Numerous tests were conducted where there was negative condensate production from this practice.

Not all of the condensate water is cracked within the reactor, requiring excessive evaporation of this moisture into the syngas flow stream. The syngas exiting polisher separator PS-110 is saturated at the temperature of the polisher liquid. Heat exchanger HE-115 heated the polisher liquid to force the desired evaporation rate to maintain a net zero or negative condensate production rate. Excess condensate accumulated in condensate tank CT-114 due to the mechanical limitations of the system and was drained only when absolutely required.

Gas reheater RH-111 increases the temperature of the gas by 10 to 15 °F using heat from the engines cooling system. Adding heat locks the water vapor in the form of relative humidity. Condensation will not occur unless the gas temperature cools in downstream piping by 10 to 15 °F.

### 4.8.2 Dial-In Heating Value Adjustment

Metering pump MP-117 is infinitely adjustable up to the maximum operating speed. The heating value of the gas may be enriched by increasing the speed of the metering pump allowing additional flow of reflux into gasifier RG-103. The operators normally adjust the speed of the pump to maintain a constant liquid level in quencher QC-104. All of the oil condensed in Quencher QC-104 and some of the liquid water added from condensate tank CT-114 enters the reactor to be cracked into additional hydrocarbons. Adjusting the metering pump speed up or down allows the regulation of the heating value of the gas entering the engine.

### 4.8.3 Volume and Heating Value Adjustment

The HHV represents the gross energy in the syngas mixture. The heating value calculated from the GC-MS analysis was on a dry gas basis. Moisture creates numerous thermal loads in combustion, which reflects by the adjusted low heating value (LHV). The presence of water vapor creates the following issues:

1. Water vapor passes through the engine and discharges to atmosphere as a gas in the exhaust, displacing combustion air.
2. The density of water vapor is about half of syngas, small amounts of water vapor (by mass) greatly dilute the syngas mixture by volume.
3. Although latent heat of vaporization was added when evaporating this moisture into the syngas, the latent energy is not recovered in combustion since the engine exhaust discharges to atmosphere at high temperatures, preventing energy recovery by condensing (zero energy net gain or loss).
4. The combustion energy required to superheat the water vapor up to the combustion temperature creates an additional heat loss in the reactor.
5. Hydrogen (free or locked up in hydrocarbons) oxidizes to water vapor, where latent heat is not recovered.

Flow orifice FO-112 measures the mass flow of the mixture of syngas and water vapor entering the engine. Figure 4-15 represents a simplified method to adjust the heating value of the syngas (adjusted LHV) to compensate for the presence of water in the syngas mixture.

A psychrometric chart estimates the moisture content in the syngas on a mass basis. For example, if the temperature at TE-105 is 115 °F, the moisture content of the syngas on a mass basis is 07% (0.07 lbs of water per pound of syngas). Use Figure 4-15 to estimate the adjusted LHV due to the presence of water vapor in the syngas mixture. The adjusted LHV for the standard term mix would be 250 BTU/scf.

The gas flow measured by flow orifice FO-112 includes both water vapor and syngas. If the flow was measured to be 22 SCFM, the net adjusted gaseous fueling rate (LHV) entering the engine would be 250 BTU/scf * 22 SCFM * 60 min/hr = 330,000 BTU/hr.

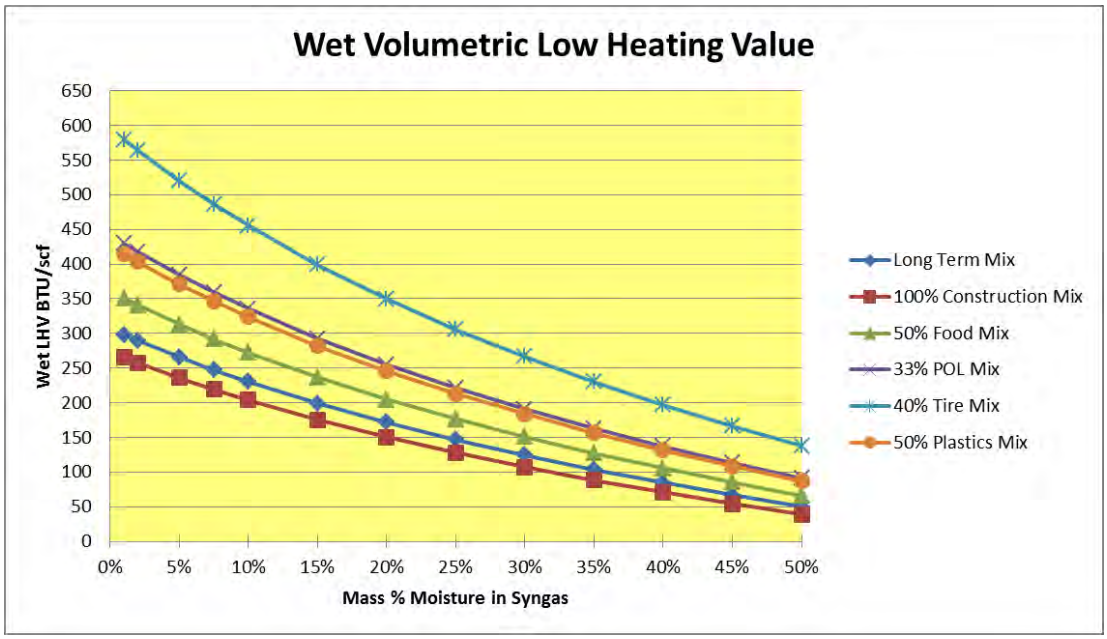



**Figure 4-15. Moisture vs. Heating Value.**

### 4.8.4 Loss of Thermodynamic Efficiency of Engine

Feeding syngas into the diesel engine results in a loss of thermodynamic efficiency as the engine transitions from a Diesel thermodynamic cycle to an Otto cycle with increasing gaseous fueling rate. Figure 4-16 estimates the loss in thermodynamic efficiency based on the gaseous fueling rate.

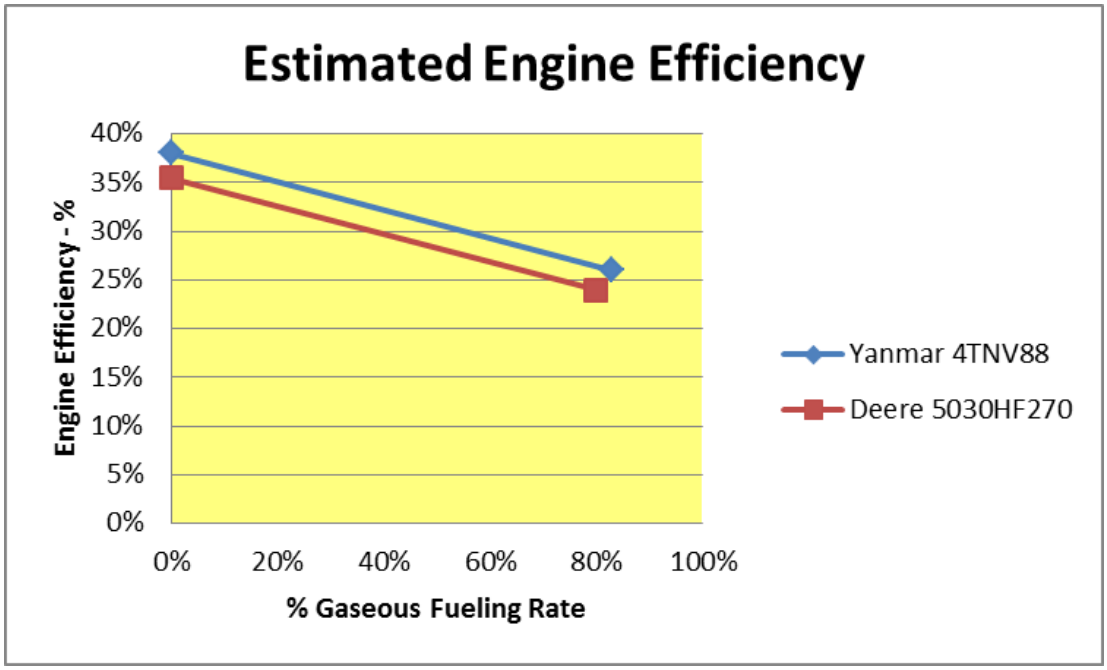



**Figure 4-16. Estimated Loss in Engine Efficiency.**

### 4.8.5 Thermodynamic Energy Balance Around Engine

Figure 4-17 shows the energy flow through the entire system.

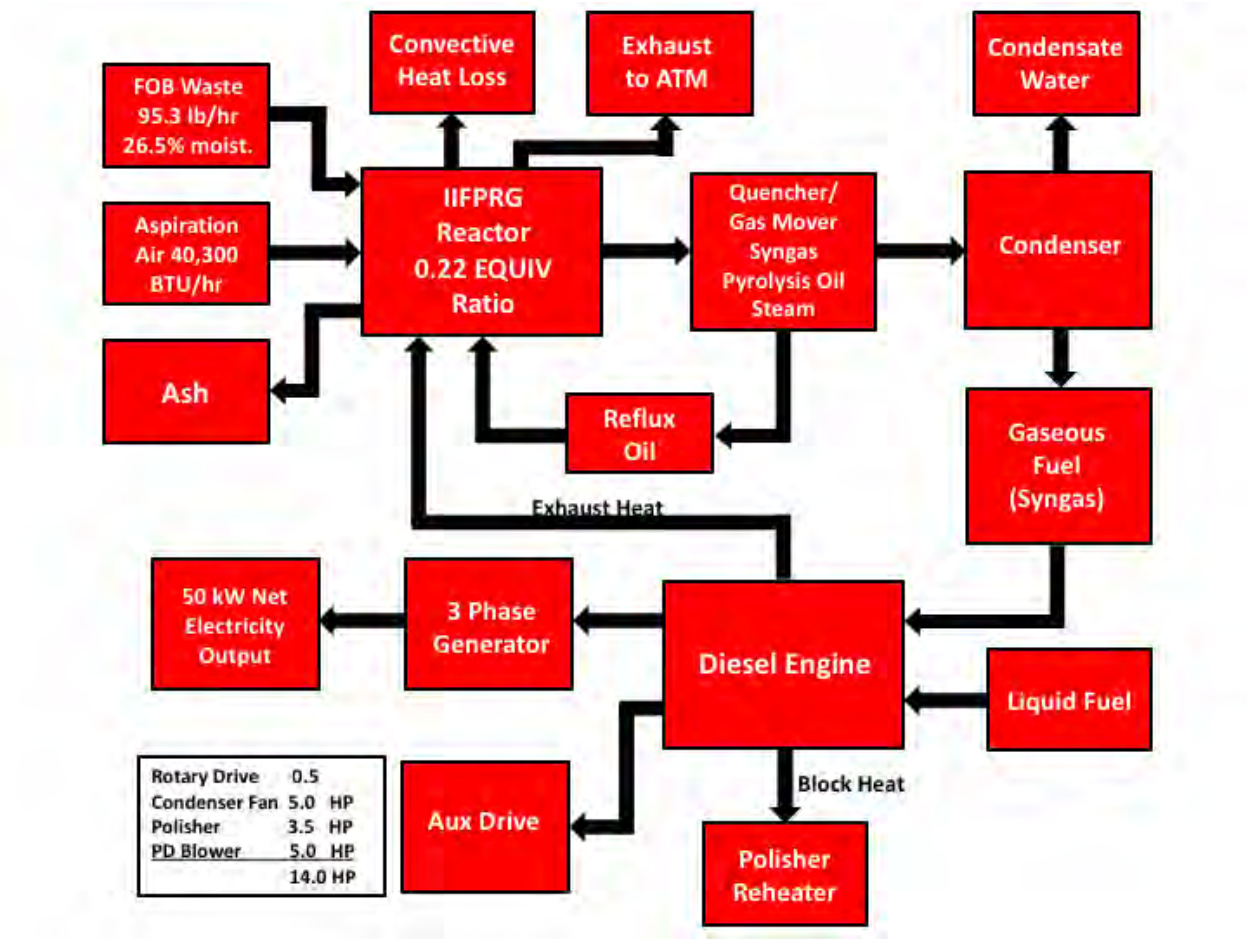



**Figure 4-17. Energy Flow through the Entire System.**

# 5. Development of the IIFPRG

The rotary gasifier (IIFPRG) uniquely combines the positive features of cross draft, updraft, downdraft, and indirect pyrolysis gasifiers into a single rotating unit. The gasifier is designed to process mixed and unsorted feedstock that can be dripping wet. Large inert items must be removed, but smaller inert items such as cans, glass, metals, soil, etc. simply pass through the gasifier and discharge with the ash.

The IIFPRG is designed to process plastics that have a low melting temperature, with little or no fixed carbon. The gasifier is not designed to operate on 100% plastics. Plastics must be mixed with other wastes to provide sufficient fixed carbon to sustain operation. The same issue applies when gasifying volatile liquids such as motor pool lubricants.

The gasifier rotates, causing a tumbling action that continually exposes fresh feedstock to the thermal reaction zone. This prevents clogging and passes inert materials out of the process. The design of the ram style feed system provides 70,000 lbs of hydraulic pushing force (up to 2,800 psi contact stress) to feed wastes into the gasifier without the blockages.

SUNY Cobleskill developed and engineered a complete trailer-mounted IIFPRG system to convert solid feedstock to electricity. The feedstock handling system delivers feedstock into the rotary gasifier and consists of a super-compression dewatering ram. The IIFPRG gasifier vessel, piping, and process components are constructed of carbon steel due to budget limitations (ideally, stainless steel would be used on a deployable system). The gas cleaning system consists of a unique oil based wet scrubber, an oil separator, a gas cooler/condenser, a condensate separator, and a gas reheater. The gas moving system consists of a variable speed positive displacement rotary lobe blower to deliver pressurized gas to either a combustion flare or to a 60 kW diesel engine-driven generator. The generator engine was slightly modified to allow the introduction of synthetic fuel gas (syngas) with the intake air.

## 5.1 Engineering of the IIFPRG

Researchers engineered the trailer-mounted IIFPRG prototype from January through April 2013. The following features were incorporated into the design:

1. The entire gasifier system fits on an 8 x 20-ft trailer.
2. The ram feed system compresses, densifies, and mechanically dewaters feedstock to less than 50% moisture content by squeezing in a one step process.
5. The outer fixed shell around the gasifier indirectly transfers heat from diesel engine exhaust into the rotating gasifier vessel.
6. The system maintains a 22-degree inclination angle based on AutoCAD layouts of the gasifier internals, char bed depth, and tumbling angle of repose.
7. The system uses refractory firebrick at the burning char zone (downhill end).
8. Thermodynamic heat balance ensures enough thermal energy exists to dry wet feedstock and fully volatilize within the gasifier.
9. The cyclone captures particulates from the syngas stream.
10. The water seal in the bottom of cyclone relieves any upset overpressure condition.
11. The all-in-one jet scrubber:

a. Cleans syngas of tars and particulates to allow use in an engine.
b. Fills with used motor pool lubricants.
c. Maintains fluid temperature of 220 °F to prevent steam from condensing out of the syngas.
d. Quenches syngas from > 800 °F to 210 °F.
e. Provides a liquid seal for flashback prevention and extinguish flaming fly embers (safety).
f. Cleans gas by high momentum exchange jet scrubbing using high pressure oil at 1,500 psi.
g. Incorporates internal recirculation to allow syngas to be cleaned multiple times before leaving vessel.
h. Gasifies spent scrubbing oil with feedstock.

12. Aspiration is forced by using positive displacement gas pump (rotary lobe blower) to deliver syngas to the engine without loss of engine power or efficiency.
13. All equipment is mechanically driven using hydraulic motors powered by the front power take off available on John Deere generator engines.
14. The three stage sandwich cooler is configured as follows:
    d. The (air intake) condenser cools syngas to within 20 °F of the ambient temperature to condense steam and lower dewpoint of the syngas.
    e. The hydraulic cooler cools hydraulic drive oil to less than 140 °F.
    f. The scrubbing oil cooler (fan with air discharge) cools scrubbing oil to 210 °F.
15. The gas reheater uses scrubbing oil heat to raise the syngas temperature 20 °F higher than the dewpoint (which lowers relative humidity to about 50%).
16. The system uses a 60 kW diesel engine-driven generator with the ability to accurately monitor liquid fuel usage.
17. The system employs a 0 to 60 kW load center to electrically load the diesel engine-driven generator at various loads.

### 5.2 Compression Dewatering

A student intern was assigned to research the ability to dewater various wastes using super-compression. Sixteen wastes were collected from the campus and analyzed for bulk density, moisture content, and proximate analysis.

Feedstocks with dramatic differences in physical properties were selected for compression dewatering. Water was added to each feedstock to obtain a moisture content of 80% (wet basis, 80% water, 20% solids). A modified hydraulic shop press was used to compress each feedstock using a piston / die. Various compressive stresses were tested to evaluate how much water could be mechanically removed. The results of this test are reported separately in Section 5.2 .

In summary, all of the feedstock types tested were mechanically dewatered to less than 50% moisture content (wet basis) at 1,800 psi compressive stress. Increasing the compressive stress to 4,000 psi only lowered the moisture content to less than 42%. Increasing further to 8,000 psi only lowered the moisture content to less than 38%.

Researchers decided to target a compressive stress of 1,800 psi to mechanically reduce the feedstock moisture content to less than 50% when entering the gasifier.

## 5.3 Gasification System Fabrication and Cold Testing

Fabrication of the complete trailer-mounted gasification system began in January 2013 and was completed in early May 2013 (Figure 5-1). Cold testing was conducted throughout the month of May, where numerous mechanical issues were identified and corrected. The scrubber (SC-105) was modified to incorporate a washed packed bed design developed by USMA Cadets. The USMA design used rolled stainless steel mesh as packing and vegetable oil as the wash liquid. Scrubber SC-105 was then filled with used cooking (vegetable) oil and fully tested at various gas flows up to the full design flow of 85 SCFM. Note: used cooking oil was replaced with used crankcase oil during hot testing in July 2013.

The entire gasification system is hydraulically powered using a hydraulic gear pump that is driven by a separate mechanical power take off located on the front end of the diesel engine. All hydraulic driven equipment immediately stops rotating when the generator stops.

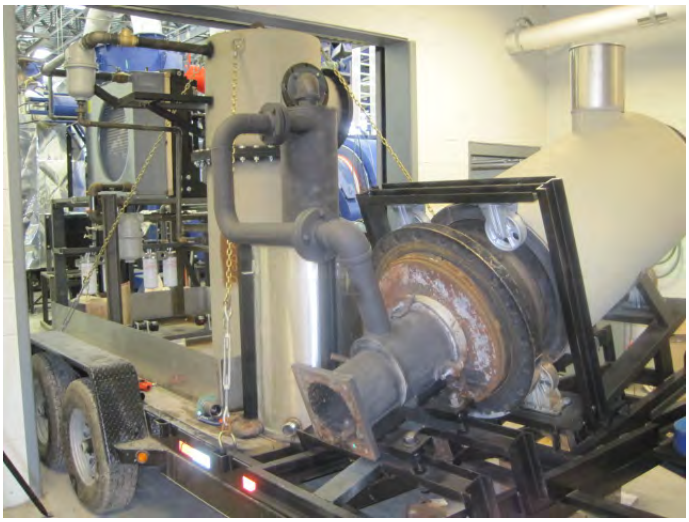


**Figure 5-1. Gasifier Trailer during Fabrication.**

The hydraulic system was fully commissioned during cold testing. Motors are controlled using 24 VDC dual coil hydraulic solenoid valves. Researchers found that the wrong hydraulic pump mount was provided on the engine block power take off, forcing the use of a gear pump that was 50% smaller than design. Budget limitations forced the following approach:

1. Positive displacement blower PDB-201 had to be electrically driven with a 3-phase variable speed drive. The blower was removed from scrubber SC-105 outlet and located on the ground about 75 ft from the gasifier trailer.
2. The hydraulic ram feeder RF-102 had to be powered by a separate gasoline engine.

Special hydraulic motors were purchased with high pressure seals that do not require case drains to relieve shaft seal pressure (when the system is designed with low hydraulic return pressure). All of the shaft seals began to leak within a few hours of cold testing, requiring the installation of separate case drains for all hydraulic motors and pumps. The seals were replaced on all of the hydraulic motors and pumps. The system was tested extensively after the installation of case drains and all seal failure problems were resolved before hot testing.

## 5.4 Feedstock Handling System

The feedstock handling system was constructed using a repurposed 35 ton hydraulic log splitter. The design had numerous problems that occurred during hot testing, forcing various mechanical changes. All problems have been resolved and the feedstock handling system currently works reliably as originally designed. Note that the feed system is driven by a small, external gasoline engine. This was done for expedience while testing. In a production version, the compression ram would be powered from the main system hydraulic pump.

The compression section was fabricated using a 6 x 6 x 24-in. stroke ram. Figure 5-2 shows the compression chamber and the end of the ram piston. Figure 5-3 shows the fabricated stainless steel feedstock hopper. Figure 5-4 shows the fabricated joint that is used to attach the hydraulic cylinder to the feedstock ram. A two-stage hydraulic pump (16:4 GPM) drives a 5-in. hydraulic cylinder. The ram is capable of pushing feedstock at a force of 70,000 lbs into the gasifier.




**Figure 5-2. Six-in. Hydraulic Ram Piston and Compression Chamber.**



**Figure 5-3. Feedstock Hopper.**



**Figure 5-4. Thirty-Five Ton Feedstock Ram.**

Originally, the ram was mounted at a 7-degree angle to allow feedstock water to freely drain by gravity as wet feedstock is compressed. This configuration required a 15-degree miter joint

(Figure 5-5), which became a significant problem during testing. Severe feedstock jamming occurred at the miter joint. This design was abandoned about a month into hot testing. The miter was eliminated and the feedstock system was mounted at the same inclination angle as the gasifier. Feedstock pushed directly straight up into the gasifier feed tube.



**Figure 5-5. Miter Joint.**

## 5.5 Feedstock Dewatering

A test was conducted in Sept. 2013 to determine if the ram feeder is able to dewater feedstock from 80% moisture content to less than 50% moisture content. A synthetic waste blend of dripping wet mixed paper and plastic at 80% was fed into the gasifier. Significant amounts of moisture was squeezed from the feedstock and drained. The moisture content was reduced to less than 50%. The system worked as designed and intended. Dewatering was also observed anytime when handling feedstock that has over 50% moisture content. Liquids freely drained from the compression chamber when processing dripping wet cafeteria waste.

Subsequent testing will focus on the effectiveness of feedstock dewatering using super-compression. Each feedstock will be tested using the ram feeder to determine moisture removal. Water will be captured and measured. Samples will be obtained and analyzed for moisture content by loss in weight. Data will be reported for each feedstock.

## 5.6 Hot Testing of the IIFPRG

Extensive hot testing commenced on 6 June 2013 and continued through 8 August 2013. Numerous technical problems occurred, preventing the system from operating at any level of steady state conditions. Each problem was addressed as it occurred. Numerous tests were attempted during this timeframe. Each test had a significant process or mechanical problem, preventing the system from ever reaching the steady state conditions necessary to obtain adequate data to meet project objectives.

Data was recorded for the majority of runs during the hot testing period. All available resources were dedicated to troubleshooting problems and ensuring safe operating conditions for the researchers working on the equipment.

The main problems experienced during hot testing were:

1. Rotary gasifier drive jamming and breakage
2. Overfilling the gasifier with feedstock
3. Nonflammable syngas at the flare
4. Feedstock jamming in the feed pipe.

### 5.6.1 Overfilling the Gasifier with Feedstock

#### 5.6.1.1 Resulting Problems

The low inclination angle (22 degrees above horizontal) of the gasifier vessel did not allow unreacted feedstock to properly tumble downhill and adequately fill the reactor vessel. Excessive unreacted feedstock accumulated on the uphill end of the rotary vessel, consistently covering the gas exit point. The slightest amount of overfeeding caused the gas exit pipe to plug with unreacted feedstock, resulting in excessive vacuum within the downstream equipment. Blockages required the gasifier to be emptied and completely disassembled. Blockages of the syngas exit piping occurred almost every time the gasifier was operated.



**Figure 5-6. Rotary Chain Drive.**

Excessive vacuum sucked the safety water seal located on the bottom of the cyclone into the scrubber vessel, creating a dangerous situation by allowing air to enter the system. The water seal was replaced with a blank flange to correct this safety issue.

The gasifier required blind operation. Feedstock level within the gasifier vessel was impossible to determine. A magnetic material level sensor was developed to monitor feedstock level from the uphill end. This device was complicated, provided false indications, and promoted overfilling problems.

#### 5.6.1.2 Attempted Corrective Action

The location of the gas exit port was moved to the furthest top uphill location. Three different port geometries (Figure 5-7) were fabricated and tested to force gas removal at the far uphill corner of the gasifier at the lowest gas velocity possible at the entrance point. A helical lifter (Figure 5-8) was added to help push unreacted feedstock downhill in the cylindrical reactor vessel. The helical lifter plate caused excessively high torque and jamming problems. These modifications did little to correct the problems.



**Figure 5-7. Various Syngas Exit Nozzle Geometries Tested.**



**Figure 5-8. Helical Lifter Uphill of Brick.**

### 5.6.2 Gas Burning Within the Gasifier Vessel

#### 5.6.2.1 Resulting Problems

Air leakage into the reactor vessel caused a portion of the flammable gas generated to burn before exiting the reactor vessel. The flammability of the gas at the flare was weak or in most cases not flammable. Syngas samples were taken only when observing the highest levels of flammability in the combustion flare.

Air was observed to enter the reactor vessel through a rat-hole that formed at the top sector of the burning char bed between 10:00 and 2:00 o'clock positions. This "rat-hole" formed due to insufficient feedstock in the top portion of the rotary reactor that resulted from the low 22-degree inclination angle of the reactor vessel. Air was also observed to enter the reactor vessel and burn gas through the material feed pipe.

#### 5.6.2.2 Attempted Corrective Action

Changing the inclination angle of the rotary vessel was a major modification and was not attempted during the summer hot testing period. Changing the rotational speed of the reactor vessel helped to control the rat-hole issue within the burning char bed. Speeds over 1 RPM quickly promoted the combustion of syngas within the gasifier vessel. The optimum speed was determined to be less than 0.5 RPM.

Various attempts to form an adequate char bed at startup were tested, which included wood char, charcoal, wood pellets, and anthracite coal. The use of this feedstock addressed the problem during startup, but the rat-holes returned after the initial charge was consumed. Using these materials for starting was not deemed practical for military applications. Other attempts including reversing the rotary drive direction multiple times per minute, increasing the rotational speed to 6 rpm, and adding a helical lifter to help move feedstock downhill did little to correct the problem.

### 5.6.3 Feedstock Jamming Within the Feed Pipe

**Problems**: Feedstock jammed within the feed pipe preventing the flow of fresh feedstock into the reactor vessel when using 70,000 lbs of pushing force. This was an ongoing problem throughout the summer hot testing period. The feedstock handling system worked fine when the system was cold, but consistently plugged when the system became hot.

The system was crashed stopped and opened to observe problems. Internals were inspected with a custom video camera. Large super-compressed briquettes (sausages) formed within the feed pipe and became rock hard with reactor heat. These briquettes created endless mechanical problems and did not readily gasify.

Blockages formed at the discharge end of the feed pipe at the uphill end of the gasifier. This caused a wedging action that progressively compacted the material for the entire length of the feed pipe. Blockages were nearly impossible to remove mechanically. Special tools were developed to allow boring and drilling to remove blockages. Hard blockages were also caused by the rubber sleeved pinch valve.

**Attempted Corrective Action**: Numerous tests were conducted on varying feedstock type, size, and preparation methods. Smaller amounts of feedstock per pushing cycle helped, but blockages remained a problem. A smaller ram and insert (5 x 5-in.) was fabricated to increase the pushing stress and to minimize compaction size. This change significantly helped, but blockages remained an ongoing problem. Both the ram and sleeve were modified numerous times with some positive effect.

A rubber sleeved pinch valve was installed to minimize air leakage through the material feed pipe. This rubber sleeve of this valve was partially burned as unreacted feedstock burned down the feed pipe overnight. The fire within the rubber sleeve caused the inside surface to become excessively rough. Feedstock continually jammed in the pinch valve regardless of the sleeve pressure, requiring the valve to be removed.

### 5.7 Corrective Action to the IIFPRG System in 2013

Significant ongoing problems occurred during early testing. Principal Investigator (Stephen Cosper) decided to stop all testing and execute a major corrective action plan to permanently resolve the ongoing problems.

The modifications consisted of:

1. Increase the inclination angle of the gasifier from 22 to 40 degrees (Figures 5-9 and 5-10).
2. Replace entire rotary gasifier drive with a torque tube line shaft drive, slip clutch, and all new gearboxes.
3. Modify the internals of the gasifier.
4. Shorten the feed pipe and inject feedstock directly into the reaction zone.
5. Install thermocouples at varying locations near the feedstock feed point to monitor the charge level within the gasifier.
6. Connect diesel exhaust to heat rotary shell. Insulate gasifier vessel to minimize heat losses.



**Figure 5-9. Feedstock Handling System at 22-Degree Inclination.**




**Figure 5-10. Feedstock Handling System and Gasifier at 40-Degree Inclination.**

### 5.7.1 Increase the Inclination Angle of the Rotary Gasifier from 22 to 40 Degrees

Researchers did full scale layouts of the rotary gasifier internals using AutoCAD to determine the optimum inclination. A minimum angle of 40 degrees was determined based on the desired char bed depth at the 12:00 position and the tumbling angle of repose. Increasing the angle above 45 degrees would reduce or even stop the tumbling action.

Hinges were added to the downhill end of the gasifier to allow the adjustment of the gasifier inclination angle. The angle was increased to 40 degrees, requiring reworking of the discharge piping and the feedstock handling system. Stabilizing jacks on the corners of the trailer allow further adjustment of the inclination angle from 36 to 44 degrees by tilting the entire trailer up to 4 degrees.

Increasing the angle resolved all problems with feedstock flow within the gasifier. The problem of “rat-hole” formation on the top segment of the burning char zone was resolved and feedstock freely tumbles downhill.

### 5.7.2 Replace the Rotary Gasifier Drive

The entire rotary gasifier drive and support platform was replaced with a line shaft drive. All chain drives were removed, eliminating the problems with excessive chain forces at high torque. The rotary gasifier was modified with a shaft drive to provide pure rotational torque free of dislodging forces (common to chain and gear drives).

Three new gearboxes were used to provide a drive reduction of 8750:1. The new drive allows the gasifier rotational speed to be varied from 0.15 to 0.5 RPM. An automatic slip clutch was added to limit the rotational torque on the rotary gasifier to 1,400 ft-lbs. A safety shear pin was added at the gasifier connection. All drive train components are rated for the maximum allowable drive torque. This change resolved all rotational drive problems. The rotational speed of the gasifier can be varied by simply adjusting the hydraulic flow control valve to hydraulic motor M-1

(Figure 5-11). The torque limiting clutch was adjusted and tested to slip as designed without damaging components.



**Figure 5-11. Hydraulic Rotational Direct Drive.**

### 5.7.3 Modify the Gasifier Internals

The downhill end of the gasifier was cut off using a plasma torch to expose the fire brick. Mortar was not used, allowing the top brick fall down and creating a path for air to leak behind the brick and burn syngas within the gasifier vessel (Figure 5-12). Researchers felt there was no way to reliably resolve this problem and all brick was removed from the gasifier. The internals of the gasifier were modified using fabrications to replace the function of the brick. Various major internal modifications were made to the gasifier during September 2013 to remove all pinch points that could raise torque, causing problems with gasifier rotation. The gasifier was welded closed and the fixed downhill spring plate was modified to control the path of combustion air flow. These changes were a success. All subsequent testing from 19 September provided high and consistent gas flammability without any sign of gasifier jamming or high drive torque conditions.

### 5.7.4 Shorten the Feed Pipe

The entire feed pipe assembly was modified. The feed pipe was shortened by 75%, which significantly reduced the distance feedstock must be pushed by the ram feeder. The feed nozzle was modified to force feedstock to the bottom half of the rotating gasifier vessel. This change eliminated the formation of rock hard briquettes within the feed pipe.

This change also resolved all feedstock blockage problems in the feedstock handling system and corrected the safety issue of air leakage into the gasifier with feedstock. Any air that leaks into the gasifier with the feedstock is consumed immediately by combustion. This change greatly increases the overall safety of the system. The use of nitrogen during startup was no longer required and the gasifier no longer puffs due to overpressure during operation.



**Figure 5-12. Problem of Dropping Brick.**

The design of the gas outlet pipe was also changed. All pinch points that could cause feedstock wedging were removed. Changes allowed feedstock to freely tumble without obstructions downhill within the gasifier. This change resolved all problems with high rotational torque that had been caused by feedstock jamming between the stationary pipe and rotating reactor vessel.

### 5.7.5 Install Thermocouple Wells on the Feed Pipe to Determine Charge Depth

Four thermocouple wells were added to the feed pipe monitor the level of feedstock charge at various points within the gasifier. These thermocouples provide a temperature profile to determine the level of feedstock charge within the gasifier. Fresh and drying feedstock drives the temperature to less than 230 °F. Thermocouples that read significantly less than the discharge temperature are covered by feedstock. Thermocouples that read similar to the discharge temperature are not covered with feedstock. This change allowed researchers to use instrumentation to determine the level of charge within the gasifier. All problems related to overfeeding the gasifier and plugging the syngas exit pipe with feedstock were resolved.

### 5.7.6 Connect Diesel Exhaust to Provide Indirect Heat to Rotating Gasifier Shell

The outer stationary gasifier shell was cut open to allow the use of a thermal imaging camera to evaluate the temperature profile on the gasifier shell (Figure 5-13). Lower than expected temperatures were observed. The cut-out was installed with hinges to allow the use of future thermal imaging. The door can be opened anytime during operation to obtain thermal images of the rotating shell. The entire gasifier was insulated with 2-in. of mineral wool insulation. The insulation was covered with stainless steel cladding (Figure 5-14). Piping was added to provide hot diesel exhaust to the outside of the rotary gasifier shell. Hot diesel exhaust enters the gasifier at 900 to 1000 °F and exits to atmosphere at about 500 °F (Figure 5-15). The conduction of heat indirectly through the gasifier shell provides substantial energy to dry wet feedstock. A significant performance improvement was observed with this change. A highly flammable gas

was produced within 15 minutes after lighting the gasifier. The gas flammability was consistent throughout the entire test.



**Figure 5-13. Thermal Imaging Cut-Out on Stationary Outer Shell.**



**Figure 5-14. Gasifier Fully Insulated with Stainless Steel Cladding and 65-kW Generator, Exhaust Connected to Shell**



**Figure 5-15. Sixty-kW Generator Exhaust Connected to Gasifier.**

## 5.8 Summary Operations after 16 September 2013

The modifications were completed and testing continued from 16 September through 21 November 2013. The system currently works as follows:

1. The use of nitrogen during startup is no longer required.
2. No safety issues or concerns have occurred.
3. The gasifier starts on any feedstock. No special starting stock is required.
4. The gasifier ignites with a hand torch (Figure 5-16). The torch flame is licked into the gasifier to ignite feedstock. A burning char bed naturally forms within 15 minutes.
5. Flammable syngas is observed within 15 minutes of ignition. The flare ignites and sustains combustion at the flare.
6. The combustion at the flare is consistent throughout the operation. The gas burns directly on the water, indicating sufficient heating value to operate an engine.
7. No noticeable change in syngas flammability at the flare throughout operation.
8. All feedstock handling problems have been resolved. The system has handled woodchips, , plastic, rubber, and cafeteria waste without any malfunction or technical problems.
9. The rotary drive operates reliably and all jamming problems are resolved.
10. All problems related to air leaking past the burning char zone ("rat-holes" and brick stability) and combusting syngas within the gasifier have been resolved.
11. Optimum performance occurs at a gasifier rotational speed of one rotation in 3 minutes.
12. The burning char bed consistently runs between 1,900 and 2,200 °F on the far downhill end of the gasifier.
13. The gasifier was able to process any feedstock fed into flammable gas without any technical problems. Feedstocks tested include dripping wet cafeteria waste, rubber, office paper, cardboard, catalogs, plastic bags, packaging, and pellets, mixed wood chips with excessive shavings and fines.



**Figure 5-16. Lighting Gasifier with Hand Torch.**

## 5.9 Permitting Issues

Currently the IIFPRG is operated at SUNY Cobleskill under a research and development (R&D) permit with the New York State Department of Environmental Conservation (NYDEC). In a

contingency environment, technically there are no environmental regulations or permitting relevant. However, the research team acknowledges that for longer scale testing and demonstration purposes in the Continental United States (CONUS), the gasifier will need to fall under the appropriate regulatory regime. The difficulty arises because small scale WTE and gasification systems are rare. Consequently, there are no clear cut regulatory definitions or categories that apply. Further, because the IIFPRG is unique, there is literally no precedent. Added to that, each state (and each potential site) would have different criteria (e.g., pollutant).

Therefore, to scope the environmental permitting likely to be required, the research team is taking the approach of figuring out what would be required to permit the gasifier for a demonstration in the state of New York, even though there are currently no plans to do so. Consultations with an NYDEC engineer on specific requirements are ongoing.

A permitted site would require solid waste handling and air pollution permits, possibly wastewater discharge permits. The waste and water permits should be pro-forma exercise, but the air permit will likely be the more challenging. The primary emission point will be the diesel engine exhaust.

An air permit in NY would incorporate NSPS rules for stationary internal combustion engines. A portable generator on a trailer becomes stationary if parked at the same location for more than 12 months. CFR Title 40, Part 60, Subpart IIII, Standards of performance for stationary compression ignition (diesel) internal combustion engines (CI ICE), requires that any modified engine subject to this subpart must meet the emission standards applicable to the model year, maximum engine power, and displacement. Therefore, the gasifier modified engine it must still meet the same specifications as the initial manufacturer.

As a point of reference, a commercial biomass gasifier in NY (154 MMBTU/hr turbine) was recently permitted. The emissions are regulated for PM, opacity, Cd, Pb, Hg, $SO_2$, HCl, dioxin/furan, $NO_X$, and CO. This is of course a very large stationary power generator. There were several emissions points, but the primary is the turbine output, which also is the same stack that exhausts the flare and startup boiler emissions.

# 6. CFD Modeling

## 6.1 Methodology

The goal of this work is to use CFD simulations as a tool that provides an insight into thermal and chemical conversion of waste as it travels through the gasifier and effect of hydrodynamics on these processes. Several species were considered as waste, wood chips at the beginning, and later on plastic (cafeteria waste). CFD analysis will be able to predict the syngas composition and temperature in rotating bed gasifier close to collected experimental data. The CFD model will help to understand the effect of operating parameters like pressure, temperature, flow rates, mixing, and waste content on syngas composition. Over the years, many such studies are published in the literature [1-8]. However they do not address large scale gasifiers, which require superior computational power due to the large amount of cells in the mesh.

This work was able to mesh the gasifier with less than 1 million cells, which is enough to provide accurate results. One of the most important tasks in performing numerical simulations for gasification process is the evaluation of species concentration during devolatilization process. In this work, species were evaluated as a result of devolatilization, referred to as volatile break-up, and developed using step by step conversion of the elements in volatile into the species concentrations.

This approach conserves the mass of each of the elements as well as overall heat content in the solid fuel during this conversion. It was assumed that that the volatile material from the solid fuel consists of Carbon (C), Hydrogen (H), Oxygen (O), Nitrogen (N), and Sulfur (S). Other constituents (like Chlorine) exist in very small amount and therefore are neglected in this approach. Volatile matters from solid fuel are initially converted to a pseudo gas phase species, referred to as “volatile” using a devolatilization model. A gas phase volatile break-up reaction, R1 is added to convert this gaseous volatile to several other gas phase species. Species TAR is another pseudo gas phase species added to account for left over carbon from the volatiles, if any. Step by step approach is developed to evaluate the mass fractions of resultant species. Stoichiometric coefficients a, b, c, d, e, f, g, and h for the resultant species are calculated from the obtained mass fractions and molecular weights of these species. Using current approach, a SCHEME script is written to automatically calculate stoichiometric coefficients of volatile break-up reaction and setup the gasification simulation in ANSYS FLUENT (ANSYS. 2014).

$$\text{Volatile} \rightarrow a\,CO + b\,H_2S + c\,CH_4 + d\,H_2O + e\,H_2 + f\,N_2 + g\,TAR \qquad (R1)$$

This script in the form of add-on module is referred to as “Gasification calculator.” Heating value of species, *Volatile* is obtained by first converting as-received heating value of cal to its lower heating value and then subtracting the lower heating value of fixed carbon (Char) from it. Latent heat of water vapor formed from moisture content and hydrogen is considered appropriately while converting as-received heating value of waste (wood) to its lower heating value. A three dimensional CFD solver ANSYS FLUENT 14.5 is used to solve a set of governing equations for the gas phase and the solid phase. RANS based mass, momentum, turbulence, energy and species conservation equations are solved in Eulerian reference frame for the transport of gas phase.

Solid-particles/droplets are tracked using Lagrangian reference frame referred to as Discrete Phase Model (DPM) [9].

The entire gasification process will be broken up on the following sub processes:

- Inert heating of the fuel from initial temperature to the vaporization temperature
- Release of moisture from the fuel
- Devolatilization and tar cracking
- Char combustion and gasification
- Inert heating of ash.

Inert heating will be taken care by inbuilt inert heating law. Moisture release will be taken care by wet combustion model. For devolatilization, FLUENT allows only one species as the devolatilizing species. However, in actual case different species are evolved during devolatilization. This can be taken care by defining a pseudo species as a devolatilizing species and then breaking up this species into required composition of species using a volumetric reaction (volatile break-up reaction). Different gas phase reactions (R2-R7) will be defined as volumetric reactions. Other heterogeneous reactions (R8-R11) taking place during char combustion and gasification will be defined as particle surface reactions once the multiple char reactions model is enabled.

- CO combustion (R2)
  $CO + 0.5\ O_2 \rightarrow CO_2$
- Water-gas shift (R3)
  $CO + H_2O \rightarrow CO_2 + H_2$
  $CO_2 + H_2 \rightarrow CO + H_2O$
- $H_2$ combustion (R4)
  $H_2 + 0.5\ O_2 \rightarrow H_2O$
- $CH_4$ combustion (R5)
  $CH_4 + 1.5\ O2 \rightarrow CO_2 + 2\ H_2O$
- $CH_4$ reforming (R6)
  $CH_4 + H_2O \rightarrow CO + 3\ H_2$
  $CO + 3\ H_2 \rightarrow CH_4 + H_2O$
- Tar combustion (R7)
  $TAR + CO \rightarrow n\ CO_2$
- Char oxidation (R8)
  $C<S> + O2 \rightarrow CO_2$
- $CO_2$ gasification (R9)
  $C<S> + CO_2 \rightarrow 2\ CO$
- $H_2O$ gasification (R10)
  $C<S> + H_2O \rightarrow CO + H_2$
- $H_2$ gasification (R11)
  $C<S> + 2\ H_2 \rightarrow CH_4$

## 6.2 Model Setup

The model is developed and ready to be applied on the right gasifier geometry (Figure 6-1)). This work built and meshed the geometry several times due to significant design changes (Figure 6-2). This delayed the simulation analysis. Since the design is complex, it was not possible to use automatic meshing procedure, so gasifier had to be decomposed on parts with simple geometry that could be meshed manually to receive good quality mesh (orthogonal quality > 0.1) (Figure 6-3). To ensure more accurate results, it was decided to use a 360-degree geometry despite the increase in the number of cells (Figure 6-4). The final design and corresponding mesh are shown on Figures 6-5 and 6-6. The small gap (0.08-in.) between rotating and nonrotating plates that allows entering small amount of air will also be incorporated in the model (Figure 6-7). To reduce time of calculations, the model did not include the external big pipe that surrounds the gasifier and keeps it heated. The heat flux is calculated separately and will be applied as boundary conditions on the walls. The feedstock is treated as porous material with 25% porosity. It will be introduced as feed inlet with injection rate of 0.018 kg/s. As results the model will provide contours of mass fractions of syngas main species and evaluate the temperature in different part of gasifier.

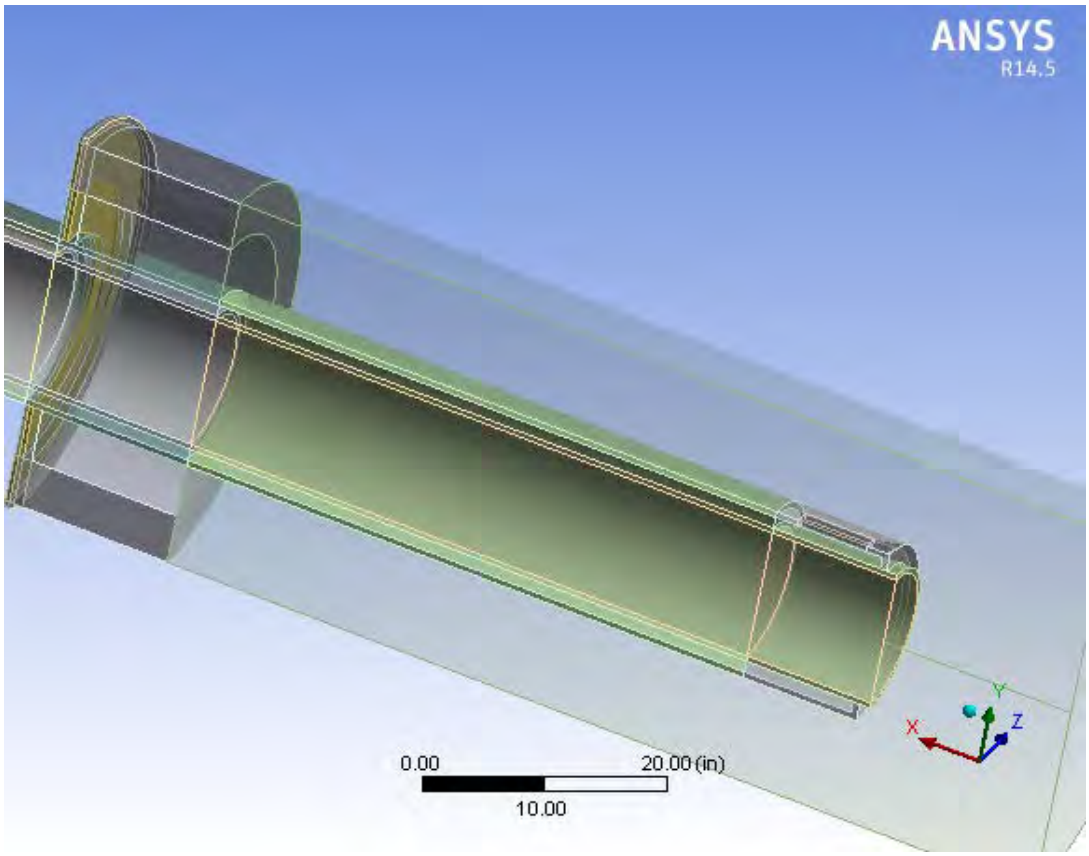



**Figure 6-1. Geometry of the Initial Design Requirements.**

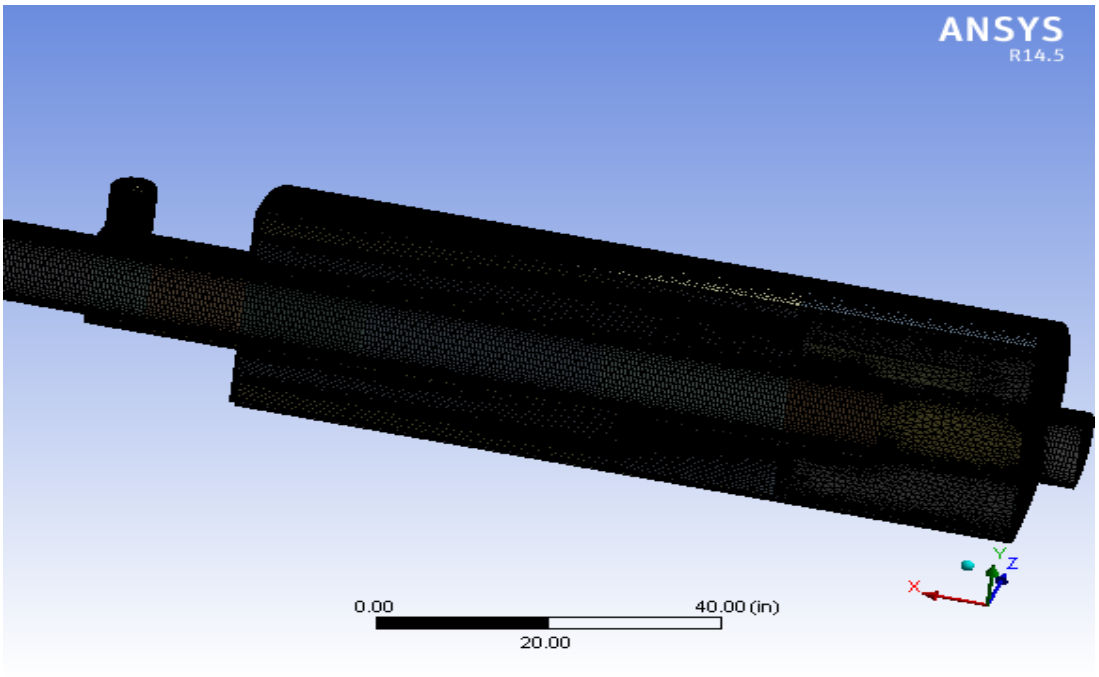



**Figure 6-2. Mesh of the Initial Design Requirements.**

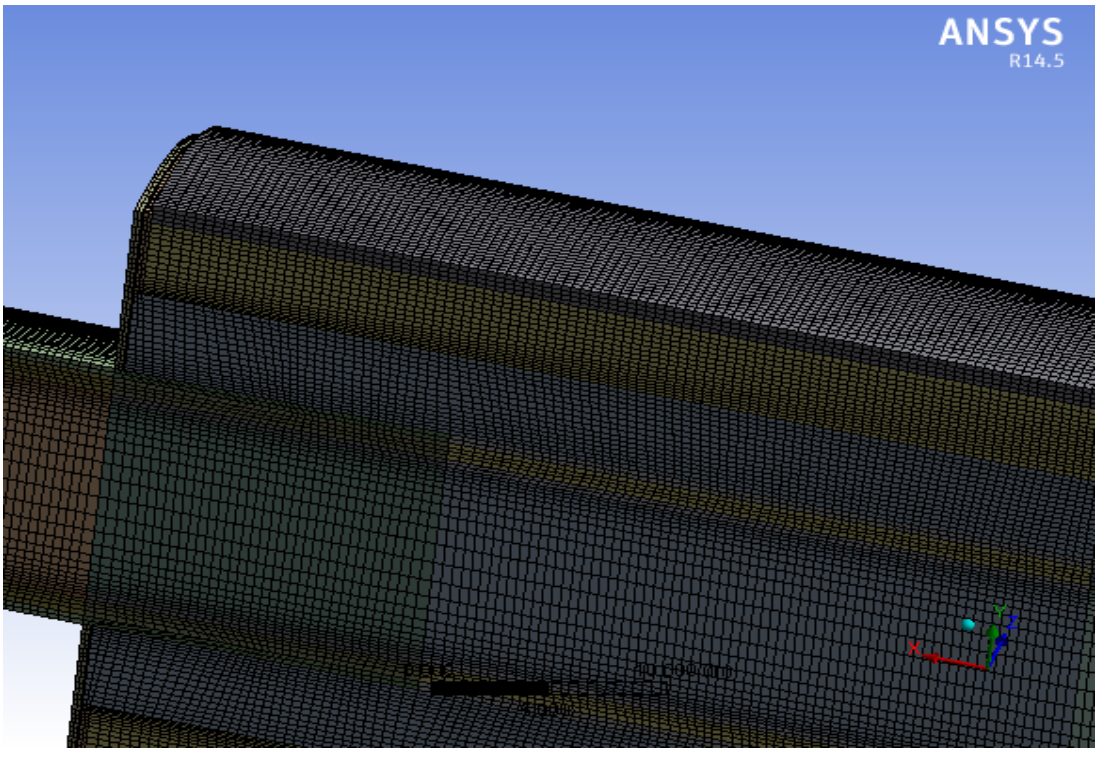



**Figure 6-3. Close up View of Meshed Geometry.**

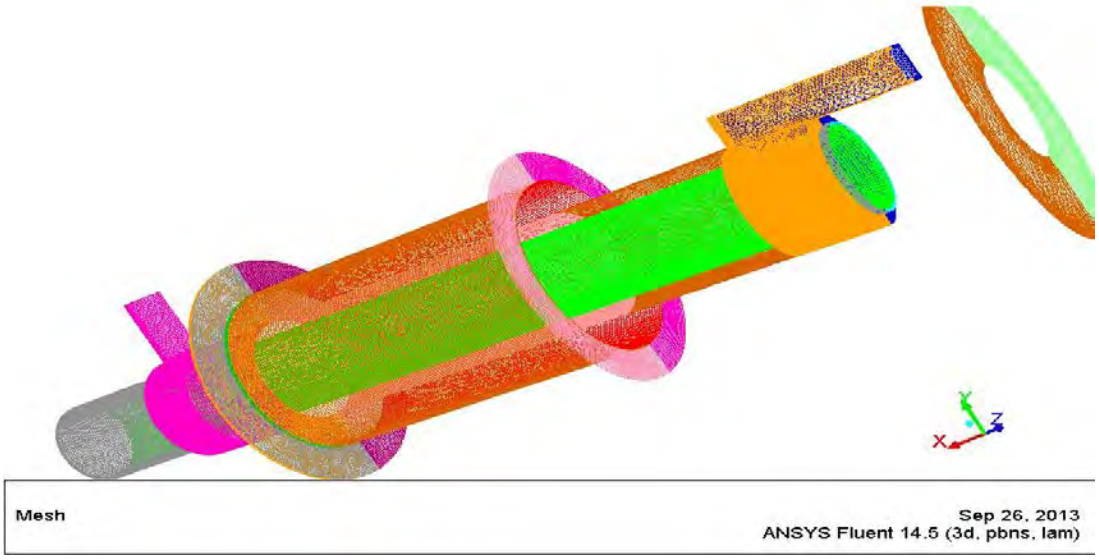



**Figure 6-4. Meshed Geometry of Other Design Requirements, 360 Degrees.**

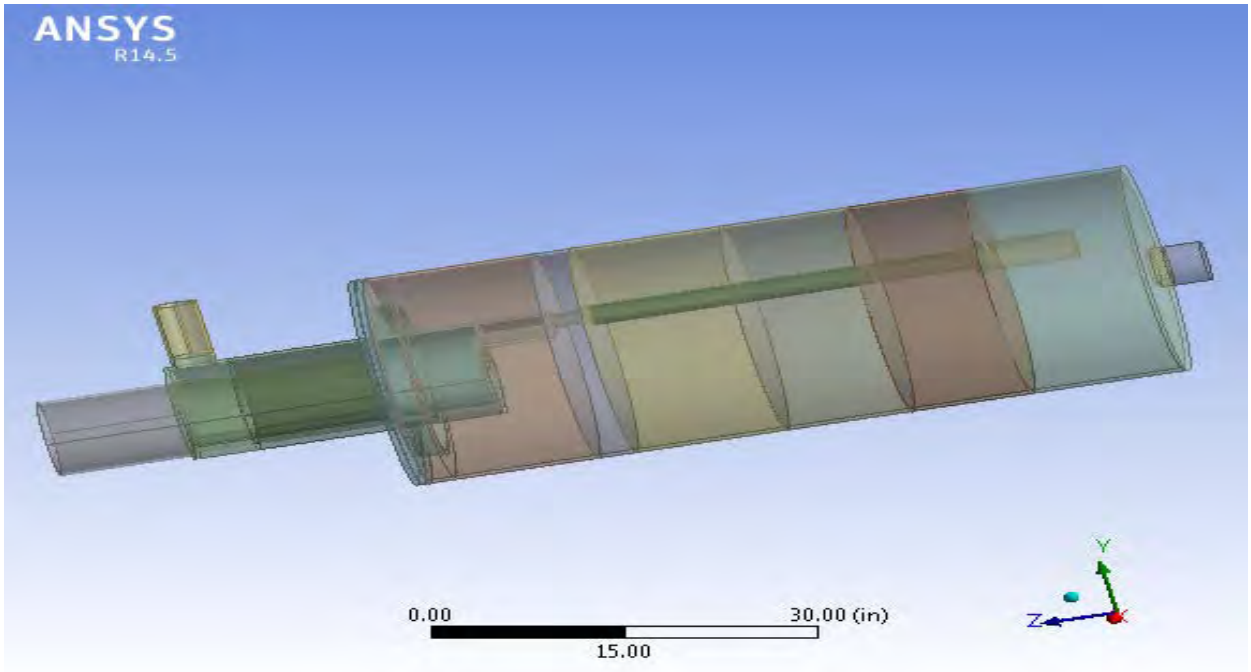



**Figure 6-5. Geometry of the Last Design Requirements.**

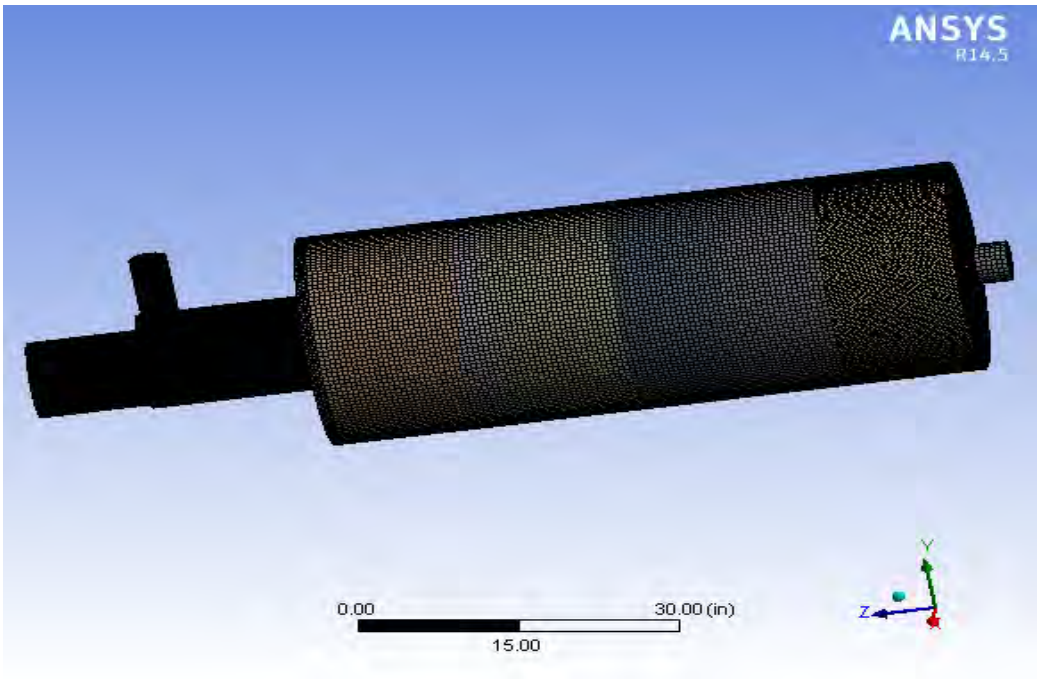



**Figure 6-6. Mesh of the Last Design Requirements.**

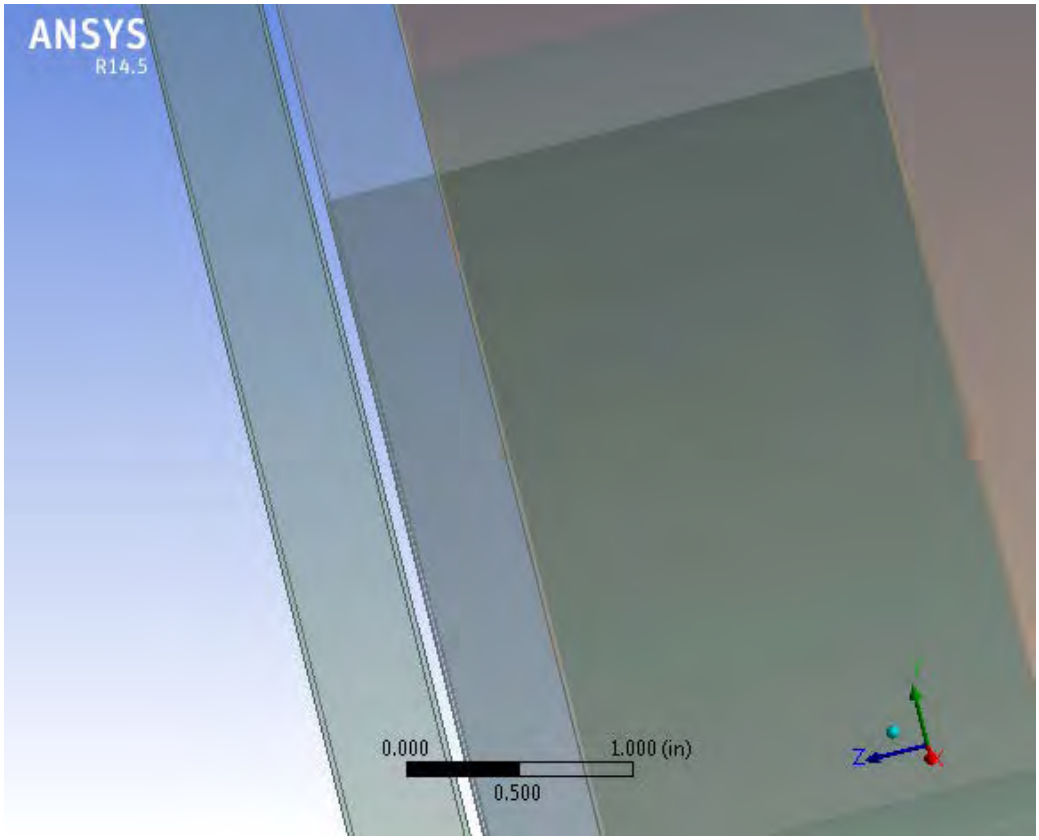



**Figure 6-7. Air Entrance Gap between Rotating and Nonrotating Plate.**

## 6.3 Geometric and CFD Modeling

Fluid dynamic modeling of the Reaction Chamber was initiated in FY13 to provide additional insight into the operating characteristics of the Rotary Kiln Gasifier under development at SUNY Cobleskill. CFD modeling of the primary reaction chamber initially used the ANSYS FLUENT software available at Picatinny Arsenal. A parallel effort using the Star-CCM+ software available at Benét Labs was initiated later in the year to take advantage of their computational resources. ANSYS FLUENT and Star-CCM+ are both well respected commercial software packages. Consistent geometric and thermochemical models were supplied to both CFD codes.

Modeling activity at Benét Labs focused on three areas:

- ProE solid model descriptions of the reaction chamber and the exhaust manifold surrounding it
- CFD analysis of exhaust manifold thermal performance
- CFD analysis of reaction chamber performance.

Solid models generated at Benét Labs were transmitted to Picatinny Arsenal staff for use in their FLUENT model preparations. The following sections describe results from each of these areas.

### 6.3.1 Geometric Model Development

The ProE solid modeling effort provided a convenient means to track test hardware evolution and to provide hardware geometry to the CFD software. Test hardware development followed a largely empirical path, which resulted in the testing of several hardware configurations during the current fiscal year. All configurations were similar in concept, but very different in detail. Concept similarities included the following:

- A central stationary piping system for waste supply and syngas extraction
- A rotating reactor drum assembly surrounding the piping assembly and containing the waste material undergoing chemical reaction
- A gap interface between the rotating drum and the stationary piping assembly to supply combustion air to the char bed at the lower end of the reactor chamber and between the rotor and the stator
- A stationary exhaust shroud channeling diesel exhaust gas over the outer surface of the reactor and supplying heat to the interior of the reactor.

Figure 6-8 shows these representative Reaction Chamber components and regions. Figures 6-9 – **6-12** show the four principal configurations tested during FY13.

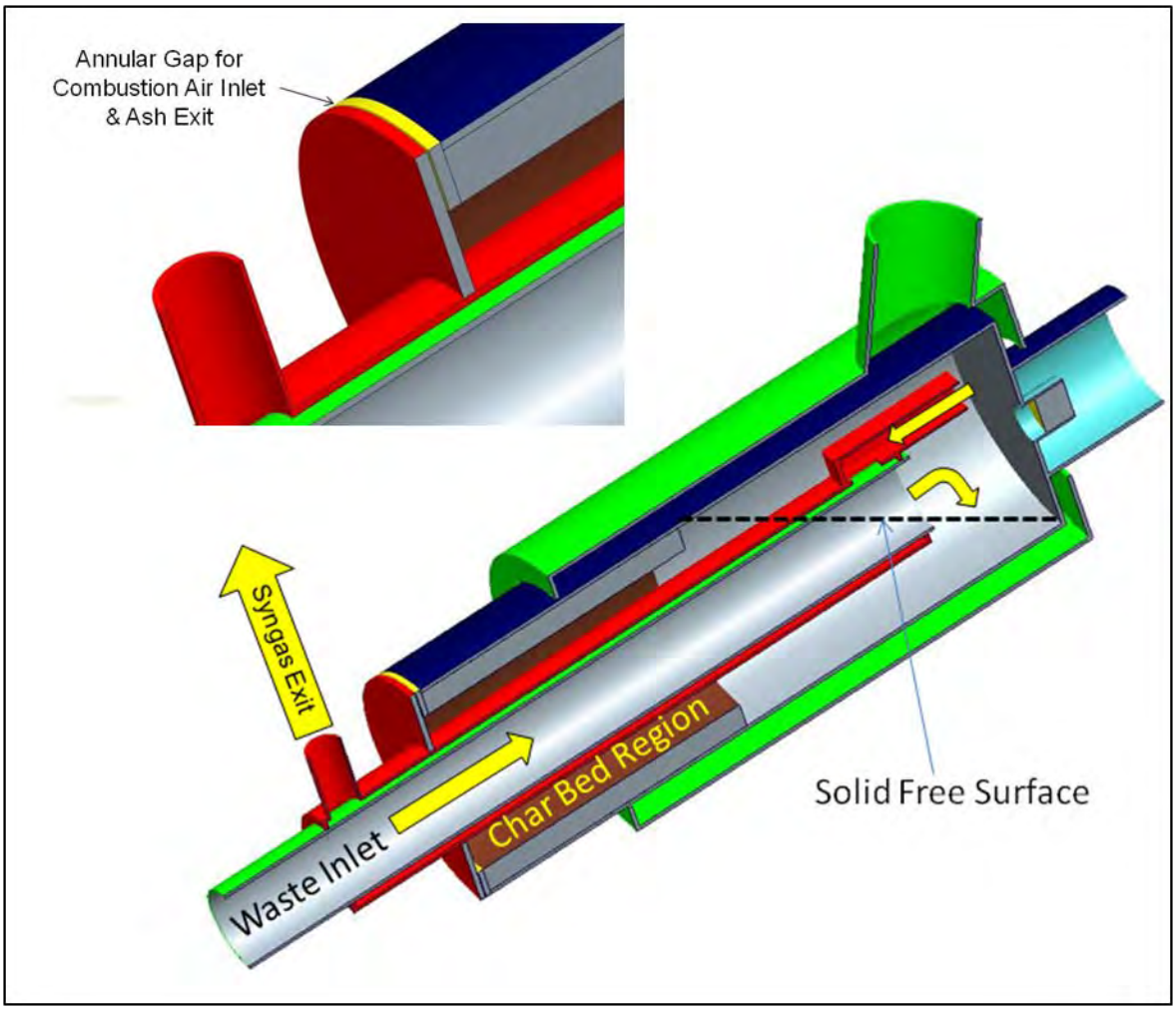



**Figure 6-8. Representative Reaction Chamber Regions.**

The May 2013 configuration (Figure 6-9) was operated with the reactor axis at an inclination angle of 22 degrees and the reactor drum rotating at various angular velocities. Several problems were encountered in this configuration. The long waste stream feed pipe often became impacted with compressed waste, which required system shutdown. Waste material in the reaction chamber developed a free surface that sometimes partially covered and plugged the syngas extraction pipe inlet leading to system shutdown. Increased drum angular velocity altered the free surface location to alleviate covering of the syngas pipe entrance, but also increased the potential for combustion air to burn through the char bed adjacent to the stationary piping, and provide a direct path for combustion air to reach and prematurely oxidize the syngas.

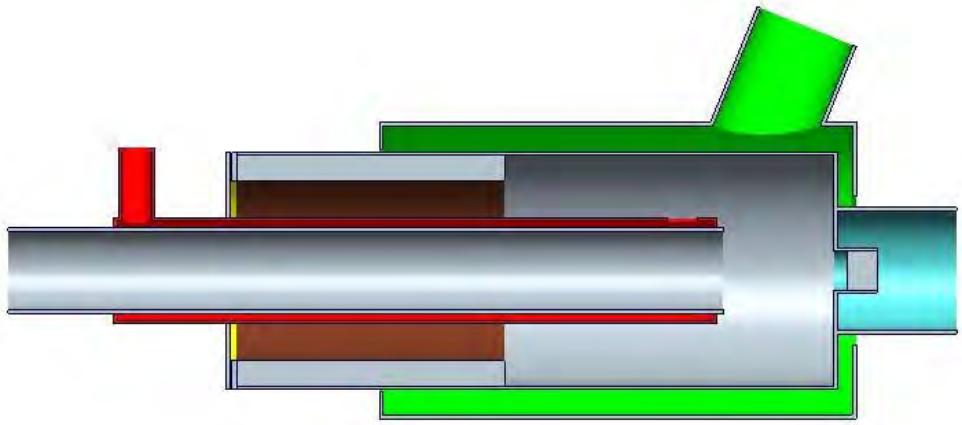


**Figure 6-9. May 2013 Configuration.**

The July 2013 configuration (Figure 6-10) added an extension to the syngas pipe entrance to move the syngas pipe was well above the expected waste material free surface. Testing quickly showed this modification did not provide successful operation, because the highly compacted material in the feed pipe filled and plugged the entire upper end of the reactor chamber, and did not distribute well onto the waste material free surface. Combustion air was still able to burn through the char bed adjacent to the stationary piping, and to generate a direct path for combustion air to reach and prematurely oxidize the syngas. Inadequate sealing in the lower end of the reaction chamber was also observed, which also permitted combustion air to flow through and around the porous fire brick adjacent to the outer edge of the char bed, and contribute to premature combustion of the syngas in the upper end of the reaction chamber. The additional testing associated with this configuration confirmed previously identified problems were not resolved, and led to isolation of problems associated with leakage around the fire brick insulation. Clearly additional changes were needed before successful reactor operation would become a reality.

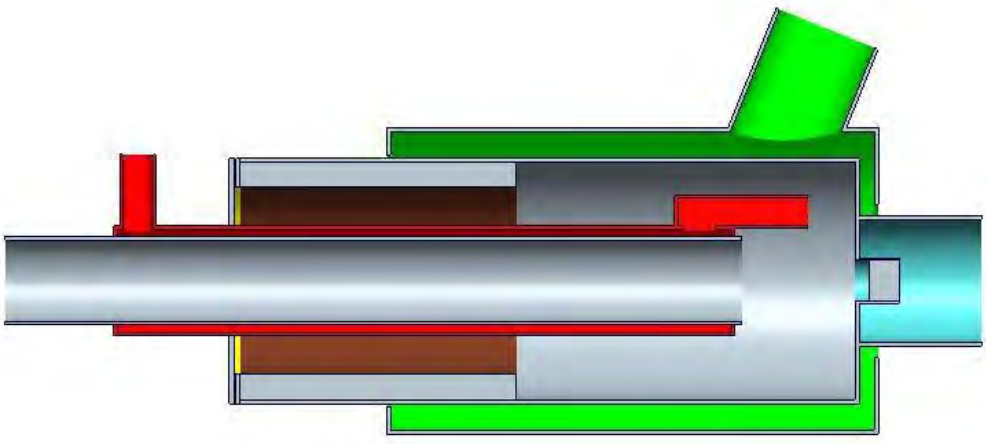


**Figure 6-10. July 2013 Configuration.**

The September 2013 configuration (Figure 6-11) included changes that alleviated many of the problems identified in the previous configuration. The reduced length of the waste stream feed pipe resulted in less compaction of the waste material in the feed pipe, a lower free surface level in the chamber, and improved delivery of the waste material to the top of the char bed. The syngas extraction pipe was also revised to locate it close to the top of the reaction chamber. Both of these changes virtually eliminated the potential for waste material to plug the upper end of the reaction chamber and directly enter the syngas extraction piping. The fire brick adjacent to the char bed were replaced by a steel wall assembly filled with Fiberfrax ceramic fiber and welded to the reaction chamber outer wall, which eliminated the potential combustion air leakage. To maintain the integrity of the char bed and reduce the potential for premature combustion of the syngas, the chamber inclination was increased to 40 degrees, and the rotation rate was limited to 0.5 rpm. Reactor performance was much improved, but still not acceptable.

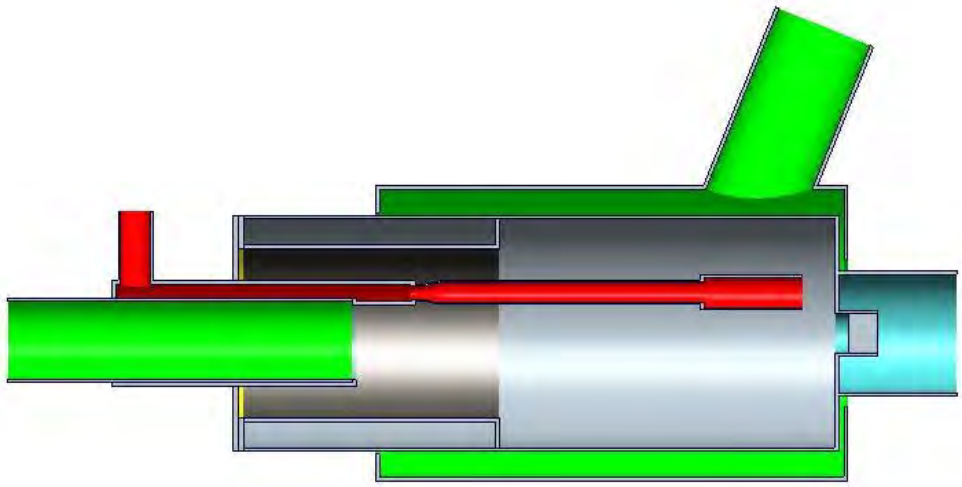


**Figure 6-11. September 2013 Configuration.**

The October configuration (**Figure 6-12**) eliminated the Fiberfrax insulation and most of the steel assembly containing it, which increased waste / char bed volume and allowed reaction chamber performance to approach system goals. The shortened feed pipe and increased bed axial cross-section appears to allow the feed stream to directly enter and replenish the char bed and to nearly the eliminate premature combustion of the syngas. Planned CFD analysis was expected to yield further insight into mechanisms controlling system performance. Because chamber internal temperature measurements were lower than expected, CFD based heat exchanger analysis of the exhaust heating configuration was initiated in parallel with CFD modeling of the primary reaction chamber.

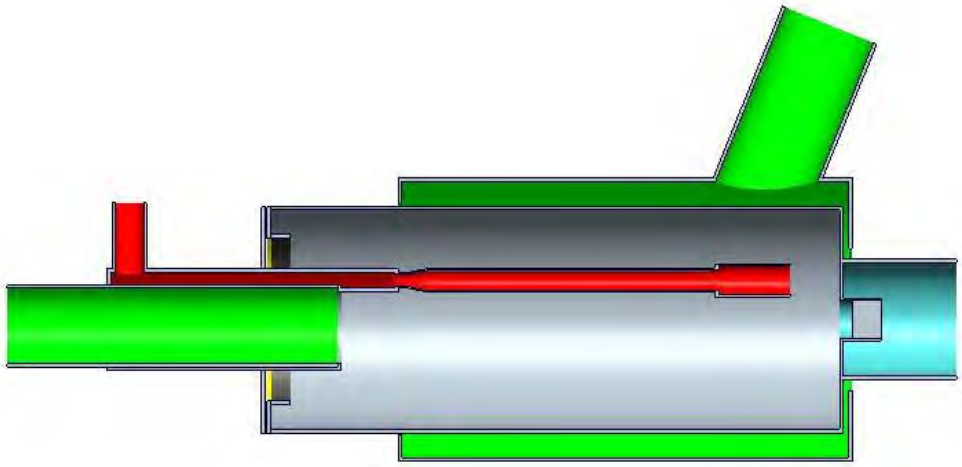


**Figure 6-12. October 2013 Configuration.**

Because of the several configuration changes, initial CFD analysis was limited to evaluating the performance of the exhaust gas heat exchanger associated with the September and October 2013 configurations (**Figure 6-13**). CFD modeling of the primary reaction chamber for the October 2013 configuration is currently underway in both FLUENT and Star-CCM+.

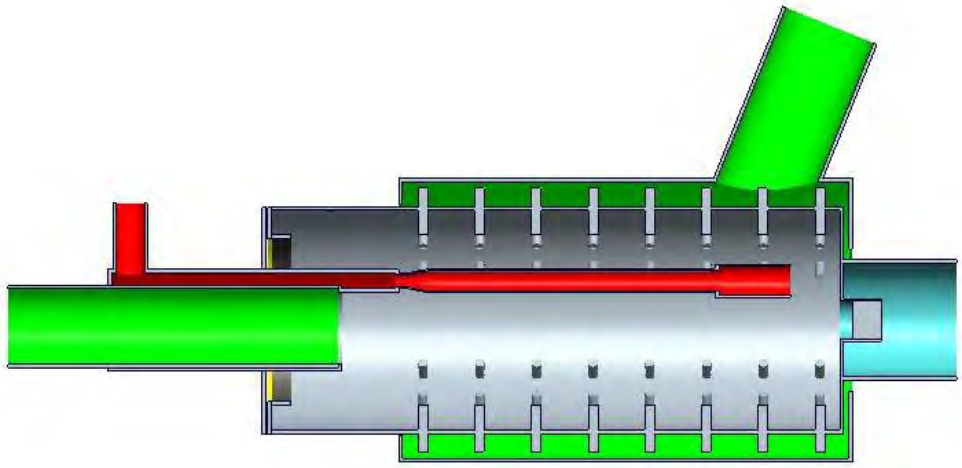


**Figure 6-13. October 2013 Configuration with "Pin-Fin" Heat Transfer Surface Extensions.**

The lower than expected chamber temperatures measured during testing of the October configuration prompted evaluation of a "Pin-Fin" enhanced chamber wall configuration. Measured exhaust inlet and exit temperatures suggested the thermal efficiency of the current heat exchanger geometry could be significantly improved. The October configuration was analytically modified to include the "Pin-Fin" surface extensions shown in **Figure 6-13**. "Pin-Fins" could be readily applied to the current system with either an "external" or "through" pin configuration. Exhaust manifold thermal performance results for the "external" version are presented in the next section.

### 6.3.2 Exhaust Manifold CFD Analysis

Two exhaust manifold models were completed to evaluate the thermal performance of the current configuration and a practical “Pin-Fin” configuration. From the outside, both models appeared as shown in **Figure 6-14**, and considered heat transfer in both the fluid and the exhaust shell. The reference model assumed the outer surface of the rotor adjacent to the exhaust gas was a uniform 533 K, while the “Pin-Fin” enhanced model assumed the inner reactor wall was a uniform 500 K and considered heat transfer in both the reactor wall and the exhaust shell. Both models were supplied with 922K air entering a tangential inlet port at 0.09 kg/s and exiting a “nominally” vertical exhaust pipe at the upper end of the reactor, and neither model considered radiations effects.

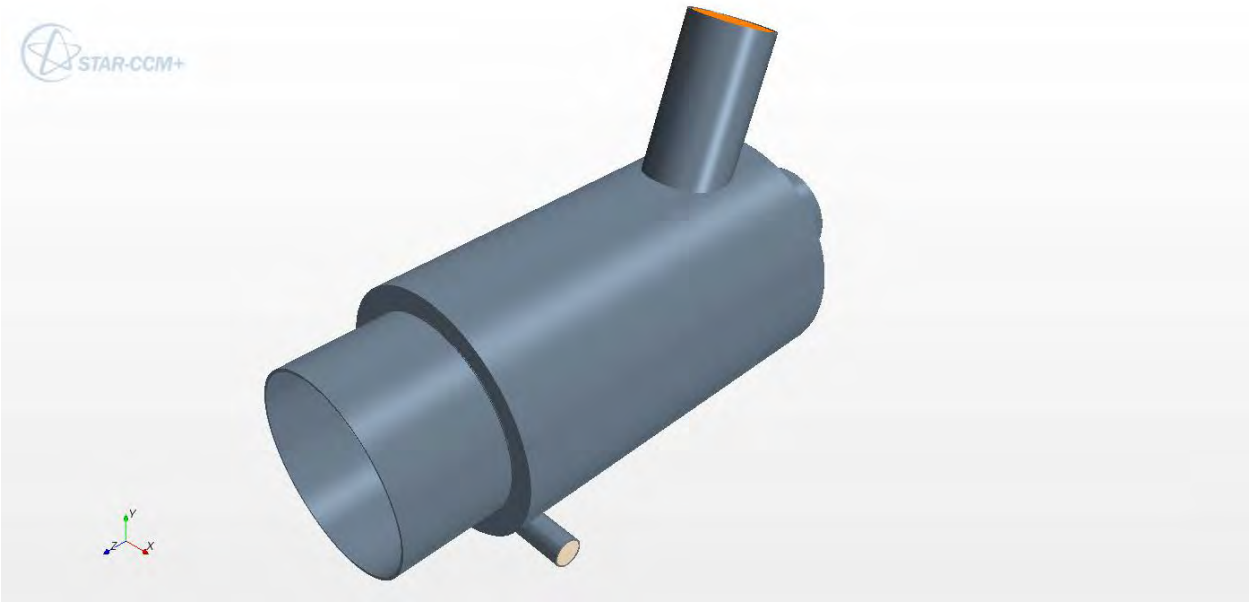



**Figure 6-14. Nominal Exhaust Manifold Geometry.**

#### 6.3.2.1 Current Reactor Geometry

In the reference model, the steady RANS conservation equations were solved in a coupled-implicit manner on 375K cell mesh. The solution included the effects of flow turbulence, reactor wall rotation, and buoyancy. **Figure 6-15** shows the resulting Rotor Heat Flux distribution, which was fairly uniform except in the vicinity of the tangential exhaust gas inlet. For the assumed 533K rotor surface temperature, heat entered the rotor at the rate of 11.0 kW. The average heat transfer coefficient (H) was 18.9 W/m2/K, the corresponding surface area (S) was 2.5 $m^2$, and the H*S product was 47.3 W/K.

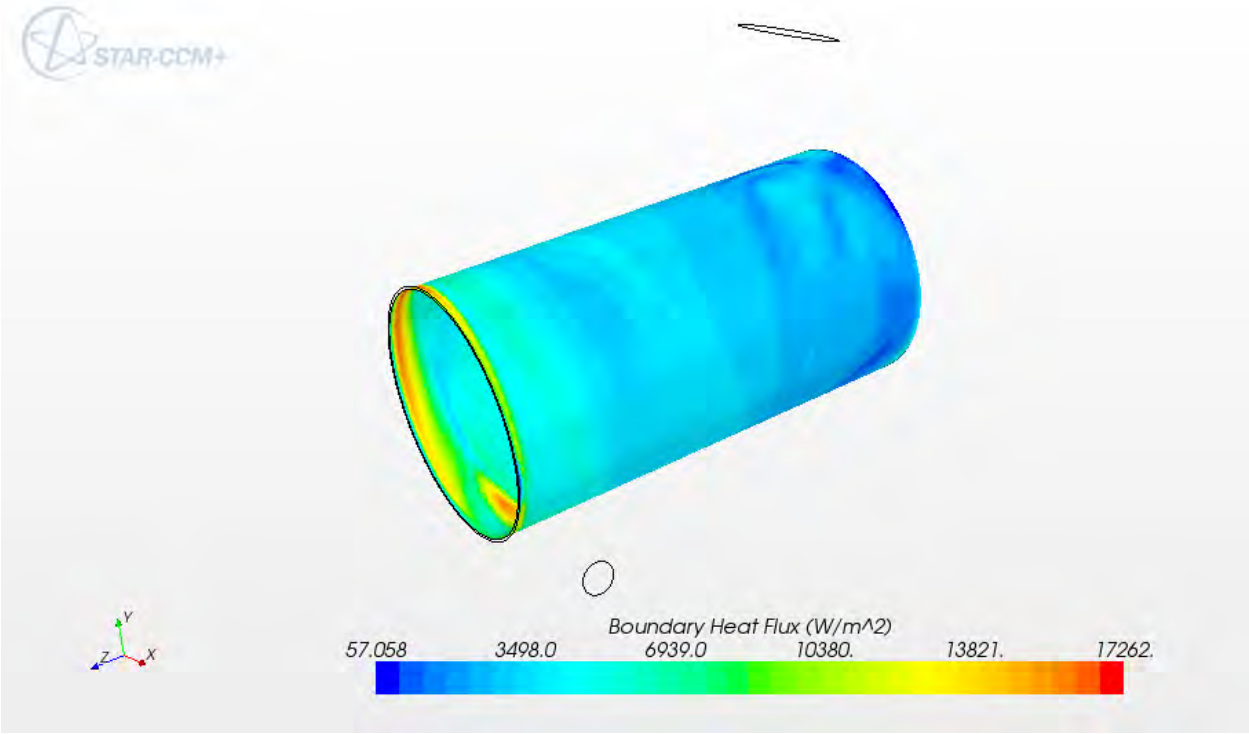



**Figure 6-15. Rotor Surface Heat Flux Distribution.**

### 6.3.2.2 Pin-Fin Enhanced Reactor Geometry

The “Pin-Fin” configuration model was solved in an equivalent manner on a much larger 2.285 million cell mesh. The larger grid size was required to “nominally” resolve flow characteristics around the pin-fins. Figure 6-16 shows the resulting Rotor Heat Flux distribution, which was fairly uniform except in the vicinity of the tangential exhaust gas inlet. For the assumed 500K internal rotor surface temperature, heat entered the rotor at the rate of 12.8 kW. The average heat transfer coefficient (H) was 16.0 $W/m^2/K$, the corresponding surface area (S) was 2.9 $m^2$, and the H*S product was 46.5 W/K. The thermal performance of this configuration was slightly less than the reference configuration, and would not be considered a beneficial addition to the system. Alternate surface enhancements may yield significantly improved performance without incurring excessive exhaust side pressure drop.

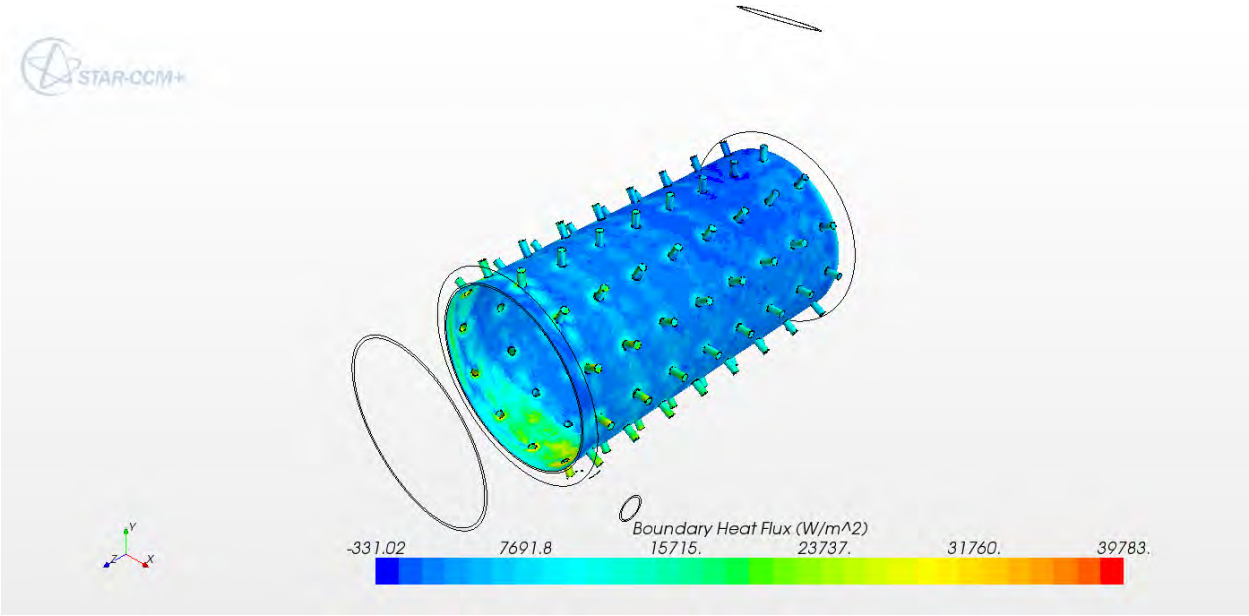



**Figure 6-16. Rotor Surface Heat Flux Distribution with "Pin-Fins."**

### 6.3.3 Reactor CFD Analysis

CFD analysis of the reactor chamber started with a fluid-thermal analysis of the reaction chamber without the effects of chemistry and discrete particles. This permitted selection and evaluation of a candidate mesh without the complexity of the chemical and particle dynamics. The initial fluid-thermal analysis solved the steady RANS conservation equations on a 1.03 million cell grid. The subsequent full model is expected to use the same grid, and include chemical and particle dynamics representative of the full system. Both steady and transient solutions are under consideration. The chemical and particle dynamics available in Star-CCM+ are similar to those available in ANSYS FLUENT, and will be selected for consistency between the two software packages. A brief discussion of relevant literature, chemical modeling, and particle dynamics has been provided in the section covering the Methodology and Model Setup of the ANSYS FLUENT model, and will not be repeated here.

#### 6.3.3.1 Initial Fluid-Thermal Analysis

The initial model considered the fluid dynamics of chamber "air" coupled to the energy flows in the rotor and stator walls under boundary conditions representative of actual chamber operation. The inlet flow was set at 0.019 kg/s, the exit of the syngas extraction pipe was fixed to a static pressure of -1990 Pa relative to ambient, and the outer edge of the rotor-stator gap at the base of the reaction chamber was fixed to ambient conditions of 101325 Pa and 300K. A uniform convective boundary condition with a heat transfer coefficient of 300 W/m2/K and an exhaust temperature of 700 K was applied to the rotor surface in contact with the exhaust flowing through the exhaust shroud. Rotor and stator wall properties will be updated from Aluminum to Carbon Steel, and rotor convective boundary condition will be consistent with the above exhaust manifold analyses before execution of the full model.

Figures **6-17** to **6-20** show representative flow, pressure, and temperature distributions from this initial solution. The grid and solution parameter adjustments required to obtain this initial solution will be carried over to the full chamber solution.

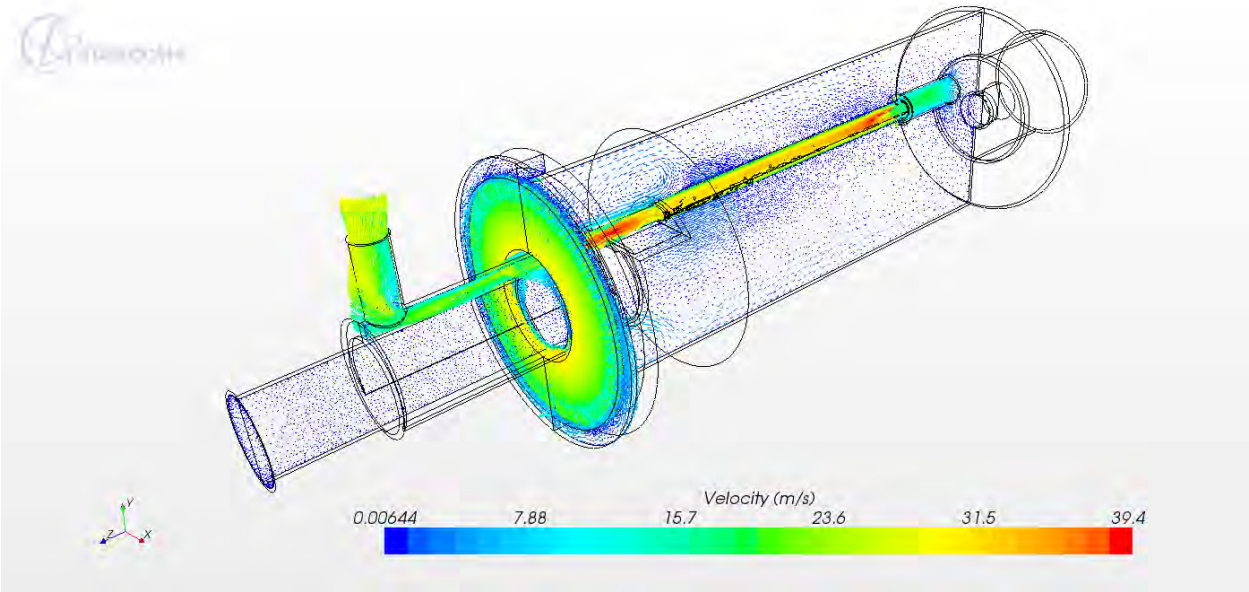



**Figure 6-17. Representative Flow Patterns – Vertical Cross-Section.**

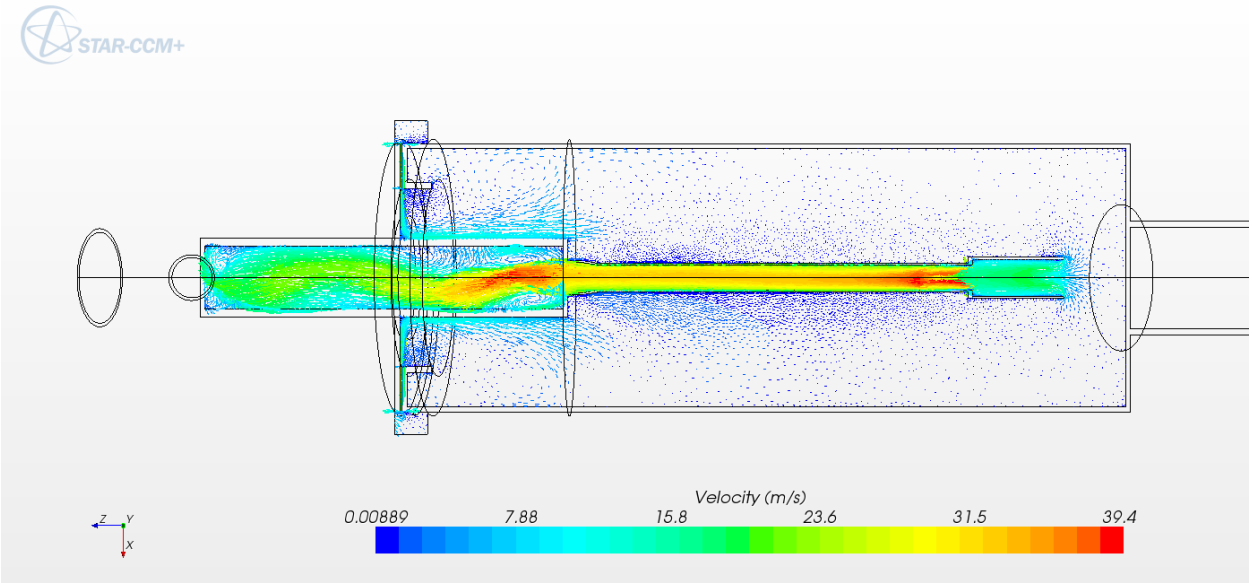



**Figure 6-18. Representative Flow Patterns – Plan View.**

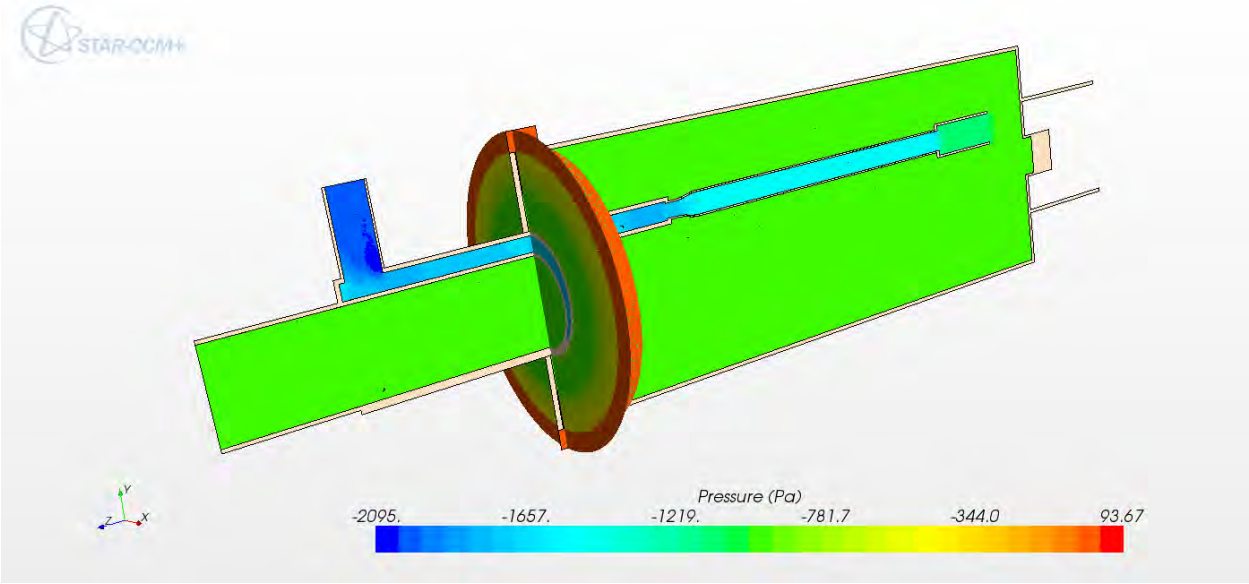



**Figure 6-19. Representative Pressure Distributions without Chemical and Particle Dynamics.**

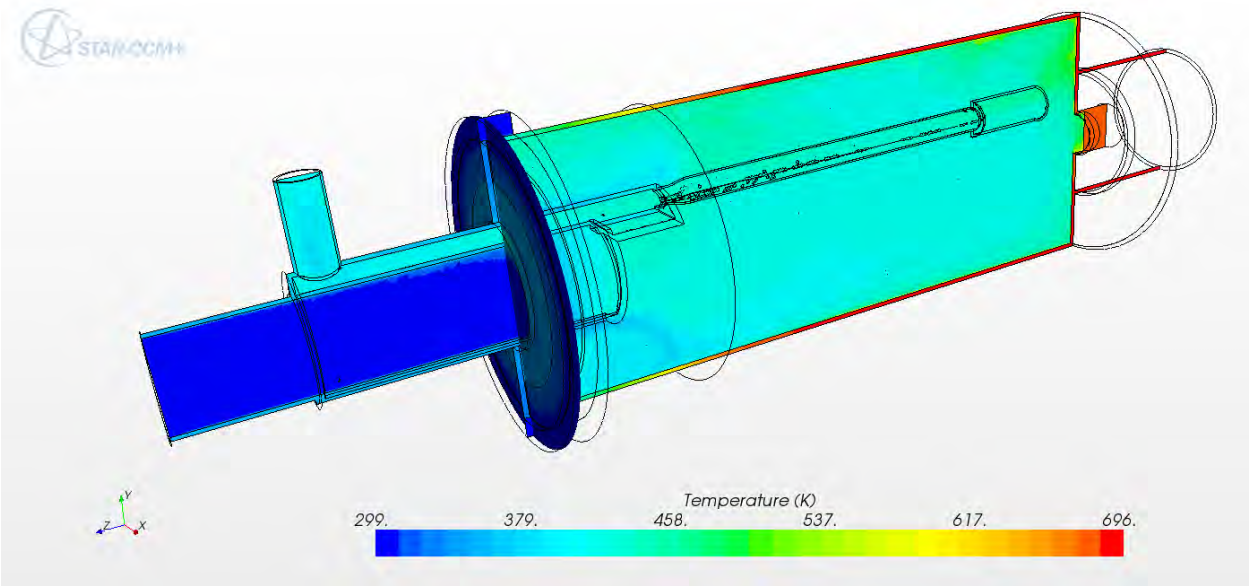



**Figure 6-20. Representative Temperature Distributions without Chemical and Particle Dynamics.**

### 6.3.3.2 Fluid-Thermal Analysis with Lagrangian Feed and Chemistry

Model preparation for a more complete solution of the Gasifier Reaction Chamber dynamics included selected review of relevant literature, and exploration of the Star-CCM+ modeling capabilities to confirm suitability for the current problem. The required chemical and particle dynamics will be added to the initial fluid dynamic model from Section 3.1 to form the basis for comparison to test data and evaluation of alternate chamber configurations.

### 6.3.4 Conclusions

Completed work has tracked evolution of the test hardware at SUNY Cobleskill, provided solid models for CFD activities at both Benét Labs and Picatinny Arsenal, has helped quantify thermal boundary conditions for the reaction chamber, and provided a basis for CFD evaluation of reaction chamber performance.

## 6.4 Equipment Arrangement

In addition to the thermodynamic modeling, staff at Benét Labs created detailed 3-D models of all parts of the gasifier system. The goal was to show that all the equipment could fit into standard shipping containers. TRICONs were selected because it is more likely that smaller camps would have the capability to move these, rather than an entire 20-ft container.

Figure 6-21 and Figure 6-22 show the results of this effort. All of the gasifier system, including generator fits into three TRICONs, which can be hauled on the back of a HEMTT. The TRICONs can be mounted in a standard steel rack, that can be mechanically dismounted (rolled-off the back) from the HEMTT.

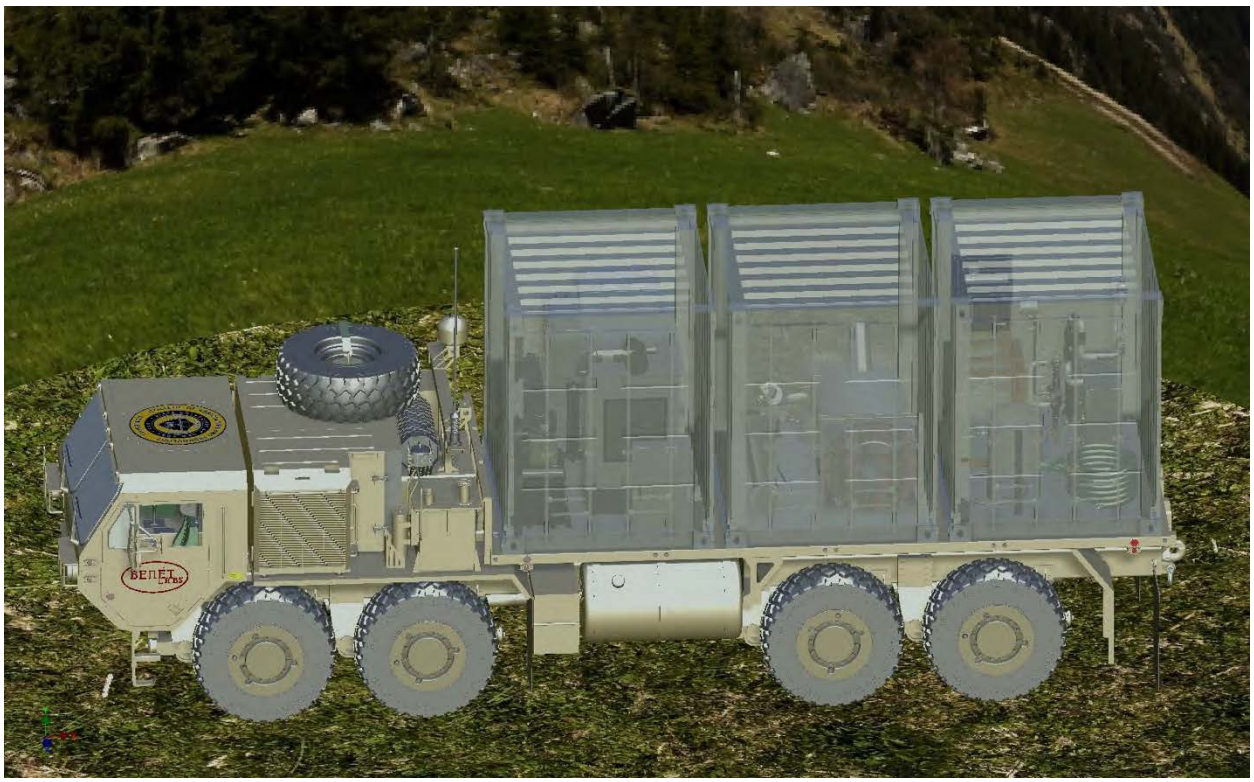


**Figure 6-21. Side view of gasifier equipment in TRICONs.**

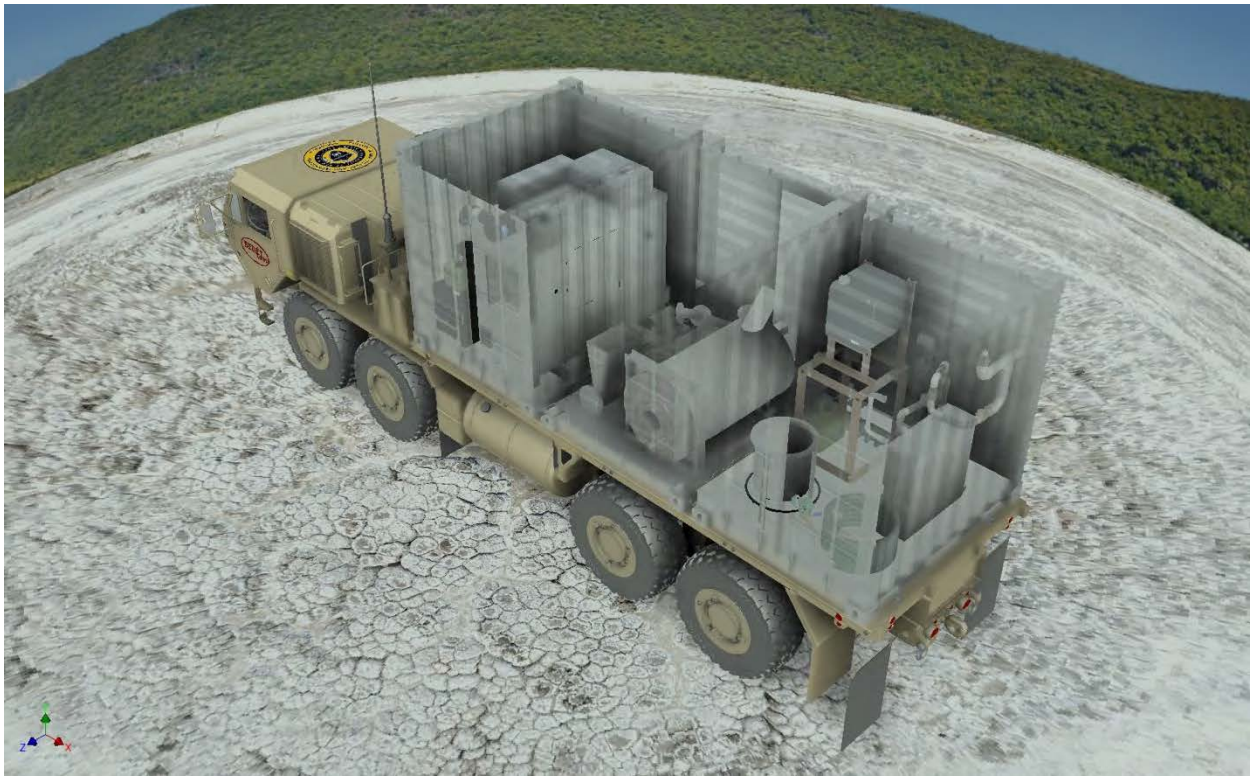


**Figure 6-22. Top View of Gasifier System in TRICONs.**

# 7. Diesel Engine Efficiency Studies

This chapter presents syngas efficiency testing on using commercial diesel engines with 60 kW generators, the common size for contingency power applications

## 7.1 EPA Tier 2 and Tier 3 Engines

Modern diesel engines replace mechanical governors with electronic fuel injection and electronic ECMs. Electronic governor controls maintain the engine speed at the exact synchronous speed to maintain 60 Hz electrical frequency. Electronic governors maintain precision frequency response over the entire operating range for electrical load.

Zero percent electronic governor "droop" is not a desired feature when dual fueling. Mechanical governors operate at a 4% governor droop (1860 rpm no load and 1780 rpm full load) for generator drives. Observations indicate a loss in fuel savings due to the fact that the electronic controls over-inject liquid fuel, which force the engine to operate more like a diesel cycle than as a combination "Diesel-Otto." The main observations are additional liquid fuel usage and heavy PM in the exhaust stream.

Tier 2 and Tier 3 engines were tested as follows:

1. Sixty-kW Generator with EPA Tier 2 John Deere 5030HF270 with electronic controlled fuel injection and Woodward electronic governor.
   a. No abnormal PM.
   b. Maximum liquid fuel savings measured was 65% on IIFPRG syngas.
   c. All tests conducted at >90% load. No noticeable loss in engine power when dual fueling.
2. Sixty-five-kW Generator with EPA Tier 3 John Deere 4045TF285 with electronic controlled fuel injection and John Deere electronic ECM.
   a. Heavy PM observed at the slightest amount of dual fueling.
   b. Maximum liquid fuel savings measured was 37% on IIFPRG syngas.
   c. All tests were conducted at > 90% load. There was no noticeable loss in engine power when dual fueling.

## 7.2 Feedstocks for EPA Tier 2 Engines Testing

Researchers decided to stop testing the EPA Tier 3 engine due to excessive black smoke emissions. The EPA Tier 2 engine was tested for 60-second fuel usage "clip tests" using syngas created from the IIFPRG. Table 7-1 lists the feedstocks tested.

**Table 7-1. Clip Test Feedstocks.**

| Diesel Clip Tests | | | |
|---|---|---|---|
| Test | Date | Time | Feedstock |
| Test 1 | 11/19/2013 | 13:49 | Cooksburg Wood Chips |
| Test 2 | 11/19/2013 | 14:17 | 50% Cooksburg Chips / 50% Prentice Hall Cafeteria Waste |
| Test 3 | 11/20/2013 | 12:52 | Cooksburg Wood Chips |
| Test 4 | 11/20/2013 | 13:52 | 70% Cooksburg Wood Chips, 30% HDPE by weight |
| Test 5 | 11/20/2013 | 13:54 | 70% Cooksburg Wood Chips, 30% HDPE by weight |
| Test 6 | 11/20/2013 | 15:15 | 50% Cooksburg Wood Chips, 50% Horse Manure by weight |
| Test 7 | 11/20/2013 | 15:34 | 50% Cooksburg Wood Chips, 50% Horse Manure by weight |
| Test 8 | 11/21/2013 | 12:10 | 50% Cooksburg Wood Chips, 50% Cafeteria Waste by weight |
| Test 9 | 11/21/2013 | 12:12 | 50% Cooksburg Wood Chips, 50% Cafeteria Waste by weight |
| Test 10 | 11/21/2013 | 14:45 | 50% Cooksburg Wood Chips, 50% Cafeteria Waste by weight |

## 7.3 Test Configuration

Figure 7-1 shows the equipment used to measure liquid fuel usage. Fuel consumption is determined using the change in fuel level in a clear sight glass over a 60-second test period. The density used for liquid diesel fuel is 7.1 pounds per US gallon.

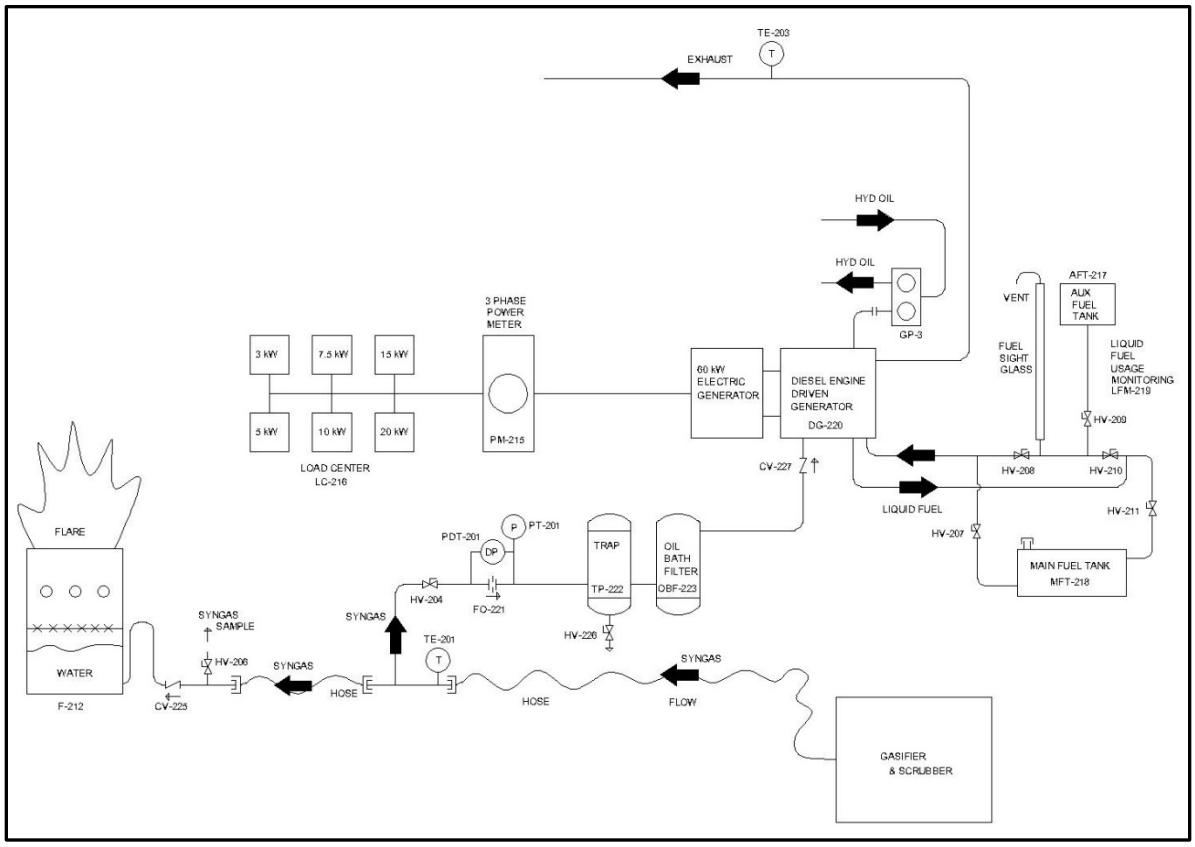



**Figure 7-1. Equipment Configuration for Clip Tests.**

### 7.4 Baseline Factory Ratings

Figure 7-2 shows the fuel consumption for the EPA Tier 2 John Deere 5030HF270 engine as shown on the engine manufacturer's data sheet. Figure 7-3 shows the brake specific fuel consumption and Figure 7-4 shows the thermodynamic efficiency as calculated from the engine data sheet.

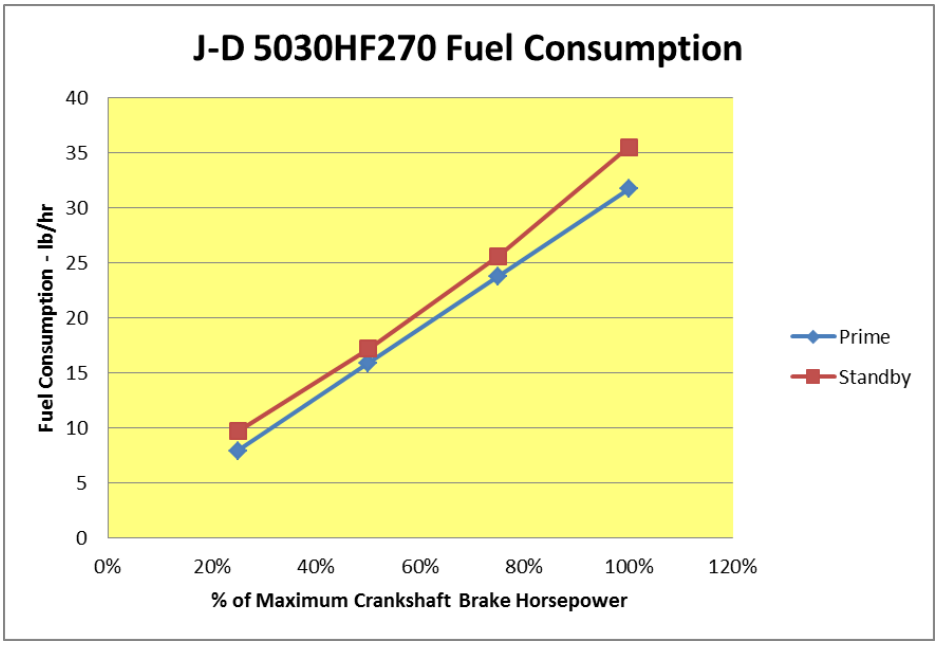



**Figure 7-2. Fuel Consumption.**

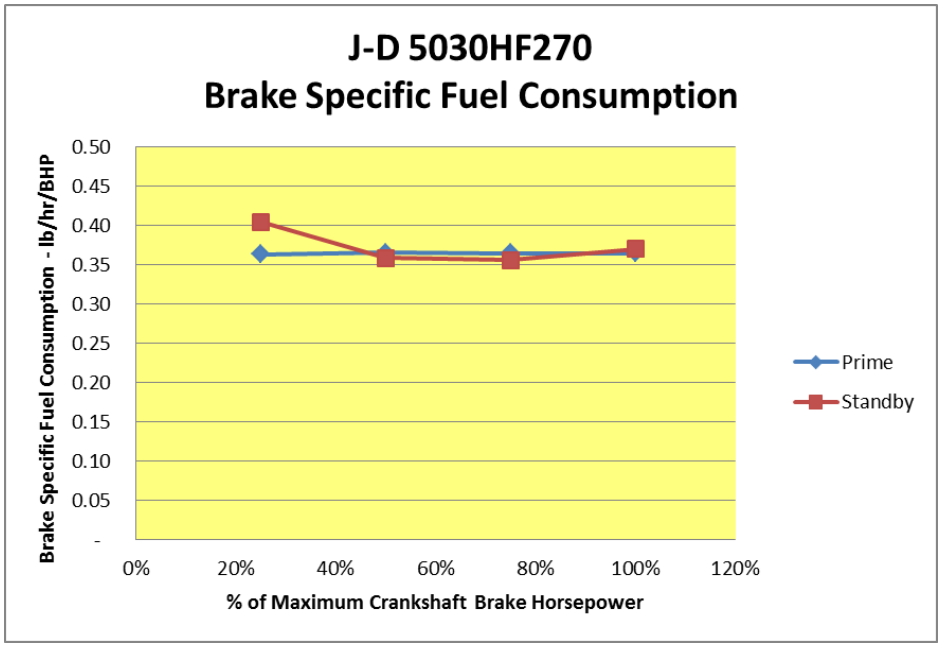



**Figure 7-3. Brake Fuel Consumption.**

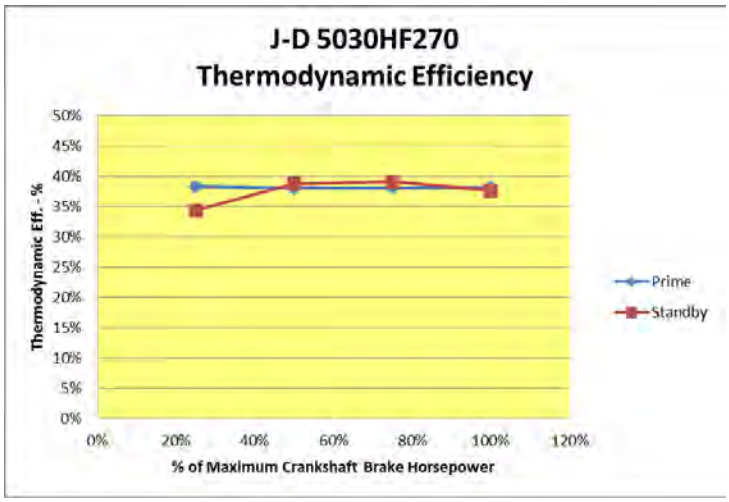



**Figure 7-4. Thermodynamic Efficiency.**

### 7.5 Clip Test Procedure

Clip tests are conducted as follows:

1. Hand valves HV-207 and HV-211 are open. HV-208 and HV-210 are closed. The engine operates normally using fuel from main fuel tank MFT-218.
2. Open HV-209. Fuel flows from aux. fuel tank AFT-217 and fills the sight glass.
3. Close HV-209 when the sight glass is full.
4. Open HV-208 and HV-210. Close HV-207 and HV-211. Fuel to run the engine flows from the fuel sight glass.
5. Open HV-204 to allow syngas to flow into the engine.
6. Mark the fuel level on the sight glass with a dry erase marker and start the 60-second timer.
7. Mark the fuel level on the sight glass with a dry erase marker when the 60-second timer expires.
8. Obtain exhaust emissions.
9. Open HV-207 and HV-211 to allow diesel fuel to flow from main fuel tank MFT-218.

### 7.6 Clip Test Results

The data in Table 7-2 summarize the results from this set of tests. This shows that 60% reductions in liquid fuel usage (for a constant electric load) are achievable on IIFPRG syngas, in diesel engines similar to those in common tactical generator sets. While CO exhaust emissions increase slightly, $NO_X$ emissions are reduced by roughly 50%. The afterburner system should combust almost all CO from the exhaust.

Figure 7-5 shows no loss in thermodynamic efficiency when dual fueling with an electronic governor, which is contrary to the mechanical governor findings. The data indicates the electronic governor may be injecting more liquid fuel than necessary to maintain precision frequency control. Another possibility is electronic fuel injection atomizes liquid fuel better by pulsing up to 100 times per injection cycle. This may help to compression ignite the gaseous fuel-air mixture more efficiently.

**Table 7-2. Clip Test Results.**

| Test: | | Test 1 | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 | Test 8 | Test 9 | Test 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Test Date:** | | 11/19/2013 | 11/19/2013 | 11/20/2013 | 11/20/2013 | 11/20/2013 | 11/20/2013 | 11/20/2013 | 11/21/2013 | 11/21/2013 | 11/21/2013 |
| **Test Time:** | | 13:49 | 14:17 | 12:52 | 13:52 | 13:54 | 15:15 | 15:34 | 12:10 | 12:12 | 14:45 |
| **Electrical Load:** | kW | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| **Power Take Off Load:** | BHP | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 |
| **Syngas Flow to Engine During Test:** | | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **Syngas Sample Number:** | | SB111913-1345 | SB111913-1417 | SB112013-1245 | SB112013-1400 | SB112013-1400 | SB112013-1515 | SB112013-1515 | SB112113-1217 | SB112113-1217 | SB112113-1455 |
| **Syngas Low Heating Value** | BTU/scf | 122 | 134 | 135 | 176 | 176 | 145 | 145 | 119 | 119 | 109 |
| **Visual Opacity** | | No Visible PM | No Visible PM | No Visible PM | No Visible PM | No Visible PM | No Visible PM | No Visible PM | No Visible PM | No Visible PM | No Visible PM |
| | | | | | | | | | | | |
| **Dual Fuel Test** | | | | | | | | | | | |
| Test Start Measurement: | inch | 26.75 | 33.375 | 40 | 40.5 | 27 | 35.75 | 37 | 36.5 | 30.25 | 23.625 |
| Test End Measurement: | inch | 43.25 | 42.25 | 51.25 | 50.75 | 34.5 | 48.5 | 49.75 | 50.5 | 44 | 35.125 |
| Test Duration: | sec | 90 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Liquid Fueling Rate | gal/hr | 2.56 | 2.06 | 2.62 | 2.38 | 1.74 | 2.97 | 2.97 | 3.26 | 3.20 | 2.67 |
| Liquid Fueling Rate | lb/hr | 18.16 | 14.65 | 18.58 | 16.92 | 12.38 | 21.05 | 21.05 | 23.12 | 22.70 | 18.99 |
| Syngas Flow to Engine | SCFM | 36.5 | 36.5 | 28.9 | 20.3 | 27.0 | 22.0 | 27.8 | 26.5 | 26.9 | 24.6 |
| Gaseous Fueling Rate | BTU/hr | 267505 | 293817 | 234441 | 214550 | 285013 | 191723 | 241563 | 189092 | 192325 | 160884 |
| Liquid Fueling Rate | BTU/hr | 332734 | 268456 | 340297 | 310048 | 226864 | 385669 | 385669 | 423480 | 415918 | 347859 |
| Total Gross Fueling Rate | BTU/hr | 600240 | 562273 | 574738 | 524598 | 511877 | 577392 | 627233 | 612573 | 608243 | 508743 |
| Crankshaft Load | BHP | 88.7 | 88.7 | 88.7 | 88.7 | 88.7 | 88.7 | 88.7 | 88.7 | 88.7 | 88.7 |
| Crankshaft Load | BTU/hr | 225654 | 225654 | 225654 | 225654 | 225654 | 225654 | 225654 | 225654 | 225654 | 225654 |
| Liquid Diesel Fuel Savings | | 47.6% | 56.2% | 46.4% | 51.0% | 64.1% | 37.0% | 37.0% | 31.7% | 32.9% | 43.9% |
| Dual Fuel Thermodynamic Efficiency | | 37.6% | 40.1% | 39.3% | 43.0% | 44.1% | 39.1% | 36.0% | 36.8% | 37.1% | 44.4% |
| | | | | | | | | | | | |
| **Baseline Fuel Consumption** | | | | | | | | | | | |
| Test Start Measurement: | inch | 12.75 | 34.5 | 38.25 | 26.375 | 26.375 | 29.5 | 29.5 | 27.5 | 27.5 | 27.5 |
| Test End Measurement: | inch | 33.75 | 54.75 | 59.25 | 47.275 | 47.275 | 49.75 | 49.75 | 48 | 48 | 48 |
| Test Duration: | sec | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Liquid Fueling Rate | gal/hr | 4.88 | 4.71 | 4.88 | 4.86 | 4.86 | 4.71 | 4.71 | 4.77 | 4.77 | 4.77 |
| Liquid Fueling Rate | lb/hr | 34.67 | 33.44 | 34.67 | 34.51 | 34.51 | 33.44 | 33.44 | 33.85 | 33.85 | 33.85 |
| Liquid Fueling Rate | BTU/hr | 635220 | 612534 | 635220 | 632195 | 632195 | 612534 | 612534 | 620096 | 620096 | 620096 |
| Total Gross Fueling Rate | BTU/hr | 635220 | 612534 | 635220 | 632195 | 632195 | 612534 | 612534 | 620096 | 620096 | 620096 |
| Crankshaft Load | BHP | 88.7 | 88.7 | 88.7 | 88.7 | 88.7 | 88.7 | 88.7 | 88.7 | 88.7 | 88.7 |
| Crankshaft Load | BTU/hr | 225654 | 225654 | 225654 | 225654 | 225654 | 225654 | 225654 | 225654 | 225654 | 225654 |
| Baseline Thermodynamic Efficiency | | 35.5% | 36.8% | 35.5% | 35.7% | 35.7% | 36.8% | 36.8% | 36.4% | 36.4% | 36.4% |
| | | | | | | | | | | | |
| **Dual Fuel Emissions** | | | | | | | | | | | |
| CO | % Vol | NA | NA | NA | 0.16% | 0.16% | 0.41% | 0.41% | NA | NA | NA |
| $O_2$ | % Vol | NA | NA | NA | 10.83% | 10.83% | 11.00% | 11.00% | NA | NA | NA |
| $CO_2$ | % Vol | NA | NA | NA | 8.70% | 8.70% | 7.90% | 7.90% | NA | NA | NA |
| $NO_x$ | PPM | NA | NA | NA | 300 | 300 | 213 | 213 | NA | NA | NA |
| | | | | | | | | | | | |
| **Baseline Emissions** | | | | | | | | | | | |
| CO | % Vol | NA | NA | NA | 0.04% | 0.04% | 0.04% | 0.04% | NA | NA | NA |
| $O_2$ | % Vol | NA | NA | NA | 12.90% | 12.90% | 12.90% | 12.90% | NA | NA | NA |
| $CO_2$ | % Vol | NA | NA | NA | 6.30% | 6.30% | 6.30% | 6.30% | NA | NA | NA |
| $NO_x$ | PPM | NA | NA | NA | 493 | 493 | 493 | 493 | NA | NA | NA |

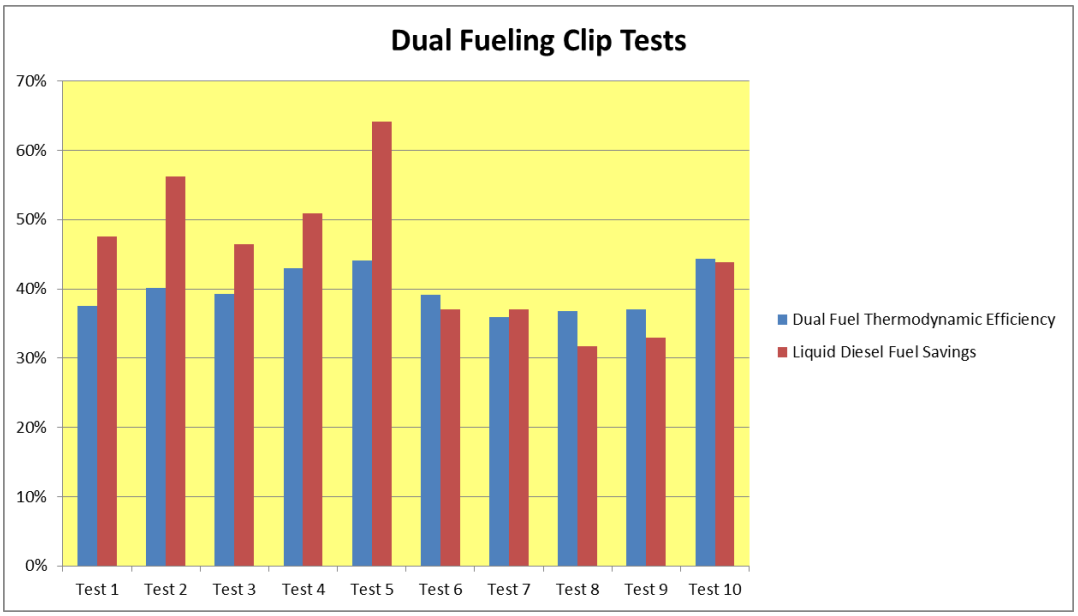



**Figure 7-5. Clip Test Efficiency and Fuel Savings.**

## 7.7 Conclusions

The diesel engine performance, when dual fueled on nitrogen diluted methane, is similar to operating on ultra-low energy syngas. Weak gaseous mixtures, that are not flammable in air, still provide liquid fuel savings in a diesel engine.

Diesel engines can operate with little or no power loss, even when dual fueled at high gaseous fueling rates using very weak syngas. Liquid fuel savings of 83% have been measured on 135 BTU/scf LHV syngas with less than 1.5% moisture content. Reducing the dewpoint of weak syngas greatly increases liquid fuel savings by reducing the thermal load (due to moisture) on the engine.

The engine governor automatically adjusts the liquid fuel injection rate to maintain crankshaft speed at the target 60 Hz synchronous speed. The engine automatically increases speed when feeding gaseous fuel. The governor automatically reduces the liquid fuel injection rate to provide a liquid fuel savings. Gaseous fueling can vary at any flow rate, without concern for air to fuel ratio, by mixing the syngas directly with the engine intake airflow.

Over-fueling is observed by engine speed instability. The governor momentarily stops the injection of liquid fuel to reduce engine speed. Compression ignition stops, causing the engine speed to decrease rapidly. The governor senses the loss of engine speed and starts liquid fuel injection again. The engine speed “hunts” until the gaseous fueling rate is reduced.

The optimum fueling point is determined by engine speed at any electrical load. Gaseous fuel is fed into the engine until the crankshaft speed reaches 98% of the no load governor speed. The control of air to fuel ratio is not required. This type of gas metering control will not work on engines with electronic governors using precision frequency regulation.

Gaseous fuel with significant nitrogen content reduces NOx emissions. Ultra-low energy syngas with a LHV between 100 and 160 BTU/scf provides the lowest NOx emissions. Reducing engine load also reduces NOx emissions.

Dual fueling a diesel engine increases carbon monoxide emissions. A significant loss of thermodynamic efficiency was also observed with mechanical governors. Researchers feel this is the result of the diesel thermodynamic cycle transitioning towards an Otto thermodynamic cycle as the gaseous fueling rate increases.

A significant loss of thermodynamic efficiency was not observed on electronically governed engines. These engines did not provide liquid fuel savings comparable to mechanically governed engines. Excessive PM (diesel soot) was observed in EPA Tier 3 engines. These observations indicate the electronic governor control with precision frequency regulation is over-fueling the engine with liquid fuel to maintain the precise synchronous speed. Reprogramming electronic controls to provide a traditional 4% governor droop may correct these problems.

After all of the gasification experiments, the diesel engine used to burn syngas was disassembled and thoroughly inspected. The engine was in very good condition, with small amounts of wear that could be attributed to syngas operation. Appendix D gives details of this inspection.

# 8. Dewatering Waste via Mechanical Compression

## 8.1 Mechanical Compression to Reduce Moisture Content

One of the chief challenges of processing unsorted Municipal Solid Waste (MSW) is the inconsistent and often high moisture content. Commercial mass-burn incineration plants rely on homogenization of vast quantities of incoming waste, excess oxygen, and sometimes supplemental fuels to overcome wet wastes. Some small scale gasification systems attempt to dry incoming waste by diverting a portion of produced thermal energy.

The current objective of the testing being done on biomass products is to test several theories and ideas concerning mechanical dewatering and moisture content percentage reduction. The objective is to first complete small scale testing to find out if using just mechanical and hydraulic methods the moisture content percentage on a wet basis scale can be reduced to a moisture percentage level that will allow for those materials to be burned cleanly and efficiently for heat, power and fuel generation and use. After testing has confirmed that the moisture percentage can be reduced by mechanical means alone or other methods must be used in conjunction with mechanical dewatering a prototype machine will be designed and built for use in testing the mechanical dewatering process. During the testing phase the amount of product being compressed and extruded as well as the integrity of the pressed products shape as well as density and moisture content shall all be tested and observed. Modifications will be done during and after testing to fix any problems or malfunctions that are observed during the building and testing phase of the prototype machine.

This report is to examine the results of tests on several biomass materials using a mechanical method to press out water and to reduce the amount of moisture content percentage within the materials themselves. These test results are the preliminary findings from the testing of paper at 80 and 50% moisture and switchgrass tested at 80% moisture content. The test were done to see what the results were after mechanically dewatering the samples and if the percentage of moisture removed from the biomass type being tested was within the allowable moisture percentage range to allow for it to be burned/combusted without the need for adding a drying element to the prototype that will be built in the near future.

## 8.2 Mechanical Dewatering Tests Procedure

### I Determine as-Received Moisture Content of Feedstock Sample

1. Obtain an approximate 5 gallon (clean bucket) sample of as-received wet feedstock.
2. Remove a sample of about 100 grams from the center of the bucket.
3. Record the tare weight of the small foil drying pan.
4. Place the 100g wet sample in the small foil drying pan and spread the sample out evenly.
5. Record the total combined gross weight of the foil drying pan and the 100 gram as-received wet sample.
6. Calculate the net sample weight (subtract the gross weight from the tare weight).
7. Place the foil sample pan in the drying oven at 115 °C (239 °F) for at least 1 hour.
8. Remove the foil sample pan from the oven and measure the total gross weight.

9. Determine the net weight of the dried sample by subtracting the gross weight from the tare weight.
10. Calculate the percentage moisture (wet basis) of the as-received feedstock samples.

## I Sample Preparation

1. Remove about 200 grams and place in one or two large foil pans (keep material depth less than 1-in.).
2. Place the large foil pans in the drying oven at 115 °C (239 °F) for at least 12 hours. Mix the sample by hand numerous times during the drying period.
3. Remove the large foil pans from the drying oven.
4. Remove a sample of about 100 grams from each large foil pan.
5. Record the tare weight of each small foil drying pan.
6. Place the 100g wet sample in the small foil drying pan and spread the sample out evenly (do this twice if there are two samples).
7. Record the total combined gross weight of the foil drying pan and the 100 gram dried sample.
8. Calculate the net sample weight (subtract the gross weight from the tare weight).
9. Place the foil sample pan in the drying oven at 115 °C (239 °F) for at least 1 hour.
10. Remove the foil sample pan from the oven and measure the total gross weight.
11. Determine the net weight of the dried sample by subtracting the gross weight from the tare weight.
12. Calculate the percentage moisture (wet basis) of the dried feedstock samples.
13. The samples must be less than 3% moisture before proceeding.
14. Measure the tare weight of a large foil pan.
15. Using the large foil pan, measure out approximately 200 grams of dried (< 3% moisture) feedstock sample (200 g + tare weight of the large foil pan).
16. Measure out 800 grams of tap water.
17. Hand mix the 800 grams of water with the 200 gram feedstock sample in the large foil pan.
18. As a check,
19. Measure the gross pan weight.
20. Determine the wet net weight (gross – pan tare).
21. The wet net weight should be approximately 1000 grams.

## II Ram Dewatering Test Procedure

1. Measure the tare weight of the compression tube.
2. Hand fill the compression tube with wet feedstock (at 80% moisture).
3. Measure the gross weight of the filled compression tube.
4. Compress the tube to the target hydraulic pressure for 10 seconds.
5. Release and retract the hydraulic jack.
6. Measure the gross weight of the compressed sample cylinder.
7. Remove the pressed sample from the compression cylinder using the shaft punch.
8. Measure the tare weight of the foil sample pan.
9. Measure the gross weight of the foil sample pan and pressed sample.
10. Place sample in oven at 115 °C (239 °F) for 3 hours.
11. Measure the gross weight of the dried sample.
12. Calculate the percentage moisture in the as pressed condition.

## 8.3 Results of Compressions Tests

Table 8-1 lists (and Figure 8-1 shows) the percent moisture content that was in each paper sample after it had been mechanically dewatered at the compression indicated. If the moisture content percentage is above 25% moisture content wet then the material cannot be used as a fuel sources as it has too high a moisture content to allow for easy combustion. The numbers of each sample test at 80% and at 50% rule the current use of just compressing and dewatering the samples out. The data shows that across the test samples and at both 80% and 50 % moisture levels the moisture percentage show a steady decrease as the psi levels used in the compaction of each test are increased. With the increase in psi pressure the amount of water is all but removed at the higher levels and the material is just being compacted into a much denser form. With each sample test of paper the percentage numbers of each test for each sample varied between 1 to 5% in either direction of the percentage scale of all tests 1 through 5 across three different paper sample with several wide spread variations in percentage data that are explainable by the amount of initial moisture in the paper that was used in the test pipe, how hard packed the amount of material was in the test pipe and the kind of paper used. In the 80% moisture sample white office paper was used, which was thicker than the shredded magazine paper used for the 50 % moisture test, which would allow for more moisture absorption in the thicker paper but more moisture to be squeezed out from the thinner paper and allow for more compaction at the same pressure. Figure 8-2 shows compresses paper slugs after dewatering, then drying. From left to right, this shows test pressures from 1000 to 12000 psi.

The testing for switchgrass was the same as the testing done on the samples of paper. There were three tests done on the sample as was done for the paper test, but only the 80 % moisture content testing was done and the 50% moisture content testing was not done. The initial moisture content of the switchgrass as it was received was calculated at 11.1 % moisture content. During the 80% moisture content tests, the amount of water was 800g water to 200g of dry switchgrass sample to make about an 80% moisture content mixture to use for testing. For the test the switchgrass was cut into much smaller pieces before water was added to it, to allow for the same amount of material to take up less space than the uncut material was currently taking up in the tin pans. After compressing the switchgrass sample compressed at 12000 had about the same moisture content percentages as the paper samples did after being compressed at the sample psi pressure. These results would indicate that switchgrass that was extremely wet when compressed at a high compression psi than tested at could be dewatered enough to allow for the materials to be used as fuel (Table 8-2 and Figure 8-3).

**Table 8-1. Paper Dewatering Data.**

| | | Paper | Paper | Paper |
|---|---|---|---|---|
| | | Sample 1 | Sample 2 | Sample 3 |
| | Compres | moisture | moisture | moisture |
| | Stress | Content | Content | Content |
| | psi | Wet Basis | Wet Basis | Wet Basis |
| Test 0 | 0 | | | |
| Test 1 | 1000 | 43.0% | 41.9% | 40.5% |
| Test 2 | 2000 | 37.7% | 37.1% | 34.4% |
| Test 3 | 4000 | 32.9% | 32.5% | 32.5% |
| Test 4 | 8000 | 31.9% | 30.3% | 30.0% |
| Test 5 | 12000 | 31.4% | 28.4% | 28.7% |
| | | | | |
| | 50 % MO | Paper | Paper | Paper |
| | | Sample 1 | Sample 2 | Sample 3 |
| | Compres | moisture | moisture | moisture |
| | Stress | Content | Content | Content |
| | psi | Wet Basis | Wet Basis | Wet Basis |
| Test 0 | 0 | | | |
| Test 1 | 1000 | 47% | 47.0% | 46% |
| Test 2 | 2000 | 37% | 38.5% | 38% |
| Test 3 | 4000 | 33% | 33.0% | 37% |
| Test 4 | 8000 | 26% | 29.0% | 31% |
| Test 5 | 12000 | 28% | 29.2% | 33% |

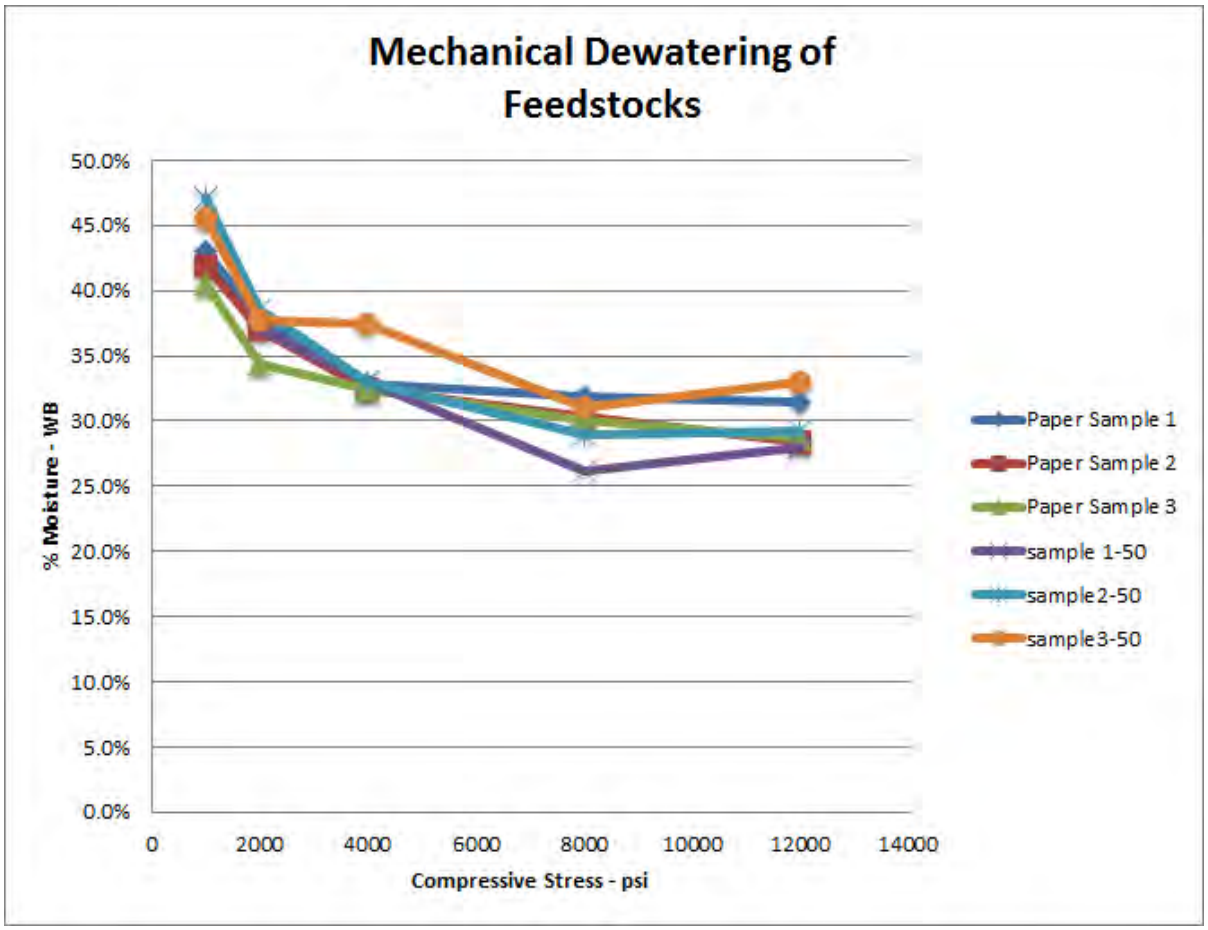



**Figure 8-1. Compression Dewatering of Paper Samples.**



**Figure 8-2. Compressed Paper Test Slugs.**

**Table 8-2. Switch Grass Samples for Compression.**

| | Switch grass | Switch Grass | Switch Grass |
|---|---|---|---|
| | Sample 1 | Sample 2 | Sample 3 |
| Compres | moisture | moisture | moisture |
| Stress | Content | Content | Content |
| psi | Wet Basis | Wet Basis | Wet Basis |
| 0 | | | |
| 1000 | 46.20% | 47.9% | 50.9% |
| 2000 | 41.50% | 56.0% | 41.3% |
| 4000 | 39.10% | 39.6% | 36.4% |
| 8000 | 37.00% | 37.4% | 36.0% |
| 12000 | 36.30% | 34.5% | 35.1% |

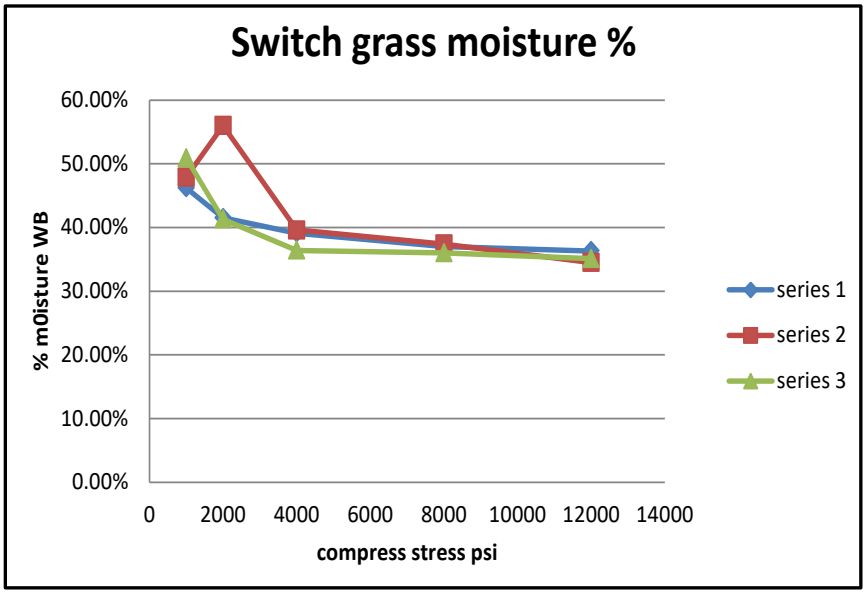



**Figure 8-3. Results of Switch Grass Compression Test.**

When paper was used the amount of moisture percentage in the remaining dried sample was still too high even in with the psi being between 8,000 to 12,000 when the test was performed it was found that the moisture content was still too high at around 28% moisture content. These results also occurred with the switchgrass tests with the moisture content of the lowest sample after dewatering was 34.5 % moisture content.

After the materials had been dewatered and pressed at the psi test point the slugs that were created were dried in an oven for several hours to remove moisture and to see how well the slugs of the material being tested at that particular moisture content held up when heated. The paper at the 80% test held its shape well, both when it was wet and had been pressed and also when the samples had been exposed to 115 °C (239 °F) heat for 3 to 4 hours to dry them and to see if prolonged drying would reduce the moisture down to 25% or lower. At lower compression psi levels the paper slug was bigger in size and could be broken apart more easily and had a higher moisture content percentage after drying. The higher the compression, the denser the paper slugs, which made breaking them apart much more difficult. The denser paper pellets moisture content was around 26% when compressed to 12,000 compress stress psi or just above the desired 25% moisture content of materials.

With compressing of switchgrass samples the switchgrass held its shape well after it had been compressed while each sample was still wet and had not been dried for several hours. After drying the switchgrass slugs pressed at the first 4 psi test pressures broke when picked up and handled, while the switchgrass sample pressed at 12,000 psi compress stress pressure barely maintained its shape when picked up, but the round shape of the switchgrass slug could still be made out.

With the data showing that even when switchgrass and paper were pressed at a high psi pressure that the amount of moisture pressed out was not lowered enough in terms of moisture percentage in the sample to allow for the materials to be used for burning as a fuel source. Paper at 50% moisture content was able to be dewatered down to the point of having 26% moisture content and that result was created by pressing the paper at 12,000 stress pressure psi limit on the bottle jack gauge. Switch grass had a relatively low initial moisture content percentage as received than paper.

### 8.4 Equipment and Procedures

Several different types of equipment were used during testing and each had a specific function during the testing procedure. The main piece of equipment used was a bottle jack that had a rated 12 ton load limit capacity and was manufactured by the Central Hydraulic Company. The bottle jack rested on two metal flat weights that then rested on a shop press frame made by the same company that made the bottle jack. The second piece of equipment that was used during testing was an oven that was used to dry samples. The oven was manufactured by Thermo Scientific with the type being the **Precision** model. An electronic scale with a 3,100g capacity was used for measuring all samples weight, the weight of the metal pipes both empty and full of test samples as well as the test samples that have been compressed before drying and the samples weights after drying. Twelve small tin pans were used to hold the compressed sample slugs to allow them to be weighed and then put into the oven with each sample being identifiable by the numbers on each of the pans. Six metal pipe sections were used for the forming of the samples and to hold

the sample in place while they were compressed under different psi loads by the bottle jack. Two five- gallon buckets were used to collect the necessary samples of switchgrass and horse manure while shredded paper material was collected from the local paper recycling box as well as the shredder itself. Two large foil tins or pans depending on what material was being tested were used during finding out the moisture content as collected of the current material type.

Several methods and analytical tools were used in the collection of the data acquired from testing the moisture content percentage on paper both at 50% and 80% moisture content as well as moisture content on switchgrass at 80% and as-received samples of horse manure. The test done to determine the as-received moisture content used the wet basis formula to figure out the moisture percentage from the test material. Once the percentage moisture content was found of the initial material test sample of which a 100g sample from the material being test was taken weighed to get the weight of the sample wet and then dried in an oven for 1 hour to get a dry weight. After this first test was done on each material sample, each material was tested the same way. A 200g sample of paper and 200g sample of switchgrass were mixed with 800g of water to create 80% moisture content sample mixture for testing both types of material samples and 100g of paper and 100g of water were mixed to create the 50% moisture sample. Six pipes were filled with the test material packed down to about a ¼ -in. below the rim surface of the pipe. Each individual pipe was weighed empty to get the tare of the pipe and then with a sample in it to get the gross weight of the sample and pipe. Each sample then had the moisture mechanically pressed out of it by use of a piston and bottle jack setup on the jack press stand. After each sample was dewatered the weight of the sample still in the individual test pipe was taken. The sample was taken out of the pipe and put in a numbered tin pan that had been weighed to get its tare weight. The wet compressed sample was weighed in the pan and the weight of the pan and sample was recorded. The sample was placed in an oven and dried for several hours at 115 °C (239 °F). After drying the sample were weighed again to get a dry weight. The gross weight of the dry sample in the pan minus the tare weight was subtracted from the gross weight of the wet sample in the pan minus the tare weight of the pan. This procedure was done for each of the three sample batches and was done for each of the five compression stress test psi compression levels to get the required data results.

### 8.5 Conclusions

Paper after testing samples of 80 % moisture content as well as testing of sample composed of a 50% moisture content proved to be the easiest in terms of reducing moisture content around the 25% or under moisture content percentages needed for burning. The highest that paper was compressed at was 12000 compression stress psi pressure and the average moisture content at a 50 % moisture content was 29%. This should mean that any paper products that are to be pressed should be as dry as possible and by doubling the amount of psi pressure used to compress the paper the amount of moisture should be reduced to the point of the moisture percentage being 25% or under. When the tests at 80% and 50% were done different kinds of paper was used. At 80% it was plain shredded office paper, which held and absorbed a lot of moisture and compacted nicely and maintained shaped even after drying and at 50% it was printed thin magazine paper and this absorbed water as well be also allowed for more water to be pressed out of it and that the pressed sample was compressed to an even thinner size. It is recommended that, when compressing paper-based products, the maximum amount of pressure (psi) be used to allow for the greatest amount of moisture to be pressed out. This should result in the lowest

possible moisture percentage and also creates a very dense very dry slug that holds its shape and is great for burning for fuel. In terms of design if by just compressing the materials at a higher psi pressure does not work to bring the moisture content of the materials down to an acceptable moisture content percentage level then a drying device of some form may have to be incorporated into the design plan as well as a some type of grinder for reducing the particle size of the material as its going into the machine to be compressed.

Viewing the graphs and data tables of each of the materials tested and compressed at different moisture content levels and what the graphs show of the data pattern that developed there can be several conclusions made. One that the idea of using mechanical means to dewater materials down to a level of moisture content percentage that allows for full combustion and burning can be done. That a much higher psi pressure has to be used in compressing materials to allows for such a level or moisture content percentage to be reached. Materials such as animal waste may not be suitable for compression by mechanical means at high psi pressure. That the results from these tests on paper, switchgrass and manure can only be used as a baseline for gauging test data results as there may be many kinds of material that may be compressed and dewatered that have much higher or lower as-received moisture contents then the materials tested and hold their shapes and structural integrity better.

# 9. Conclusions and Implications for Future Research/Implementation

## 9.1 Conclusions from this Project

The prototype gasification system performed well, in terms of accepting unsorted, realistic waste mixtures, and converting the waste to exportable power. The reactor and system design described in sections 2 and 3 have proven gasification of mixed (unsorted) solid wastes without the need for pre-processing (the requirement for intensive pre-processing in other systems based on downdraft gasification has proven problematic). Additionally, our team demonstrated that our overall system approach destroys waste and produces net-positive electric output. Our new reactor design is a novel gasifier type that meets its purpose.

When we began this project, we did not know what composition of syngas to expect. Most literature describes syngas from downdraft systems, which contain mostly C1 compounds. Our reactor is a modified version of an updraft gasifier. Experimentally, we found our syngas to be much higher in energy than could be accounted for by $H_2$, CO, and $CH_4$, etc. Then analytically, we found that the syngas was very similar to commercial liquid fuels (Appendix E). This updraft-like reactor, plus the oil reflux (below) contribute to the favorable overall energy balance.

The oil quench tank described in section 3.5 turned out to be very important to the overall process for a number of reasons. First, it performed its main job of removing tars from the syngas very well. Second, it very effectively, sharply reduced the temperature of the syngas coming out of the reactor, while maintaining itself at a constant temperature. We believe this is due to the entrained, emulsified water that enters the quencher as steam. As long as water is present, it keeps the temperature of the quencher below the boiling point of water. Third, refluxing the accumulating tars and pyro oils back into the gasifier greatly increased the energy content of the syngas (section 4.5.2

## 9.2 Additional Research Needed

There are several areas of engineering work left before moving towards a long term demonstration at a military site. These include integrating a shredder and automatic waste feed system; establishing redundant PLC logic controls for extra safety; and of course, putting the whole system into shipping containers.

The above items require work, but that work is well understood, using commercial technology. The one significant engineering problem that remains, is determine the most efficient way to introduce syngas into a diesel engine. Appendix C below, gives a detailed discussion of the benefits of using a diesel engine for this application. In short, diesel is more flexible in terms of syngas quality and quantity it will accept; and diesels are the dominant engine type in theater. However, the method of introducing the syngas, used in the project, is problematic. We introduced syngas into the engine air intake via the turbocharger, so the engine uses less liquid fuel because of the energy value in the syngas. This works up to a point, but by doing so, you displace air with the syngas. Therefore the engine becomes starved for oxygen at high rates of syngas feed, which causes the engine to run “rich” and produce soot. You want to maximize the

syngas feed because that means you are maximizing liquid fuel savings, and waste destruction throughput.

To solve this problem may require working with an engine manufacturer to figure out correct gas flow rates and turbo size and pressure to assure that adequate oxygen gets to the engine so it can run cleanly and efficiently (Appendix C).

### 9.3 Suggested Implementation

The author has participated in the Joint Defense Waste-to-Energy work group (JDW2E), which is hosted by the Navy. This working group is aware of this technology, and it is hoped that this report will generate interest among multiple services. The Air Force Research Lab's periodic WTE workshops have also been brief on this technology.

The prototype system developed under this project was a full scale, proof of concept. It is suitable for short term demonstrations, and SUNY Cobleskill has sought funds for upgrades to make the system more mobile and automated; better for short demonstrations in multiple types of venues.

To move this technology towards DoD contingency operations, the next logical steps would be to construct a new version in a 20-ft container, or three TRICONs, that incorporates all technical lessons-learned from this project, and an automated waste feed system. This version would be suitable for long term military testing at a location such as the Contingency Basing Integration Technology Evaluation Center at Fort Leonard Wood, MO – also the home of the Engineer School. There, the gasifier could be run and observed by soldiers in training; soldier waste disposal would be somewhat realistic; and the power output could be monitored and integrated into the camp micro-grid. There's another test center at Tyndall Air Force Base (AFB), which has hosted WTE demonstrations and a containerized system, could easily be moved there for Air Force exposure.

Once we are in a position for long term demonstration, it will be time to engage with PM-E2S2 to work on a formal technology transfer agreement.

## 10. Bibliography


ANSYS, Inc. 2014. ANSYS FLUENT. 14.5 Theory Guide Help Document, http://www.ansys.com

Bain, R. 2006. "Thermochemical Technologies for Conversion of Biomass to Fuels and Chemicals." Biomass to Chemicals and Fuels; Science, Technology and Public Policy. Presented at Rice University, Houston Texas, September 26, 2006.

Barrio, M., B. Gobel, H. Risnes, U. Henricksen, J. E. Hustad, and L. H. Sorensen. 2006. "Steam Gasification of Wood Char and the Effect of Hydrogen Inhibition on the Chemical Kinetics." In A.V. Bridgwater (ed.). *Progress in Thermochemical Biomass Conversion*. vol. 1. Oxford, United Kingdom: Blackwell Science, pp. 32–46.

Curkeet, R. 2011. *Wood Combustion Basics*. PowerPoint Presentation. EPA Workshop, March 2, 2011. Salt Lake City, UT, http://www.epa.gov/burnwise/workshop2011/WoodCombustion-Curkeet.pdf

Farooq, Abid, Moinuddin Ghauri, Mujtaba Hussain Jaffery, and Khurram Shahzad. 2103. "Modeling of Biomass Gasification with $CO_2$ as Gasifying Agent." Sci. Int (Lahore) 25(3):497-500.

Inayat, Abrar, Murni Melati Ahmad, M. Ibrahim A. Mutalib, and M. Khairuddin Yunus. 2009. "Kinetic Modeling of Biomass Steam Gasification System for Hydrogen Production with $CO_2$ Adsorption." *Proceedings of International Conference for Technical Postgraduates, Kuala Lumpur, Malaysia, 14-15 December, 2009.*

Kumar, Ajay, David D. Jones, and Milford A. Hanna. 2009. "Thermochemical Biomass Gasification: A Review of the Current Status of the Technology." *Energies* 2:556-581.

Kumar, M., and A. F. Ghoniem. 2012. "Multiphysics Simulations of Entrained Flow Gasification. Part I: Validating the Nonreacting Flow Solver and the Particle Turbulent Dispersion Model." *Energy Fuels* 26(1):451-463.

McBroom, M. "The Woody Cell Wall." Lecture Slides drawn from Roger M. Rowell (ed.). 2005. *Handbook of Wood Chemistry and Wood Composites*. Boca Raton, FL: CRC Press, http://titus.nsm.iup.edu/jford/projects/Cellulose/Wood_McBroom.pdf
(cited in John Ford. 2011. *The Conversion of Cellulosic Materials to Simple Organics*, http://titus.nsm.iup.edu/jford/projects/Cellulose/index.html

O'Brien, T. J., M. Syamlal, and C. Guenther. 2003. "Computational Fluid Dynamics Simulations of Chemically Reactive Fluidized Bed Processes." *Third International Conference on CFD in the Minerals and Process Industries, CSIRO, Melbourne, Australia, 2003*.

Radmanesh, R., J. Chaouki, and C. Guy. 2006. "Biomass Gasification in a Bubbling Fluidized Bed Reactor: Experiments and Modeling." *AIChE Journal* 52(12):4258-4272.

Ronsch, S., and H Wagner. 2012. *Calculation of Heating Values for the Simulation of Thermochemical Conversional Plants with Aspen Plus*. Leipzig, Germany: Deutsches Biomasseforschungszentrum, https://www.dbfz.de/web/uploads/media/Roensch_und_Wagner_2012_Calculation_of_heating_values_with_Aspen_Plus.pdf

Sharma, A. 2011. “Modeling and Simulation of a Downdraft Biomass Gasifier. Model Development and Validation.” *Energy Conversion and Management* 52:1386-1396.

Shi, S., C. Guenther, and S. Orsino. 2007. “Numerical Study of Coal Gasification Using Eulerian-Eulerian Multiphase Model.” *POWER2007-22144*. San Antonio, TX: ASME Power Conference, pp 497-505.

Silaen, A., and T. Wang. 2012. “Investigation of the Coal Gasification Process under Various Operating Conditions Inside a Two-Stage Entrained Flow Gasifier.” *J. Thermal Sci. Eng. Appl*. 4(2).

Solar Energy Research Institute (SERI). 1988. *Handbook of Biomass Downdraft Gasifier Engine Systems*. Golden, CO: SERI, http://taylor.ifas.ufl.edu/documents/Handbook_of_Biomass_Downdraft_Gasifier_Engine_Systems.pdf

Syamlal, M., and L. A. Bissett. 1992. *METC Gasifier Advanced Simulation (MGAS) Model*. Technical note, DOE/METC-92/4108, NITS/DE92001111, Springfield, VA: National Technical Information Services.

Syed, Shabbar, Isam Janajreh, and Chaouki Ghenai. 2012. “Thermodynamics Equilibrium Analysis within the Entrained Flow Gasifier Environment.” *Int J. of Thermal & Environmental Engineering*. 4(1):47-54, http://www.iasks.org/sites/default/files/ijtee20120401047054.pdf

Vaezi, M., M. Passandideh, M. Moghiman, and M. Charmchi. 2008. “Modeling Biomass Gasification: A New Approach to Utilize Renewable Sources of Energy.” *Proceedings of IMECE2008*. Oct 31 – Nov 6, 2008. Boston, MA, http://profdoc.um.ac.ir/articles/a/1008098.pdf

USEPA. 1986. Treatment Technologies for Dioxin-Containing Wastes. EPA/600/2-86/096. October 1986.

Wu, Wei, Katsuya Kawamoto, and Hidetoshi Kuramochi. 2006. “Hydrogen-Rich Synthesis Gas Production from Waste Wood via Gasification and Reforming Technology for Fuel Cell Application.” J. Mater. Cycles Waste Management 8:70-77, http://www.environmental-expert.com/Files%5C6063%5Carticles%5C9025%5C1.pdf

Wu, Y., P. J. Smith, J. Zhang, J. N. Thornock, and G. Yue. 2010. “Effects of Turbulent Mixing and Controlling Mechanisms in an Entrained Flow Coal Gasifier.” *Energy Fuels* 24(2):1170-1175.

# Appendices

# Appendix A: Points of Contact

| Point of Contact | Organization | Phone & E-mail | Role in Project |
|---|---|---|---|
| Mr. Stephen D. Cosper | U.S. Army ERDC-CERL | 217-398-5569<br>Stephen.D.Cosper@usace.army.mil | Project Manager |
| Dr. Paul Amodeo | SUNY Cobleskill Center for Environmental Science and Technology | 518-255-5384<br>AmodeoPA@cobleskill.edu | PI for technology development |

# Appendix B: Supporting Data Derived from Syngas Analysis Reports

The following pages shows initial GC work and calorific data for syngas samples during a series of IIFPRG trials in November 2013, processing a variety of feedstocks. Table B-1 summarizes this data by feedstock. For the measured HHV, the syngas was passed through a calorimeter and therefore includes all gases present, i.e., those not capture in the initial GC data which only looked for C1 species. Subsequent GC work (Appendix E) measures the full extent of organics.

**Table B-1. GC Data Summary.**

| Feedstock into IIFPRG | Vol. % $H_2$ | Vol. % O2 | Vol. % $N_2$ | Vol. % $CH_4$ | Vol. % CO | Vol. % $CO_2$ | Measured HHV (BTU/SCF) |
|---|---|---|---|---|---|---|---|
| 70% woodchips, 30% rubber by weight | 5.7 | 2.1 | 62.3 | 1.2 | 21.5 | 7.2 | 99.5 |
| 50% Cafeteria waste (wet food, liquids, plastic wrappers, packaging); 50% wood chips | 5.8 | 1.7 | 59.0 | 1.5 | 23.9 | 8.2 | 111.5 |
| Woodchips | 6.8 | 2.1 | 60.2 | 1.8 | 22.3 | 9.0 | 104.1 |
| 70% woodchips, 30% HDPE | 5.4 | 1.9 | 60.8 | 1.8 | 20.1 | 7.6 | 100.5 |
| Pine chips | 6.0 | 2.6 | 61.6 | 1.7 | 17.3 | 10.8 | 92.5 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB112113-1455 |
| Sample Date: | 11/21/2013 |
| Sample Description: | IIRPG, 70% Cooksburg wood chips, 30% rubber by weight, 113 BTU on Calorval |
| Analysis Date: | 11/21/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 4.8% | 4.8% | 0.3% |
| Oxygen | O2 | 2.8% | 2.8% | 3.2% |
| Nitrogen | N2 | 63.9% | 63.9% | 64.3% |
| Methane | CH4 | 1.0% | 1.0% | 0.6% |
| Carbon Monoxide | CO | 20.8% | 20.8% | 21.0% |
| Carbon Dioxide | CO2 | 6.7% | 6.7% | 10.6% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.345 | lb per lb of combustible |
| H2O | 0.044 | lb per lb of combustible |
| N2 | 0.565 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.218 | ft^3 per ft^3 of combustible |
| H2O | 0.068 | ft^3 per ft^3 of combustible |
| N2 | 0.557 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.83 | |
| Resultant Gas Constant - R | 55.52 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.961 | |
| Density at 70 F & 14.7 psia | 0.0720 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3868 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5198 | |
| High Heating Value - HHV | 93 | BTU/SCF |
| Low Heating Value - LHV | 89 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.704 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.656 | by Mass |
| Low Flammability Limit in Air | 2.8% | LFL |
| High Flammability Limit in Air | 19.2% | HFL |
| Auto Ignition Temperature | 1,091 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/22/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB112113-1150 |
| Sample Date: | 11/21/2013 |
| Sample Description: | IIRGP, 50% Cafeteria Waste, 50% Cooksburg wood chips, 127 BTU on Calorval |
| Analysis Date: | 11/21/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 6.3% | 6.3% | 0.5% |
| Oxygen | O2 | 1.0% | 1.0% | 1.2% |
| Nitrogen | N2 | 57.6% | 57.6% | 58.6% |
| Methane | CH4 | 1.6% | 1.6% | 0.9% |
| Carbon Monoxide | CO | 25.1% | 25.1% | 25.5% |
| Carbon Dioxide | CO2 | 8.3% | 8.3% | 13.3% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.427 | lb per lb of combustible |
| H2O | 0.063 | lb per lb of combustible |
| N2 | 0.733 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.267 | ft^3 per ft^3 of combustible |
| H2O | 0.096 | ft^3 per ft^3 of combustible |
| N2 | 0.714 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.55 | |
| Resultant Gas Constant - R | 56.10 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.951 | |
| Density at 70 F & 14.7 psia | 0.0713 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3833 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5166 | |
| High Heating Value - HHV | 118 | BTU/SCF |
| Low Heating Value - LHV | 113 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.904 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.848 | by Mass |
| Low Flammability Limit in Air | 3.5% | LFL |
| High Flammability Limit in Air | 23.6% | HFL |
| Auto Ignition Temperature | 1,088 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/22/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB112113-1217 |
| Sample Date: | 11/21/2013 |
| Sample Description: | IIRGP, 50% Cafeteria Waste, 50% Cooksburg wood chips, 124 BTU on Calorval |
| Analysis Date: | 11/21/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 5.3% | 5.3% | 0.4% |
| Oxygen | O2 | 2.3% | 2.3% | 2.6% |
| Nitrogen | N2 | 60.3% | 60.3% | 60.6% |
| Methane | CH4 | 1.4% | 1.4% | 0.8% |
| Carbon Monoxide | CO | 22.7% | 22.7% | 22.8% |
| Carbon Dioxide | CO2 | 8.1% | 8.1% | 12.7% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.381 | lb per lb of combustible |
| H2O | 0.053 | lb per lb of combustible |
| N2 | 0.643 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.241 | ft^3 per ft^3 of combustible |
| H2O | 0.081 | ft^3 per ft^3 of combustible |
| N2 | 0.633 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.84 | |
| Resultant Gas Constant - R | 55.51 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.961 | |
| Density at 70 F & 14.7 psia | 0.0721 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3841 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5194 | |
| High Heating Value - HHV | 105 | BTU/SCF |
| Low Heating Value - LHV | 100 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.801 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.748 | by Mass |
| Low Flammability Limit in Air | 3.1% | LFL |
| High Flammability Limit in Air | 21.0% | HFL |
| Auto Ignition Temperature | 1,090 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/22/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB112113-1335 |
| Sample Date: | 11/21/2013 |
| Sample Description: | IIRPG, 70% Cooksburg wood chips, 30% rubber by weight, 133 BTU on Calorval |
| Analysis Date: | 11/21/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 6.5% | 6.5% | 0.5% |
| Oxygen | O2 | 1.3% | 1.3% | 1.6% |
| Nitrogen | N2 | 60.7% | 60.7% | 61.9% |
| Methane | CH4 | 1.4% | 1.4% | 0.8% |
| Carbon Monoxide | CO | 22.1% | 22.1% | 22.6% |
| Carbon Dioxide | CO2 | 7.6% | 7.6% | 12.2% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.4% | 0.4% | 0.4% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.377 | lb per lb of combustible |
| H2O | 0.060 | lb per lb of combustible |
| N2 | 0.660 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.243 | ft^3 per ft^3 of combustible |
| H2O | 0.096 | ft^3 per ft^3 of combustible |
| N2 | 0.680 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.44 | |
| Resultant Gas Constant - R | 56.32 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.947 | |
| Density at 70 F & 14.7 psia | 0.0710 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3843 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5157 | |
| High Heating Value - HHV | 106 | BTU/SCF |
| Low Heating Value - LHV | 101 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.810 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.750 | by Mass |
| Low Flammability Limit in Air | 3.1% | LFL |
| High Flammability Limit in Air | 21.8% | HFL |
| Auto Ignition Temperature | 1,092 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/22/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB112113-1110 |
| Sample Date: | 11/21/2013 |
| Sample Description: | IIRPG, Cooksburg wood chips, 121 BTU on Calorval |
| Analysis Date: | 11/21/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 6.4% | 6.4% | 0.5% |
| Oxygen | O2 | 1.7% | 1.7% | 1.9% |
| Nitrogen | N2 | 58.5% | 58.5% | 59.4% |
| Methane | CH4 | 1.6% | 1.6% | 0.9% |
| Carbon Monoxide | CO | 23.2% | 23.2% | 23.6% |
| Carbon Dioxide | CO2 | 8.6% | 8.6% | 13.7% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.396 | lb per lb of combustible |
| H2O | 0.063 | lb per lb of combustible |
| N2 | 0.697 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.248 | ft^3 per ft^3 of combustible |
| H2O | 0.097 | ft^3 per ft^3 of combustible |
| N2 | 0.680 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.60 | |
| Resultant Gas Constant - R | 56.00 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.953 | |
| Density at 70 F & 14.7 psia | 0.0714 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3829 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5170 | |
| High Heating Value - HHV | 112 | BTU/SCF |
| Low Heating Value - LHV | 107 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.860 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.800 | by Mass |
| Low Flammability Limit in Air | 3.2% | LFL |
| High Flammability Limit in Air | 22.2% | HFL |
| Auto Ignition Temperature | 1,085 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/22/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB112113-1030 |
| Sample Date: | 11/21/2013 |
| Sample Description: | IIRPG, Cooksburg wood chips, 121 BTU on calorval |
| Analysis Date: | 11/21/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 6.2% | 6.2% | 0.4% |
| Oxygen | O2 | 2.0% | 2.0% | 2.3% |
| Nitrogen | N2 | 58.5% | 58.5% | 58.7% |
| Methane | CH4 | 2.1% | 2.1% | 1.2% |
| Carbon Monoxide | CO | 20.4% | 20.4% | 20.5% |
| Carbon Dioxide | CO2 | 10.7% | 10.7% | 16.8% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.355 | lb per lb of combustible |
| H2O | 0.067 | lb per lb of combustible |
| N2 | 0.669 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.225 | ft^3 per ft^3 of combustible |
| H2O | 0.104 | ft^3 per ft^3 of combustible |
| N2 | 0.660 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.93 | |
| Resultant Gas Constant - R | 55.33 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.964 | |
| Density at 70 F & 14.7 psia | 0.0723 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3789 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5196 | |
| High Heating Value - HHV | 107 | BTU/SCF |
| Low Heating Value - LHV | 102 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.836 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.767 | by Mass |
| Low Flammability Limit in Air | 2.9% | LFL |
| High Flammability Limit in Air | 20.1% | HFL |
| Auto Ignition Temperature | 1,082 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/22/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB112013-1400 |
| Sample Date: | 11/20/2013 |
| Sample Description: | IIRPG, 70% Cooksburg wood chips, 30% HDPE by weight, 181 BTU on Calorval |
| Analysis Date: | 11/20/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 5.7% | 5.7% | 0.4% |
| Oxygen | O2 | 2.7% | 2.7% | 3.1% |
| Nitrogen | N2 | 59.9% | 59.9% | 61.1% |
| Methane | CH4 | 2.2% | 2.2% | 1.3% |
| Carbon Monoxide | CO | 19.2% | 19.2% | 19.5% |
| Carbon Dioxide | CO2 | 6.9% | 6.9% | 11.0% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 3.5% | 3.5% | 3.6% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.342 | lb per lb of combustible |
| H2O | 0.066 | lb per lb of combustible |
| N2 | 0.650 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.284 | ft^3 per ft^3 of combustible |
| H2O | 0.171 | ft^3 per ft^3 of combustible |
| N2 | 1.029 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.48 | |
| Resultant Gas Constant - R | 56.23 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.949 | |
| Density at 70 F & 14.7 psia | 0.0711 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3801 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5156 | |
| High Heating Value - HHV | 102 | BTU/SCF |
| Low Heating Value - LHV | 97 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.800 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.751 | by Mass |
| Low Flammability Limit in Air | 3.0% | LFL |
| High Flammability Limit in Air | 19.3% | HFL |
| Auto Ignition Temperature | 1,202 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/21/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB112013-1330 |
| Sample Date: | 11/20/2013 |
| Sample Description: | IIRPG, 70% Cooksburg wood chips, 30% High Density Poly Ethylene by weight, 142 BTU on Calorval |
| Analysis Date: | 11/20/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 5.1% | 5.1% | 0.4% |
| Oxygen | O2 | 1.0% | 1.0% | 1.1% |
| Nitrogen | N2 | 61.6% | 61.6% | 62.0% |
| Methane | CH4 | 1.4% | 1.4% | 0.8% |
| Carbon Monoxide | CO | 21.0% | 21.0% | 21.1% |
| Carbon Dioxide | CO2 | 8.2% | 8.2% | 13.0% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 1.6% | 1.6% | 1.5% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.354 | lb per lb of combustible |
| H2O | 0.052 | lb per lb of combustible |
| N2 | 0.608 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.256 | ft^3 per ft^3 of combustible |
| H2O | 0.096 | ft^3 per ft^3 of combustible |
| N2 | 0.748 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.83 | |
| Resultant Gas Constant - R | 55.52 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.961 | |
| Density at 70 F & 14.7 psia | 0.0720 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3823 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5192 | |
| High Heating Value - HHV | 99 | BTU/SCF |
| Low Heating Value - LHV | 95 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.757 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.705 | by Mass |
| Low Flammability Limit in Air | 2.9% | LFL |
| High Flammability Limit in Air | 21.2% | HFL |
| Auto Ignition Temperature | 1,122 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/21/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB112013-1245 |
| Sample Date: | 11/20/2013 |
| Sample Description: | IIRPG,Cooksburg wood chips, 141 BTU on calorval |
| Analysis Date: | 11/20/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 7.4% | 7.4% | 0.5% |
| Oxygen | O2 | 1.2% | 1.2% | 1.4% |
| Nitrogen | N2 | 56.0% | 56.0% | 57.2% |
| Methane | CH4 | 2.2% | 2.2% | 1.3% |
| Carbon Monoxide | CO | 23.1% | 23.1% | 23.6% |
| Carbon Dioxide | CO2 | 9.6% | 9.6% | 15.5% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.5% | 0.5% | 0.4% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.406 | lb per lb of combustible |
| H2O | 0.077 | lb per lb of combustible |
| N2 | 0.760 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.262 | ft^3 per ft^3 of combustible |
| H2O | 0.122 | ft^3 per ft^3 of combustible |
| N2 | 0.780 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.41 | |
| Resultant Gas Constant - R | 56.38 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.946 | |
| Density at 70 F & 14.7 psia | 0.0709 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3801 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5149 | |
| High Heating Value - HHV | 120 | BTU/SCF |
| Low Heating Value - LHV | 114 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.933 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.865 | by Mass |
| Low Flammability Limit in Air | 3.3% | LFL |
| High Flammability Limit in Air | 23.5% | HFL |
| Auto Ignition Temperature | 1,088 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/21/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB111913-1515 |
| Sample Date: | 11/19/2013 |
| Sample Description: | IIRPG,Cooksburg wood chips, 143 BTU on calorval |
| Analysis Date: | 11/19/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 7.8% | 7.8% | 0.6% |
| Oxygen | O2 | 1.1% | 1.1% | 1.3% |
| Nitrogen | N2 | 54.9% | 54.9% | 56.7% |
| Methane | CH4 | 2.1% | 2.1% | 1.2% |
| Carbon Monoxide | CO | 25.5% | 25.5% | 26.3% |
| Carbon Dioxide | CO2 | 8.3% | 8.3% | 13.5% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.3% | 0.3% | 0.3% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.447 | lb per lb of combustible |
| H2O | 0.080 | lb per lb of combustible |
| N2 | 0.818 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.282 | ft^3 per ft^3 of combustible |
| H2O | 0.123 | ft^3 per ft^3 of combustible |
| N2 | 0.817 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.11 | |
| Resultant Gas Constant - R | 57.01 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.936 | |
| Density at 70 F & 14.7 psia | 0.0702 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3825 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5124 | |
| High Heating Value - HHV | 129 | BTU/SCF |
| Low Heating Value - LHV | 123 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.992 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.932 | by Mass |
| Low Flammability Limit in Air | 3.6% | LFL |
| High Flammability Limit in Air | 25.3% | HFL |
| Auto Ignition Temperature | 1,087 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/20/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB111913-1440 |
| Sample Date: | 11/19/2013 |
| Sample Description: | IIRPG,Cooksburg wood chips, 142 BTU on calorval |
| Analysis Date: | 11/19/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 7.9% | 7.9% | 0.6% |
| Oxygen | O2 | 1.1% | 1.1% | 1.3% |
| Nitrogen | N2 | 55.4% | 55.4% | 56.7% |
| Methane | CH4 | 2.2% | 2.2% | 1.3% |
| Carbon Monoxide | CO | 22.5% | 22.5% | 23.0% |
| Carbon Dioxide | CO2 | 10.2% | 10.2% | 16.4% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.8% | 0.8% | 0.7% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.397 | lb per lb of combustible |
| H2O | 0.081 | lb per lb of combustible |
| N2 | 0.761 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.262 | ft^3 per ft^3 of combustible |
| H2O | 0.130 | ft^3 per ft^3 of combustible |
| N2 | 0.808 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.36 | |
| Resultant Gas Constant - R | 56.49 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.944 | |
| Density at 70 F & 14.7 psia | 0.0708 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3787 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5142 | |
| High Heating Value - HHV | 120 | BTU/SCF |
| Low Heating Value - LHV | 114 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.932 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.857 | by Mass |
| Low Flammability Limit in Air | 3.3% | LFL |
| High Flammability Limit in Air | 23.6% | HFL |
| Auto Ignition Temperature | 1,091 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/20/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB111913-1415 |
| Sample Date: | 11/19/2013 |
| Sample Description: | IIRPG,Cooksburg wood chips, 140 BTU on calorval |
| Analysis Date: | 11/19/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 8.2% | 8.2% | 0.6% |
| Oxygen | O2 | 1.6% | 1.6% | 1.9% |
| Nitrogen | N2 | 55.0% | 55.0% | 56.5% |
| Methane | CH4 | 2.2% | 2.2% | 1.3% |
| Carbon Monoxide | CO | 22.6% | 22.6% | 23.2% |
| Carbon Dioxide | CO2 | 9.9% | 9.9% | 15.9% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.6% | 0.6% | 0.6% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.400 | lb per lb of combustible |
| H2O | 0.082 | lb per lb of combustible |
| N2 | 0.769 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.260 | ft^3 per ft^3 of combustible |
| H2O | 0.131 | ft^3 per ft^3 of combustible |
| N2 | 0.800 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.27 | |
| Resultant Gas Constant - R | 56.68 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.941 | |
| Density at 70 F & 14.7 psia | 0.0706 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3794 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5135 | |
| High Heating Value - HHV | 121 | BTU/SCF |
| Low Heating Value - LHV | 115 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.938 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.862 | by Mass |
| Low Flammability Limit in Air | 3.3% | LFL |
| High Flammability Limit in Air | 23.8% | HFL |
| Auto Ignition Temperature | 1,087 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/20/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB111913-1345 |
| Sample Date: | 11/19/2013 |
| Sample Description: | IIRPG,Cooksburg wood chips, 128 BTU on calorval |
| Analysis Date: | 11/19/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 7.2% | 7.2% | 0.5% |
| Oxygen | O2 | 2.5% | 2.5% | 2.9% |
| Nitrogen | N2 | 57.4% | 57.4% | 57.9% |
| Methane | CH4 | 2.3% | 2.3% | 1.3% |
| Carbon Monoxide | CO | 18.7% | 18.7% | 18.9% |
| Carbon Dioxide | CO2 | 11.3% | 11.3% | 17.8% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.6% | 0.6% | 0.6% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.333 | lb per lb of combustible |
| H2O | 0.076 | lb per lb of combustible |
| N2 | 0.672 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.223 | ft^3 per ft^3 of combustible |
| H2O | 0.124 | ft^3 per ft^3 of combustible |
| N2 | 0.719 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.77 | |
| Resultant Gas Constant - R | 55.65 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.959 | |
| Density at 70 F & 14.7 psia | 0.0719 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3770 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5179 | |
| High Heating Value - HHV | 107 | BTU/SCF |
| Low Heating Value - LHV | 101 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.835 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.755 | by Mass |
| Low Flammability Limit in Air | 2.8% | LFL |
| High Flammability Limit in Air | 20.2% | HFL |
| Auto Ignition Temperature | 1,087 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 11/20/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB102413-1310 |
| Sample Date: | 10/24/2013 |
| Sample Description: | IIRPG, Campus Pine Chips, Shortly after blower overload, 99 BTU on Calorval |
| Analysis Date: | 10/24/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 3.6% | 3.6% | 0.3% |
| Oxygen | O2 | 1.2% | 1.2% | 1.3% |
| Nitrogen | N2 | 66.1% | 66.1% | 64.5% |
| Methane | CH4 | 1.5% | 1.5% | 0.8% |
| Carbon Monoxide | CO | 15.6% | 15.6% | 15.2% |
| Carbon Dioxide | CO2 | 11.3% | 11.3% | 17.3% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.7% | 0.7% | 0.6% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.262 | lb per lb of combustible |
| H2O | 0.041 | lb per lb of combustible |
| N2 | 0.467 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.185 | ft^3 per ft^3 of combustible |
| H2O | 0.073 | ft^3 per ft^3 of combustible |
| N2 | 0.541 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.73 | |
| Resultant Gas Constant - R | 53.78 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.992 | |
| Density at 70 F & 14.7 psia | 0.0744 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3780 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5269 | |
| High Heating Value - HHV | 77 | BTU/SCF |
| Low Heating Value - LHV | 74 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.600 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.549 | by Mass |
| Low Flammability Limit in Air | 2.2% | LFL |
| High Flammability Limit in Air | 15.2% | HFL |
| Auto Ignition Temperature | 1,110 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 10/24/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB102413-1245 |
| Sample Date: | 10/24/2013 |
| Sample Description: | IIRPG, Campus Pine Chips, 111 BTU on Calorval |
| Analysis Date: | 10/24/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 5.5% | 5.5% | 0.4% |
| Oxygen | O2 | 1.4% | 1.4% | 1.6% |
| Nitrogen | N2 | 60.5% | 60.5% | 60.5% |
| Methane | CH4 | 1.8% | 1.8% | 1.0% |
| Carbon Monoxide | CO | 20.0% | 20.0% | 20.0% |
| Carbon Dioxide | CO2 | 10.0% | 10.0% | 15.7% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.8% | 0.8% | 0.8% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.342 | lb per lb of combustible |
| H2O | 0.058 | lb per lb of combustible |
| N2 | 0.619 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.234 | ft^3 per ft^3 of combustible |
| H2O | 0.098 | ft^3 per ft^3 of combustible |
| N2 | 0.689 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.02 | |
| Resultant Gas Constant - R | 55.16 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.967 | |
| Density at 70 F & 14.7 psia | 0.0725 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3796 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5205 | |
| High Heating Value - HHV | 100 | BTU/SCF |
| Low Heating Value - LHV | 96 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.776 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.715 | by Mass |
| Low Flammability Limit in Air | 2.8% | LFL |
| High Flammability Limit in Air | 20.0% | HFL |
| Auto Ignition Temperature | 1,102 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 10/24/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB102413-1210 |
| Sample Date: | 10/24/2013 |
| Sample Description: | IIRPG, Campus Pine Chips, 103 BTU on Calorval |
| Analysis Date: | 10/24/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 4.6% | 4.6% | 0.3% |
| Oxygen | O2 | 1.7% | 1.7% | 1.9% |
| Nitrogen | N2 | 63.3% | 63.3% | 62.2% |
| Methane | CH4 | 1.4% | 1.4% | 0.8% |
| Carbon Monoxide | CO | 17.9% | 17.9% | 17.7% |
| Carbon Dioxide | CO2 | 11.1% | 11.1% | 17.1% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.298 | lb per lb of combustible |
| H2O | 0.047 | lb per lb of combustible |
| N2 | 0.524 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.193 | ft^3 per ft^3 of combustible |
| H2O | 0.074 | ft^3 per ft^3 of combustible |
| N2 | 0.528 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.48 | |
| Resultant Gas Constant - R | 54.26 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.983 | |
| Density at 70 F & 14.7 psia | 0.0737 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3789 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5247 | |
| High Heating Value - HHV | 87 | BTU/SCF |
| Low Heating Value - LHV | 83 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.668 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.607 | by Mass |
| Low Flammability Limit in Air | 2.5% | LFL |
| High Flammability Limit in Air | 17.0% | HFL |
| Auto Ignition Temperature | 1,087 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 10/24/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB102413-1110 |
| Sample Date: | 10/24/2013 |
| Sample Description: | IIRPG, Campus Pine Chips, 124 BTU on Calorval |
| Analysis Date: | 10/24/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 8.4% | 8.4% | 0.6% |
| Oxygen | O2 | 1.9% | 1.9% | 2.2% |
| Nitrogen | N2 | 57.4% | 57.4% | 58.5% |
| Methane | CH4 | 2.1% | 2.1% | 1.2% |
| Carbon Monoxide | CO | 19.0% | 19.0% | 19.4% |
| Carbon Dioxide | CO2 | 11.3% | 11.3% | 18.1% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.338 | lb per lb of combustible |
| H2O | 0.082 | lb per lb of combustible |
| N2 | 0.693 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.211 | ft^3 per ft^3 of combustible |
| H2O | 0.126 | ft^3 per ft^3 of combustible |
| N2 | 0.673 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.47 | |
| Resultant Gas Constant - R | 56.26 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.948 | |
| Density at 70 F & 14.7 psia | 0.0711 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3774 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5151 | |
| High Heating Value - HHV | 110 | BTU/SCF |
| Low Heating Value - LHV | 103 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.852 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.761 | by Mass |
| Low Flammability Limit in Air | 2.8% | LFL |
| High Flammability Limit in Air | 20.6% | HFL |
| Auto Ignition Temperature | 1,069 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 10/24/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB102413-1055 |
| Sample Date: | 10/24/2013 |
| Sample Description: | IIRPG, Campus Pine Chips, 105 BTU on calorval |
| Analysis Date: | 10/24/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 7.1% | 7.1% | 0.5% |
| Oxygen | O2 | 4.7% | 4.7% | 5.4% |
| Nitrogen | N2 | 60.9% | 60.9% | 61.4% |
| Methane | CH4 | 1.8% | 1.8% | 1.0% |
| Carbon Monoxide | CO | 15.3% | 15.3% | 15.4% |
| Carbon Dioxide | CO2 | 10.3% | 10.3% | 16.3% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.270 | lb per lb of combustible |
| H2O | 0.069 | lb per lb of combustible |
| N2 | 0.566 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.171 | ft^3 per ft^3 of combustible |
| H2O | 0.107 | ft^3 per ft^3 of combustible |
| N2 | 0.556 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.78 | |
| Resultant Gas Constant - R | 55.64 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.959 | |
| Density at 70 F & 14.7 psia | 0.0719 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3797 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5183 | |
| High Heating Value - HHV | 90 | BTU/SCF |
| Low Heating Value - LHV | 85 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.704 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.618 | by Mass |
| Low Flammability Limit in Air | 2.3% | LFL |
| High Flammability Limit in Air | 16.9% | HFL |
| Auto Ignition Temperature | 1,066 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 10/24/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB102413-1030 |
| Sample Date: | 10/24/2013 |
| Sample Description: | IIRPG, Campus Pine Chips, 102 BTU on Calorval |
| Analysis Date: | 10/24/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 6.7% | 6.7% | 0.5% |
| Oxygen | O2 | 4.4% | 4.4% | 5.0% |
| Nitrogen | N2 | 60.9% | 60.9% | 61.1% |
| Methane | CH4 | 1.8% | 1.8% | 1.0% |
| Carbon Monoxide | CO | 15.8% | 15.8% | 15.9% |
| Carbon Dioxide | CO2 | 10.5% | 10.5% | 16.5% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.277 | lb per lb of combustible |
| H2O | 0.066 | lb per lb of combustible |
| N2 | 0.564 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.176 | ft^3 per ft^3 of combustible |
| H2O | 0.102 | ft^3 per ft^3 of combustible |
| N2 | 0.557 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.91 | |
| Resultant Gas Constant - R | 55.37 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.963 | |
| Density at 70 F & 14.7 psia | 0.0722 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3794 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5195 | |
| High Heating Value - HHV | 91 | BTU/SCF |
| Low Heating Value - LHV | 85 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.705 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.624 | by Mass |
| Low Flammability Limit in Air | 2.3% | LFL |
| High Flammability Limit in Air | 17.0% | HFL |
| Auto Ignition Temperature | 1,070 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 10/24/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB101613-1329 |
| Sample Date: | 10/15/2013 |
| Sample Description: | IIRPG, Dry Wood Chips, Good Flare |
| Analysis Date: | 10/15/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 3.1% | 3.1% | 0.2% |
| Oxygen | O2 | 5.2% | 5.2% | 6.0% |
| Nitrogen | N2 | 85.9% | 85.9% | 86.0% |
| Methane | CH4 | 0.0% | 0.0% | 0.0% |
| Carbon Monoxide | CO | 2.2% | 2.2% | 2.2% |
| Carbon Dioxide | CO2 | 3.6% | 3.6% | 5.6% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.034 | lb per lb of combustible |
| H2O | 0.020 | lb per lb of combustible |
| N2 | 0.101 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.022 | ft^3 per ft^3 of combustible |
| H2O | 0.031 | ft^3 per ft^3 of combustible |
| N2 | 0.100 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.99 | |
| Resultant Gas Constant - R | 55.21 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.966 | |
| Density at 70 F & 14.7 psia | 0.0724 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3933 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5220 | |
| High Heating Value - HHV | 17 | BTU/SCF |
| Low Heating Value - LHV | 16 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.126 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.080 | by Mass |
| Low Flammability Limit in Air | 0.4% | LFL |
| High Flammability Limit in Air | 4.0% | HFL |
| Auto Ignition Temperature | 1,013 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 10/15/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB092513-1418 |
| Sample Date: | 9/25/2013 |
| Sample Description: | IIRPG, Cafeteria Waste, 125 BTU on Calorval |
| Analysis Date: | 9/25/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 5.9% | 5.9% | 0.4% |
| Oxygen | O2 | 1.4% | 1.4% | 1.6% |
| Nitrogen | N2 | 64.7% | 64.7% | 63.6% |
| Methane | CH4 | 1.6% | 1.6% | 0.9% |
| Carbon Monoxide | CO | 12.7% | 12.7% | 12.5% |
| Carbon Dioxide | CO2 | 13.6% | 13.6% | 21.0% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.221 | lb per lb of combustible |
| H2O | 0.057 | lb per lb of combustible |
| N2 | 0.466 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.143 | ft^3 per ft^3 of combustible |
| H2O | 0.091 | ft^3 per ft^3 of combustible |
| N2 | 0.470 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.52 | |
| Resultant Gas Constant - R | 54.19 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.984 | |
| Density at 70 F & 14.7 psia | 0.0738 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3742 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5244 | |
| High Heating Value - HHV | 76 | BTU/SCF |
| Low Heating Value - LHV | 72 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.595 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.511 | by Mass |
| Low Flammability Limit in Air | 1.9% | LFL |
| High Flammability Limit in Air | 14.1% | HFL |
| Auto Ignition Temperature | 1,067 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 9/26/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB092513-1407 |
| Sample Date: | 9/25/2013 |
| Sample Description: | IIRPG, Cafeteria Waste, 124 BTU on Calorval |
| Analysis Date: | 9/25/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 4.7% | 4.7% | 0.3% |
| Oxygen | O2 | 2.3% | 2.3% | 2.6% |
| Nitrogen | N2 | 65.4% | 65.4% | 63.6% |
| Methane | CH4 | 1.7% | 1.7% | 1.0% |
| Carbon Monoxide | CO | 12.5% | 12.5% | 12.1% |
| Carbon Dioxide | CO2 | 13.4% | 13.4% | 20.4% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.217 | lb per lb of combustible |
| H2O | 0.051 | lb per lb of combustible |
| N2 | 0.444 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.142 | ft^3 per ft^3 of combustible |
| H2O | 0.081 | ft^3 per ft^3 of combustible |
| N2 | 0.452 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.82 | |
| Resultant Gas Constant - R | 53.63 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.995 | |
| Density at 70 F & 14.7 psia | 0.0746 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3748 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5272 | |
| High Heating Value - HHV | 73 | BTU/SCF |
| Low Heating Value - LHV | 69 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.572 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.502 | by Mass |
| Low Flammability Limit in Air | 1.8% | LFL |
| High Flammability Limit in Air | 13.0% | HFL |
| Auto Ignition Temperature | 1,074 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 9/26/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB092513-1403 |
| Sample Date: | 9/25/2013 |
| Sample Description: | IIRPG, Cafeteria Waste, 110 BTU on Calorval |
| Analysis Date: | 9/25/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 4.7% | 4.7% | 0.3% |
| Oxygen | O2 | 2.4% | 2.4% | 2.8% |
| Nitrogen | N2 | 62.3% | 62.3% | 61.4% |
| Methane | CH4 | 1.2% | 1.2% | 0.7% |
| Carbon Monoxide | CO | 19.1% | 19.1% | 18.8% |
| Carbon Dioxide | CO2 | 10.3% | 10.3% | 16.0% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.314 | lb per lb of combustible |
| H2O | 0.045 | lb per lb of combustible |
| N2 | 0.533 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.202 | ft^3 per ft^3 of combustible |
| H2O | 0.070 | ft^3 per ft^3 of combustible |
| N2 | 0.535 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.39 | |
| Resultant Gas Constant - R | 54.44 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.980 | |
| Density at 70 F & 14.7 psia | 0.0735 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3803 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5241 | |
| High Heating Value - HHV | 89 | BTU/SCF |
| Low Heating Value - LHV | 85 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.678 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.617 | by Mass |
| Low Flammability Limit in Air | 2.6% | LFL |
| High Flammability Limit in Air | 17.9% | HFL |
| Auto Ignition Temperature | 1,088 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 9/26/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB083013-1325 |
| Sample Date: | 8/30/2013 |
| Sample Description: | Wood Pellets, IIRPG |
| Analysis Date: | 8/30/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 8.6% | 8.6% | 0.6% |
| Oxygen | O2 | 2.1% | 2.1% | 2.5% |
| Nitrogen | N2 | 55.2% | 55.2% | 57.8% |
| Methane | CH4 | 2.1% | 2.1% | 1.2% |
| Carbon Monoxide | CO | 25.0% | 25.0% | 26.2% |
| Carbon Dioxide | CO2 | 7.1% | 7.1% | 11.7% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.445 | lb per lb of combustible |
| H2O | 0.086 | lb per lb of combustible |
| N2 | 0.833 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.271 | ft^3 per ft^3 of combustible |
| H2O | 0.127 | ft^3 per ft^3 of combustible |
| N2 | 0.788 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 26.76 | |
| Resultant Gas Constant - R | 57.75 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.924 | |
| Density at 70 F & 14.7 psia | 0.0693 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3850 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5094 | |
| High Heating Value - HHV | 129 | BTU/SCF |
| Low Heating Value - LHV | 123 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.997 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.936 | by Mass |
| Low Flammability Limit in Air | 3.6% | LFL |
| High Flammability Limit in Air | 25.2% | HFL |
| Auto Ignition Temperature | 1,078 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/30/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB083013-1318 |
| Sample Date: | 8/30/2013 |
| Sample Description: | Wood Pellets, IIRPG |
| Analysis Date: | 8/30/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 9.2% | 9.2% | 0.7% |
| Oxygen | O2 | 1.2% | 1.2% | 1.5% |
| Nitrogen | N2 | 53.5% | 53.5% | 56.1% |
| Methane | CH4 | 2.3% | 2.3% | 1.4% |
| Carbon Monoxide | CO | 25.4% | 25.4% | 26.7% |
| Carbon Dioxide | CO2 | 8.3% | 8.3% | 13.7% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.457 | lb per lb of combustible |
| H2O | 0.093 | lb per lb of combustible |
| N2 | 0.876 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.278 | ft^3 per ft^3 of combustible |
| H2O | 0.139 | ft^3 per ft^3 of combustible |
| N2 | 0.827 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 26.72 | |
| Resultant Gas Constant - R | 57.84 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.922 | |
| Density at 70 F & 14.7 psia | 0.0692 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3826 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5087 | |
| High Heating Value - HHV | 135 | BTU/SCF |
| Low Heating Value - LHV | 128 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 1.047 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.980 | by Mass |
| Low Flammability Limit in Air | 3.7% | LFL |
| High Flammability Limit in Air | 26.1% | HFL |
| Auto Ignition Temperature | 1,076 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/30/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB083013-1307 |
| Sample Date: | 8/30/2013 |
| Sample Description: | Wood Pellets, IIRPG |
| Analysis Date: | 8/30/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 7.9% | 7.9% | 0.6% |
| Oxygen | O2 | 1.3% | 1.3% | 1.5% |
| Nitrogen | N2 | 51.6% | 51.6% | 52.2% |
| Methane | CH4 | 2.7% | 2.7% | 1.6% |
| Carbon Monoxide | CO | 24.2% | 24.2% | 24.5% |
| Carbon Dioxide | CO2 | 12.4% | 12.4% | 19.7% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.428 | lb per lb of combustible |
| H2O | 0.086 | lb per lb of combustible |
| N2 | 0.824 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.269 | ft^3 per ft^3 of combustible |
| H2O | 0.133 | ft^3 per ft^3 of combustible |
| N2 | 0.806 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.67 | |
| Resultant Gas Constant - R | 55.86 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.955 | |
| Density at 70 F & 14.7 psia | 0.0716 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3752 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5167 | |
| High Heating Value - HHV | 131 | BTU/SCF |
| Low Heating Value - LHV | 124 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 1.020 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.940 | by Mass |
| Low Flammability Limit in Air | 3.5% | LFL |
| High Flammability Limit in Air | 24.2% | HFL |
| Auto Ignition Temperature | 1,079 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/30/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB083013-1301 |
| Sample Date: | 8/30/2013 |
| Sample Description: | Wood Pellets, IIRPG |
| Analysis Date: | 8/30/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 8.9% | 8.9% | 0.7% |
| Oxygen | O2 | 1.3% | 1.3% | 1.5% |
| Nitrogen | N2 | 52.7% | 52.7% | 53.6% |
| Methane | CH4 | 2.8% | 2.8% | 1.6% |
| Carbon Monoxide | CO | 21.0% | 21.0% | 21.3% |
| Carbon Dioxide | CO2 | 13.3% | 13.3% | 21.3% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.380 | lb per lb of combustible |
| H2O | 0.095 | lb per lb of combustible |
| N2 | 0.793 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.238 | ft^3 per ft^3 of combustible |
| H2O | 0.145 | ft^3 per ft^3 of combustible |
| N2 | 0.773 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.55 | |
| Resultant Gas Constant - R | 56.09 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.951 | |
| Density at 70 F & 14.7 psia | 0.0713 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3732 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5153 | |
| High Heating Value - HHV | 125 | BTU/SCF |
| Low Heating Value - LHV | 118 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.978 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.883 | by Mass |
| Low Flammability Limit in Air | 3.1% | LFL |
| High Flammability Limit in Air | 22.6% | HFL |
| Auto Ignition Temperature | 1,070 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/30/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB082913-1328 |
| Sample Date: | 8/29/2013 |
| Sample Description: | Wood Pellets, IIRPG |
| Analysis Date: | 8/29/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 5.3% | 5.3% | 0.4% |
| Oxygen | O2 | 1.3% | 1.3% | 1.5% |
| Nitrogen | N2 | 62.7% | 62.7% | 62.7% |
| Methane | CH4 | 1.4% | 1.4% | 0.8% |
| Carbon Monoxide | CO | 20.1% | 20.1% | 20.1% |
| Carbon Dioxide | CO2 | 9.3% | 9.3% | 14.6% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.338 | lb per lb of combustible |
| H2O | 0.051 | lb per lb of combustible |
| N2 | 0.587 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.215 | ft^3 per ft^3 of combustible |
| H2O | 0.080 | ft^3 per ft^3 of combustible |
| N2 | 0.581 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.02 | |
| Resultant Gas Constant - R | 55.16 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.967 | |
| Density at 70 F & 14.7 psia | 0.0725 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3819 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5208 | |
| High Heating Value - HHV | 96 | BTU/SCF |
| Low Heating Value - LHV | 92 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.736 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.677 | by Mass |
| Low Flammability Limit in Air | 2.8% | LFL |
| High Flammability Limit in Air | 19.1% | HFL |
| Auto Ignition Temperature | 1,087 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/29/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB082913-1322 |
| Sample Date: | 8/29/2013 |
| Sample Description: | Wood Pellets, IIRPG |
| Analysis Date: | 8/29/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 7.7% | 7.7% | 0.6% |
| Oxygen | O2 | 1.2% | 1.2% | 1.4% |
| Nitrogen | N2 | 57.1% | 57.1% | 59.0% |
| Methane | CH4 | 2.5% | 2.5% | 1.5% |
| Carbon Monoxide | CO | 22.9% | 22.9% | 23.7% |
| Carbon Dioxide | CO2 | 8.6% | 8.6% | 13.9% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.412 | lb per lb of combustible |
| H2O | 0.084 | lb per lb of combustible |
| N2 | 0.797 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.254 | ft^3 per ft^3 of combustible |
| H2O | 0.127 | ft^3 per ft^3 of combustible |
| N2 | 0.764 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.13 | |
| Resultant Gas Constant - R | 56.96 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.936 | |
| Density at 70 F & 14.7 psia | 0.0702 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3822 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5125 | |
| High Heating Value - HHV | 124 | BTU/SCF |
| Low Heating Value - LHV | 118 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.967 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.906 | by Mass |
| Low Flammability Limit in Air | 3.3% | LFL |
| High Flammability Limit in Air | 23.1% | HFL |
| Auto Ignition Temperature | 1,079 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/29/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB082913-1310 |
| Sample Date: | 8/29/2013 |
| Sample Description: | Wood Pellets, IIRPG |
| Analysis Date: | 8/29/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 8.0% | 8.0% | 0.6% |
| Oxygen | O2 | 1.1% | 1.1% | 1.3% |
| Nitrogen | N2 | 54.7% | 54.7% | 56.8% |
| Methane | CH4 | 1.9% | 1.9% | 1.2% |
| Carbon Monoxide | CO | 26.6% | 26.6% | 27.6% |
| Carbon Dioxide | CO2 | 7.7% | 7.7% | 12.6% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.465 | lb per lb of combustible |
| H2O | 0.079 | lb per lb of combustible |
| N2 | 0.835 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.285 | ft^3 per ft^3 of combustible |
| H2O | 0.119 | ft^3 per ft^3 of combustible |
| N2 | 0.797 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 26.98 | |
| Resultant Gas Constant - R | 57.27 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.931 | |
| Density at 70 F & 14.7 psia | 0.0698 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3840 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5114 | |
| High Heating Value - HHV | 131 | BTU/SCF |
| Low Heating Value - LHV | 125 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 1.009 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.950 | by Mass |
| Low Flammability Limit in Air | 3.7% | LFL |
| High Flammability Limit in Air | 25.9% | HFL |
| Auto Ignition Temperature | 1,082 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/29/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB082913-1304 |
| Sample Date: | 8/29/2013 |
| Sample Description: | Wood Pellets, IIRPG |
| Analysis Date: | 8/29/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 7.8% | 7.8% | 0.6% |
| Oxygen | O2 | 1.1% | 1.1% | 1.3% |
| Nitrogen | N2 | 55.2% | 55.2% | 57.1% |
| Methane | CH4 | 1.8% | 1.8% | 1.0% |
| Carbon Monoxide | CO | 26.4% | 26.4% | 27.3% |
| Carbon Dioxide | CO2 | 7.8% | 7.8% | 12.6% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.458 | lb per lb of combustible |
| H2O | 0.075 | lb per lb of combustible |
| N2 | 0.810 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.282 | ft^3 per ft^3 of combustible |
| H2O | 0.113 | ft^3 per ft^3 of combustible |
| N2 | 0.776 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.07 | |
| Resultant Gas Constant - R | 57.08 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.935 | |
| Density at 70 F & 14.7 psia | 0.0701 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3840 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5122 | |
| High Heating Value - HHV | 128 | BTU/SCF |
| Low Heating Value - LHV | 122 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.982 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.922 | by Mass |
| Low Flammability Limit in Air | 3.7% | LFL |
| High Flammability Limit in Air | 25.6% | HFL |
| Auto Ignition Temperature | 1,083 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/29/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB082913-1258 |
| Sample Date: | 8/29/2013 |
| Sample Description: | Wood Pellets, IIRPG |
| Analysis Date: | 8/29/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 8.2% | 8.2% | 0.6% |
| Oxygen | O2 | 1.0% | 1.0% | 1.2% |
| Nitrogen | N2 | 54.6% | 54.6% | 56.6% |
| Methane | CH4 | 2.0% | 2.0% | 1.2% |
| Carbon Monoxide | CO | 25.6% | 25.6% | 26.6% |
| Carbon Dioxide | CO2 | 8.5% | 8.5% | 13.8% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.451 | lb per lb of combustible |
| H2O | 0.082 | lb per lb of combustible |
| N2 | 0.828 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.277 | ft^3 per ft^3 of combustible |
| H2O | 0.123 | ft^3 per ft^3 of combustible |
| N2 | 0.791 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.02 | |
| Resultant Gas Constant - R | 57.19 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.933 | |
| Density at 70 F & 14.7 psia | 0.0699 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3825 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5116 | |
| High Heating Value - HHV | 130 | BTU/SCF |
| Low Heating Value - LHV | 124 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 1.001 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.937 | by Mass |
| Low Flammability Limit in Air | 3.6% | LFL |
| High Flammability Limit in Air | 25.5% | HFL |
| Auto Ignition Temperature | 1,080 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/29/2013 |

SUNY RF The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB082913-1253 |
| Sample Date: | 8/29/2013 |
| Sample Description: | Wood Pellets, IIRPG |
| Analysis Date: | 8/29/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 8.3% | 8.3% | 0.6% |
| Oxygen | O2 | 1.0% | 1.0% | 1.2% |
| Nitrogen | N2 | 54.0% | 54.0% | 55.6% |
| Methane | CH4 | 2.3% | 2.3% | 1.3% |
| Carbon Monoxide | CO | 24.6% | 24.6% | 25.3% |
| Carbon Dioxide | CO2 | 9.9% | 9.9% | 15.9% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.434 | lb per lb of combustible |
| H2O | 0.085 | lb per lb of combustible |
| N2 | 0.819 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.268 | ft^3 per ft^3 of combustible |
| H2O | 0.128 | ft^3 per ft^3 of combustible |
| N2 | 0.788 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.21 | |
| Resultant Gas Constant - R | 56.80 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.939 | |
| Density at 70 F & 14.7 psia | 0.0704 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3799 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5130 | |
| High Heating Value - HHV | 129 | BTU/SCF |
| Low Heating Value - LHV | 122 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.998 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.926 | by Mass |
| Low Flammability Limit in Air | 3.5% | LFL |
| High Flammability Limit in Air | 24.7% | HFL |
| Auto Ignition Temperature | 1,078 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/29/2013 |

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB082913-1248 |
| Sample Date: | 8/29/2013 |
| Sample Description: | Wood Pellets, IIRPG |
| Analysis Date: | 8/29/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 8.4% | 8.4% | 0.6% |
| Oxygen | O2 | 1.0% | 1.0% | 1.1% |
| Nitrogen | N2 | 53.1% | 53.1% | 54.2% |
| Methane | CH4 | 2.5% | 2.5% | 1.5% |
| Carbon Monoxide | CO | 23.1% | 23.1% | 23.6% |
| Carbon Dioxide | CO2 | 11.8% | 11.8% | 19.0% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.411 | lb per lb of combustible |
| H2O | 0.088 | lb per lb of combustible |
| N2 | 0.807 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.257 | ft^3 per ft^3 of combustible |
| H2O | 0.134 | ft^3 per ft^3 of combustible |
| N2 | 0.784 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.47 | |
| Resultant Gas Constant - R | 56.25 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.948 | |
| Density at 70 F & 14.7 psia | 0.0711 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3761 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5150 | |
| High Heating Value - HHV | 127 | BTU/SCF |
| Low Heating Value - LHV | 121 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.992 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.910 | by Mass |
| Low Flammability Limit in Air | 3.4% | LFL |
| High Flammability Limit in Air | 23.8% | HFL |
| Auto Ignition Temperature | 1,076 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/29/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB082913-1243 |
| Sample Date: | 8/29/2013 |
| Sample Description: | Wood Pellets, IIRPG |
| Analysis Date: | 8/29/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 8.8% | 8.8% | 0.7% |
| Oxygen | O2 | 1.3% | 1.3% | 1.7% |
| Nitrogen | N2 | 50.9% | 50.9% | 59.6% |
| Methane | CH4 | 3.3% | 3.3% | 2.2% |
| Carbon Monoxide | CO | 21.3% | 21.3% | 25.0% |
| Carbon Dioxide | CO2 | 0.0% | 0.0% | 0.0% |
| Water | H2O | 14.3% | 14.3% | 10.8% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.453 | lb per lb of combustible |
| H2O | 0.116 | lb per lb of combustible |
| N2 | 0.965 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.247 | ft^3 per ft^3 of combustible |
| H2O | 0.154 | ft^3 per ft^3 of combustible |
| N2 | 0.818 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 23.95 | |
| Resultant Gas Constant - R | 64.53 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.827 | |
| Density at 70 F & 14.7 psia | 0.0620 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3907 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.4826 | |
| High Heating Value - HHV | 131 | BTU/SCF |
| Low Heating Value - LHV | 123 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 1.035 | by Volume |
| Stoichometric Air:Fuel Ratio | 1.087 | by Mass |
| Low Flammability Limit in Air | 3.2% | LFL |
| High Flammability Limit in Air | 22.9% | HFL |
| Auto Ignition Temperature | 1,071 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/29/2013 |

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB080113-1112 |
| Sample Date: | 8/1/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 8/1/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 6.9% | 6.9% | 0.5% |
| Oxygen | O2 | 2.4% | 2.4% | 2.8% |
| Nitrogen | N2 | 56.4% | 56.4% | 58.0% |
| Methane | CH4 | 1.7% | 1.7% | 1.0% |
| Carbon Monoxide | CO | 25.3% | 25.3% | 26.0% |
| Carbon Dioxide | CO2 | 7.3% | 7.3% | 11.7% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.436 | lb per lb of combustible |
| H2O | 0.068 | lb per lb of combustible |
| N2 | 0.760 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.270 | ft^3 per ft^3 of combustible |
| H2O | 0.103 | ft^3 per ft^3 of combustible |
| N2 | 0.733 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.28 | |
| Resultant Gas Constant - R | 56.66 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.942 | |
| Density at 70 F & 14.7 psia | 0.0706 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3852 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5143 | |
| High Heating Value - HHV | 121 | BTU/SCF |
| Low Heating Value - LHV | 116 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.928 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.872 | by Mass |
| Low Flammability Limit in Air | 3.5% | LFL |
| High Flammability Limit in Air | 24.2% | HFL |
| Auto Ignition Temperature | 1,085 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/1/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB080113-1050 |
| Sample Date: | 8/1/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 8/1/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 7.5% | 7.5% | 0.6% |
| Oxygen | O2 | 1.5% | 1.5% | 1.8% |
| Nitrogen | N2 | 54.5% | 54.5% | 56.3% |
| Methane | CH4 | 1.6% | 1.6% | 1.0% |
| Carbon Monoxide | CO | 27.4% | 27.4% | 28.2% |
| Carbon Dioxide | CO2 | 7.5% | 7.5% | 12.1% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.470 | lb per lb of combustible |
| H2O | 0.071 | lb per lb of combustible |
| N2 | 0.810 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.290 | ft^3 per ft^3 of combustible |
| H2O | 0.107 | ft^3 per ft^3 of combustible |
| N2 | 0.778 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.14 | |
| Resultant Gas Constant - R | 56.95 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.937 | |
| Density at 70 F & 14.7 psia | 0.0702 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3848 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5129 | |
| High Heating Value - HHV | 129 | BTU/SCF |
| Low Heating Value - LHV | 123 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.984 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.927 | by Mass |
| Low Flammability Limit in Air | 3.8% | LFL |
| High Flammability Limit in Air | 26.1% | HFL |
| Auto Ignition Temperature | 1,086 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 8/1/2013 |

SUNY RF
The Research Foundation for The State University of New York

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB071613-1115 |
| Sample Date: | 7/16/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 7/17/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 15.2% | 15.2% | 1.2% |
| Oxygen | O2 | 0.0% | 0.0% | 0.0% |
| Nitrogen | N2 | 60.6% | 60.6% | 67.9% |
| Methane | CH4 | 2.8% | 2.8% | 1.8% |
| Carbon Monoxide | CO | 13.3% | 13.3% | 14.9% |
| Carbon Dioxide | CO2 | 8.0% | 8.0% | 14.2% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.284 | lb per lb of combustible |
| H2O | 0.150 | lb per lb of combustible |
| N2 | 0.847 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.161 | ft^3 per ft^3 of combustible |
| H2O | 0.208 | ft^3 per ft^3 of combustible |
| N2 | 0.749 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 25.01 | |
| Resultant Gas Constant - R | 61.79 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.863 | |
| Density at 70 F & 14.7 psia | 0.0647 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3817 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.4920 | |
| High Heating Value - HHV | 121 | BTU/SCF |
| Low Heating Value - LHV | 110 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.948 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.822 | by Mass |
| Low Flammability Limit in Air | 2.4% | LFL |
| High Flammability Limit in Air | 21.7% | HFL |
| Auto Ignition Temperature | 1,028 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 7/17/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB071613-1025 |
| Sample Date: | 7/16/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 7/17/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 11.0% | 11.0% | 0.9% |
| Oxygen | O2 | 0.0% | 0.0% | 0.0% |
| Nitrogen | N2 | 72.0% | 72.0% | 78.1% |
| Methane | CH4 | 2.0% | 2.0% | 1.3% |
| Carbon Monoxide | CO | 9.4% | 9.4% | 10.2% |
| Carbon Dioxide | CO2 | 5.6% | 5.6% | 9.6% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.194 | lb per lb of combustible |
| H2O | 0.105 | lb per lb of combustible |
| N2 | 0.586 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.114 | ft^3 per ft^3 of combustible |
| H2O | 0.150 | ft^3 per ft^3 of combustible |
| N2 | 0.535 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 25.82 | |
| Resultant Gas Constant - R | 59.84 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.891 | |
| Density at 70 F & 14.7 psia | 0.0668 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3875 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5007 | |
| High Heating Value - HHV | 86 | BTU/SCF |
| Low Heating Value - LHV | 79 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.677 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.567 | by Mass |
| Low Flammability Limit in Air | 1.7% | LFL |
| High Flammability Limit in Air | 15.5% | HFL |
| Auto Ignition Temperature | 1,027 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 7/17/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB062013-1336 |
| Sample Date: | 6/20/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 6/20/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 3.2% | 3.2% | 0.2% |
| Oxygen | O2 | 3.6% | 3.6% | 3.9% |
| Nitrogen | N2 | 65.0% | 65.0% | 61.5% |
| Methane | CH4 | 1.9% | 1.9% | 1.0% |
| Carbon Monoxide | CO | 10.6% | 10.6% | 10.0% |
| Carbon Dioxide | CO2 | 15.7% | 15.7% | 23.3% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.186 | lb per lb of combustible |
| H2O | 0.043 | lb per lb of combustible |
| N2 | 0.386 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.125 | ft^3 per ft^3 of combustible |
| H2O | 0.070 | ft^3 per ft^3 of combustible |
| N2 | 0.404 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 29.62 | |
| Resultant Gas Constant - R | 52.18 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 1.022 | |
| Density at 70 F & 14.7 psia | 0.0767 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3712 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5340 | |
| High Heating Value - HHV | 64 | BTU/SCF |
| Low Heating Value - LHV | 60 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.512 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.453 | by Mass |
| Low Flammability Limit in Air | 1.5% | LFL |
| High Flammability Limit in Air | 10.5% | HFL |
| Auto Ignition Temperature | 1,082 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 6/20/2013 |

SUNY RF The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB062013-1130 |
| Sample Date: | 6/20/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 6/20/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 7.2% | 7.2% | 0.5% |
| Oxygen | O2 | 2.9% | 2.9% | 3.3% |
| Nitrogen | N2 | 53.0% | 53.0% | 52.0% |
| Methane | CH4 | 3.4% | 3.4% | 1.9% |
| Carbon Monoxide | CO | 16.7% | 16.7% | 16.4% |
| Carbon Dioxide | CO2 | 16.8% | 16.8% | 26.0% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.309 | lb per lb of combustible |
| H2O | 0.088 | lb per lb of combustible |
| N2 | 0.698 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.201 | ft^3 per ft^3 of combustible |
| H2O | 0.140 | ft^3 per ft^3 of combustible |
| N2 | 0.704 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.54 | |
| Resultant Gas Constant - R | 54.14 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.985 | |
| Density at 70 F & 14.7 psia | 0.0739 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3674 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5238 | |
| High Heating Value - HHV | 111 | BTU/SCF |
| Low Heating Value - LHV | 104 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.891 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.791 | by Mass |
| Low Flammability Limit in Air | 2.5% | LFL |
| High Flammability Limit in Air | 18.3% | HFL |
| Auto Ignition Temperature | 1,070 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 6/20/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB062013-1115 |
| Sample Date: | 6/20/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 6/20/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 7.4% | 7.4% | 0.5% |
| Oxygen | O2 | 2.8% | 2.8% | 3.1% |
| Nitrogen | N2 | 54.6% | 54.6% | 53.9% |
| Methane | CH4 | 3.5% | 3.5% | 2.0% |
| Carbon Monoxide | CO | 15.6% | 15.6% | 15.4% |
| Carbon Dioxide | CO2 | 16.2% | 16.2% | 25.1% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.296 | lb per lb of combustible |
| H2O | 0.091 | lb per lb of combustible |
| N2 | 0.692 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.191 | ft^3 per ft^3 of combustible |
| H2O | 0.143 | ft^3 per ft^3 of combustible |
| N2 | 0.694 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.38 | |
| Resultant Gas Constant - R | 54.46 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.980 | |
| Density at 70 F & 14.7 psia | 0.0735 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3684 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5224 | |
| High Heating Value - HHV | 109 | BTU/SCF |
| Low Heating Value - LHV | 102 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.879 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.780 | by Mass |
| Low Flammability Limit in Air | 2.4% | LFL |
| High Flammability Limit in Air | 17.6% | HFL |
| Auto Ignition Temperature | 1,067 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 6/20/2013 |

SUNY RF

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB062013-1101 |
| Sample Date: | 6/20/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 6/20/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 8.5% | 8.5% | 0.6% |
| Oxygen | O2 | 2.2% | 2.2% | 2.5% |
| Nitrogen | N2 | 54.1% | 54.1% | 54.2% |
| Methane | CH4 | 2.7% | 2.7% | 1.5% |
| Carbon Monoxide | CO | 17.6% | 17.6% | 17.6% |
| Carbon Dioxide | CO2 | 15.0% | 15.0% | 23.5% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.319 | lb per lb of combustible |
| H2O | 0.089 | lb per lb of combustible |
| N2 | 0.700 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.203 | ft^3 per ft^3 of combustible |
| H2O | 0.138 | ft^3 per ft^3 of combustible |
| N2 | 0.692 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.98 | |
| Resultant Gas Constant - R | 55.24 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.966 | |
| Density at 70 F & 14.7 psia | 0.0724 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3706 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5189 | |
| High Heating Value - HHV | 111 | BTU/SCF |
| Low Heating Value - LHV | 104 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.876 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.771 | by Mass |
| Low Flammability Limit in Air | 2.7% | LFL |
| High Flammability Limit in Air | 19.8% | HFL |
| Auto Ignition Temperature | 1,065 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 6/20/2013 |

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB062013-1052 |
| Sample Date: | 6/20/2013 |
| Sample Desription: | IIRPG, Pine Shavings |
| Analysis Date: | 6/20/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 9.2% | 9.2% | 0.7% |
| Oxygen | O2 | 2.0% | 2.0% | 2.3% |
| Nitrogen | N2 | 55.8% | 55.8% | 56.5% |
| Methane | CH4 | 2.1% | 2.1% | 1.2% |
| Carbon Monoxide | CO | 17.4% | 17.4% | 17.6% |
| Carbon Dioxide | CO2 | 13.6% | 13.6% | 21.6% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.311 | lb per lb of combustible |
| H2O | 0.087 | lb per lb of combustible |
| N2 | 0.673 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.195 | ft^3 per ft^3 of combustible |
| H2O | 0.133 | ft^3 per ft^3 of combustible |
| N2 | 0.658 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 27.63 | |
| Resultant Gas Constant - R | 55.92 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.954 | |
| Density at 70 F & 14.7 psia | 0.0715 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3731 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5161 | |
| High Heating Value - HHV | 107 | BTU/SCF |
| Low Heating Value - LHV | 100 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.832 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.723 | by Mass |
| Low Flammability Limit in Air | 2.6% | LFL |
| High Flammability Limit in Air | 20.1% | HFL |
| Auto Ignition Temperature | 1,062 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 6/20/2013 |

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB060713-1251 |
| Sample Date: | 6/7/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 6/7/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 4.8% | 4.8% | 0.3% |
| Oxygen | O2 | 0.9% | 0.9% | 1.0% |
| Nitrogen | N2 | 62.5% | 62.5% | 61.2% |
| Methane | CH4 | 1.7% | 1.7% | 0.9% |
| Carbon Monoxide | CO | 17.8% | 17.8% | 17.5% |
| Carbon Dioxide | CO2 | 12.3% | 12.3% | 19.0% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.300 | lb per lb of combustible |
| H2O | 0.052 | lb per lb of combustible |
| N2 | 0.547 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.195 | ft^3 per ft^3 of combustible |
| H2O | 0.082 | ft^3 per ft^3 of combustible |
| N2 | 0.552 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.57 | |
| Resultant Gas Constant - R | 54.10 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.986 | |
| Density at 70 F & 14.7 psia | 0.0739 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3765 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5252 | |
| High Heating Value - HHV | 90 | BTU/SCF |
| Low Heating Value - LHV | 86 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.699 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.634 | by Mass |
| Low Flammability Limit in Air | 2.5% | LFL |
| High Flammability Limit in Air | 17.0% | HFL |
| Auto Ignition Temperature | 1,086 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 6/7/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB060713-1245 |
| Sample Date: | 6/7/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 6/7/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 6.1% | 6.1% | 0.4% |
| Oxygen | O2 | 0.9% | 0.9% | 1.0% |
| Nitrogen | N2 | 61.5% | 61.5% | 61.0% |
| Methane | CH4 | 1.8% | 1.8% | 1.0% |
| Carbon Monoxide | CO | 16.4% | 16.4% | 16.2% |
| Carbon Dioxide | CO2 | 13.1% | 13.1% | 20.3% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.283 | lb per lb of combustible |
| H2O | 0.062 | lb per lb of combustible |
| N2 | 0.561 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.182 | ft^3 per ft^3 of combustible |
| H2O | 0.097 | ft^3 per ft^3 of combustible |
| N2 | 0.561 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.28 | |
| Resultant Gas Constant - R | 54.64 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.976 | |
| Density at 70 F & 14.7 psia | 0.0732 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3748 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5223 | |
| High Heating Value - HHV | 91 | BTU/SCF |
| Low Heating Value - LHV | 86 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.710 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.631 | by Mass |
| Low Flammability Limit in Air | 2.4% | LFL |
| High Flammability Limit in Air | 16.9% | HFL |
| Auto Ignition Temperature | 1,075 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 6/7/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB060713-1132 |
| Sample Date: | 6/7/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 6/7/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 5.8% | 5.8% | 0.4% |
| Oxygen | O2 | 0.9% | 0.9% | 1.0% |
| Nitrogen | N2 | 61.0% | 61.0% | 59.6% |
| Methane | CH4 | 2.3% | 2.3% | 1.3% |
| Carbon Monoxide | CO | 15.0% | 15.0% | 14.7% |
| Carbon Dioxide | CO2 | 15.0% | 15.0% | 23.0% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.267 | lb per lb of combustible |
| H2O | 0.066 | lb per lb of combustible |
| N2 | 0.562 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.174 | ft^3 per ft^3 of combustible |
| H2O | 0.105 | ft^3 per ft^3 of combustible |
| N2 | 0.569 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.65 | |
| Resultant Gas Constant - R | 53.95 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.989 | |
| Density at 70 F & 14.7 psia | 0.0741 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3714 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5252 | |
| High Heating Value - HHV | 91 | BTU/SCF |
| Low Heating Value - LHV | 86 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.720 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.637 | by Mass |
| Low Flammability Limit in Air | 2.2% | LFL |
| High Flammability Limit in Air | 15.8% | HFL |
| Auto Ignition Temperature | 1,074 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 6/7/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB060713-1048 |
| Sample Date: | 6/7/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 6/7/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 6.1% | 6.1% | 0.4% |
| Oxygen | O2 | 0.9% | 0.9% | 1.1% |
| Nitrogen | N2 | 60.3% | 60.3% | 58.9% |
| Methane | CH4 | 2.5% | 2.5% | 1.4% |
| Carbon Monoxide | CO | 14.2% | 14.2% | 13.8% |
| Carbon Dioxide | CO2 | 15.9% | 15.9% | 24.4% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.256 | lb per lb of combustible |
| H2O | 0.070 | lb per lb of combustible |
| N2 | 0.564 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.167 | ft^3 per ft^3 of combustible |
| H2O | 0.112 | ft^3 per ft^3 of combustible |
| N2 | 0.572 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 28.70 | |
| Resultant Gas Constant - R | 53.84 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 0.991 | |
| Density at 70 F & 14.7 psia | 0.0743 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3696 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5255 | |
| High Heating Value - HHV | 91 | BTU/SCF |
| Low Heating Value - LHV | 86 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.724 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.635 | by Mass |
| Low Flammability Limit in Air | 2.1% | LFL |
| High Flammability Limit in Air | 15.5% | HFL |
| Auto Ignition Temperature | 1,070 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 6/7/2013 |

SUNY RF
The Research Foundation for

SUNY Cobleskill

# Synthetic Gas Analysis Report

| | |
|---|---|
| Sample No.: | SB060713-1011 |
| Sample Date: | 6/7/2013 |
| Sample Description: | IIRPG, Pine Shavings |
| Analysis Date: | 6/7/2013 |

Analysis by Gas Chromatograph

| Component | Chemical Formula | Analysis % Volume | Analysis % mole | Analysis % Mass |
|---|---|---|---|---|
| Hydrogen | H2 | 3.7% | 3.7% | 0.3% |
| Oxygen | O2 | 1.3% | 1.3% | 1.4% |
| Nitrogen | N2 | 66.9% | 66.9% | 64.5% |
| Methane | CH4 | 1.1% | 1.1% | 0.6% |
| Carbon Monoxide | CO | 14.3% | 14.3% | 13.8% |
| Carbon Dioxide | CO2 | 12.8% | 12.8% | 19.4% |
| Water | H2O | 0.0% | 0.0% | 0.0% |
| Acetylene | C2H2 | 0.0% | 0.0% | 0.0% |
| Ethylene | C2H4 | 0.0% | 0.0% | 0.0% |
| Ethane | C2H6 | 0.0% | 0.0% | 0.0% |
| | Total = | 100% | 100% | 100% |

Stoichiometric Combustion Products:

| | | |
|---|---|---|
| CO2 | 0.233 | lb per lb of combustible |
| H2O | 0.036 | lb per lb of combustible |
| N2 | 0.407 | lb per lb of combustible |

| | | |
|---|---|---|
| CO2 | 0.154 | ft^3 per ft^3 of combustible |
| H2O | 0.058 | ft^3 per ft^3 of combustible |
| N2 | 0.418 | ft^3 per ft^3 of combustible |

Calculated Values:

| | | |
|---|---|---|
| Molecular Weight - MW | 29.04 | |
| Resultant Gas Constant - R | 53.22 | Ft-lbf/lbm/R |
| Specific Gravity - SG | 1.002 | |
| Density at 70 F & 14.7 psia | 0.0752 | lbm/ft^3 |
| Ratio of Specific Heats - k | 1.3763 | Cp/Cv |
| Critical Pressure Ratio - CPR | 0.5295 | |
| High Heating Value - HHV | 69 | BTU/SCF |
| Low Heating Value - LHV | 66 | BTU/SCF |
| Stoichometric Air:Fuel Ratio | 0.529 | by Volume |
| Stoichometric Air:Fuel Ratio | 0.471 | by Mass |
| Low Flammability Limit in Air | 2.0% | LFL |
| High Flammability Limit in Air | 13.5% | HFL |
| Auto Ignition Temperature | 1,087 | deg F |

| | |
|---|---|
| Technician Initials: | JTX |
| Report Date: | 6/7/2013 |

# Appendix C: Engine Based Electrical Generating Systems, Diesel vs. Spark Engines

*(Note that this section was submitted previously in response to a specific question at the October 2013 IPR)*

Various methods exist to generate electricity from a gasification system operating on waste. Internal combustion (I/C) engines (spark ignition and diesel) are the simplest methods to convert gaseous fuel into mechanical work to drive a generator. Other methods include steam turbines, reciprocating steam engines, organic Rankine, Brayton gas turbines, and Stirling external combustion engines. Simplicity, power density, safety, emissions, and cost are the major considerations that make I/C engines the most attractive.

The primary problem with operating an I/C engine-driven generator on syngas is crankshaft speed control as the electrical load and syngas energy values vary. The intent of this document is to describe the differences between diesel and spark ignition engine-driven generators fueled by ultra-low energy waste derived syngas.

Diesel engine-driven generators offer significant advantages for military applications. Diesel generators operate smoothly with acceptable frequency and voltage regulation as the syngas energy value and electrical load varies. The main advantage of diesel engines is that they do not use intake air throttle control to regulate engine speed. Engine speed is controlled by a governor that meters the amount of liquid fuel injected into each cylinder. Significant amounts of excess oxygen exist in the exhaust stream and the engine is not sensitive to lean air to fuel ratios. The engine operates seamlessly with drastic variations in syngas energy levels with no adjustment of combustion air.

The greatest disadvantage of diesel driven generators is liquid fuel usage. The engine must use some liquid diesel fuel to initiate compression ignition of the gaseous fuel mixture and for crankshaft speed control.

Otto spark ignition internal combustion engines can operate on 100% gaseous fuel and do not require dual fueling to operate. This offers a significant advantage over a diesel since the engine can operate solely on waste derived gaseous fuel, eliminating the need for ongoing use of expensive fossil fuels. The avoidance of co-fueling with fossil fuels can economically justify applying this technology for use at municipalities within the United States.

The main disadvantage of spark ignition engines is the intake air flow must be throttled to control engine speed. Maintaining the proper fueling rate and air to fuel ratio is essential with dramatic airflow changes. The air to fuel ratio must be maintained slightly richer than stoichiometric combustion. Proper control of engine speed and air to fuel ratio is nearly impossible to regulate as the electrical load and syngas energy content vary simultaneously.

Numerous concepts have been researched and developed by other entities to address this problem with spark ignition engines. These concepts use multiple regulators and electronically actuated flow control valves that must respond with precision accuracy to ensure the engine is adequately fueled to maintain synchronous speed and mechanical power at the critical air to fuel ratio.

Adequate metering of air and fuel gas must occur at varying flows as the throttle adjusts to maintain crankshaft speed. Most engines that are designed to operate on gaseous fuel require extensive controls when the energy value is 40% to 60% of natural gas. Waste derived syngas has an energy content that is 10% to 15% of natural gas, making reliable fueling for electrical power generation difficult or nearly impossible.

Another problem with ultra-low energy syngas is low air to fuel ratios, which are around 1:1 by volume. The flow of combustion air is offset by gaseous fuel. Low energy fuel requires a high flow rate to meet the power demands of the engine. The engine can actually become starved for adequate combustion air under heavy load conditions, causing lugging or even a crash stop.

## C.1 Diesel Engines for Military Applications

The military has expelled significant effort to standardize on one fuel for all battlefield applications. JP-8 is a multipurpose fuel blend that is able to power both diesel and jet engines. This allows the military to deliver only one fuel to meet the energy needs of contingency bases (CB). Diesel engine-driven generators fueled by JP-8 are almost exclusively used to generate electricity on FOBs.

The project team decided to pursue the use of diesel generators for this WTE application. The single battlefield fuel policy is an important factor, but diesel gensets offer greater flexibility than spark engines in that they can effectively generate power under multiple scenarios (Table C-1). A standard spark engine can only effectively generate power when the syngas fed to it is of good, consistent quality (a new operating concept is presented in Section C.8 ).

**Table C-1. Diesel vs. Spark Operating Conditions.**

| Operating Condition Of WTE System | Diesel Genset Operation (Dual-Fuel With JP8) | Spark Genset Operation |
|---|---|---|
| used only as a generator, with no waste processing | Yes | no |
| bootstrap WTE system | Yes | no |
| highly variable waste feed, syngas quality | Yes | no |
| steady state WTE operations | Yes | yes |

## C.2 Waste Derived Syngas

Military applications require simplicity and reliability. The WTE system developed by SUNY Cobleskill uses a robust and simple approach to thermally convert wastes into a gaseous fuel. Unfortunately, mixed wastes have two problems; excessive moisture and low energy content. Gasifying low energy wastes with excessive moisture results in ultra-low energy synthetic gas (syngas). The energy content of this gas is 10% to 15% of natural gas.

Nitrogen dilution is the main reason why the energy value of the syngas is weak. Waste derived syngas can be over 50% nitrogen. The majority of nitrogen is from air entering the gasifier to provide oxygen to combust char (flaming pyrolysis). The energy content of the syngas can easily be doubled by using pure oxygen, instead of air, for char combustion. However, the project team

believes that the use of oxygen is out of the question for contingency operations. Therefore the focus of research has been the most effective use possible of an internal combustion engine operating on ultra-low energy, unenhanced syngas.

### C.3 Energy Level of Waste Derived Syngas

The LHV of the syngas must be considered when determining fueling requirements for engines. HHV is not used since water vapor is not condensed in the exhaust stream. The LHV of waste derived syngas varies between 90 and 180 BTU per standard cubic foot (BTU/SCF). The energy varies based on the feedstock. Low energy dripping wet feedstock results in low energy syngas. The intent is to homogenize feedstock to obtain an average energy content (HHV) of about 7500 BTU/lb. Depending on the FC content, this feedstock would generate a syngas with a LHV of 120 to 160 BTU/SCF.

Syngas with an energy content of 90 to 100 BTU/SCF is quasi flammable. Significant flame separation occurs as the energy value decreases. The flame blows itself out when the auto-ignition temperature cannot be maintained. A dual fueled engine can still operate with fossil fuel savings even if the syngas cannot sustain combustion in air.

### C.4 Dual Fueling of Diesel Engine-Driven Generators

Diesel engines require very minor modifications to the air system to operate dual fueled on syngas and liquid diesel fuel. The only modification necessary is piping to introduce gaseous fuel into the airstream entering the engine. Figure C-1 shows the simplest configuration to feed syngas fuel into a diesel engine.

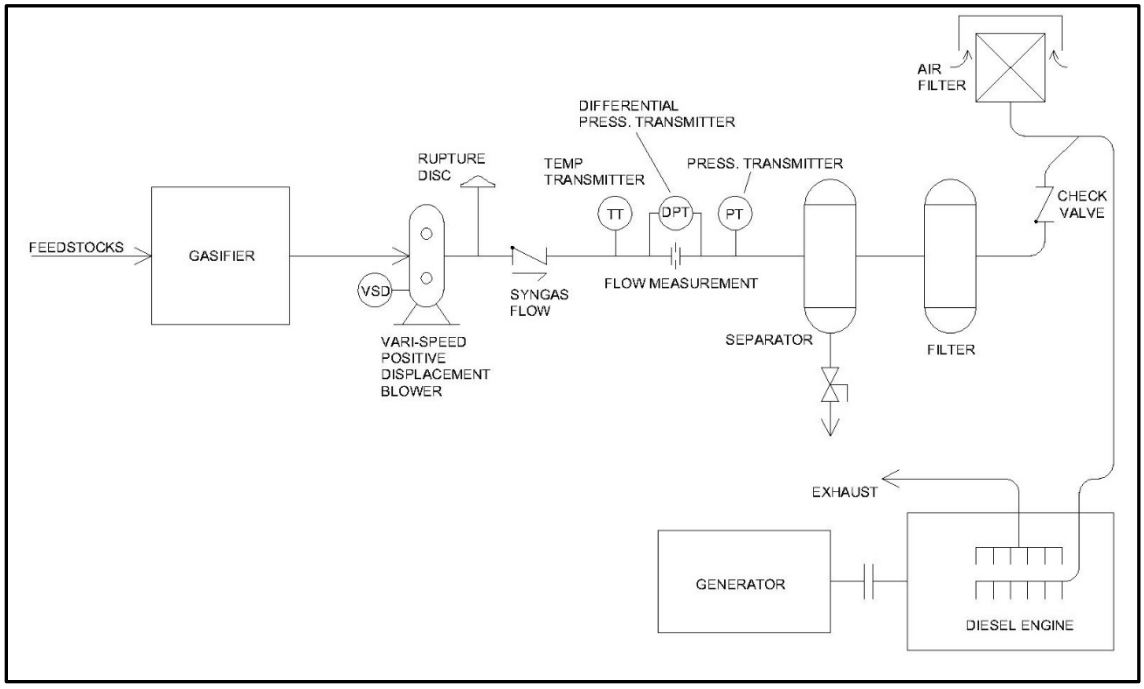



**Figure C-1. Syngas Fuel Feed System into a Naturally Aspirated Diesel Engine.**

A variable speed positive displacement blower is used to meter the feed of syngas to the engine at slightly positive pressure. The blower aspirates the gasifier system and engine vacuum is not used to avoid the significant loss of engine power. A flow orifice measures the flow of syngas. Gaseous fuel is fed into the intake air stream and enters the engine. The engine normally operates with significant amounts of excess oxygen in the exhaust stream, allowing any gaseous fuel to immediately combust.

The engine speed immediately increases when adding gaseous fuel. The engine governor monitors crankshaft speed and decreases the liquid fuel injection rate to maintain synchronous speed. The result is an immediate reduction in liquid fuel consumption. The flow of syngas can be further increased to offset liquid fuel usage. Limitations are insufficient excess air in the exhaust stream and pre-detonation (pre-ignition or excessive pinging) due to excessive gaseous fuel content exploding too quickly.

The flow of syngas is controlled at any load based on engine speed. Increasing the flow of syngas increases the engine speed on mechanically governed engines. The desired engine speed is the maximum governor speed at the fully unloaded condition. In most cases, this is 1860 rpm for a 4-pole generator. The flow of syngas is increased until the engine operates at the maximum allowable speed that results in the maximum liquid fuel savings. The engine can operate at any load using this method. Operating a diesel engine with the maximum syngas feed rate at full rated load results in 80% liquid fuel savings.

Increasing the syngas flow above the maximum allowable will cause the governor to momentarily stop the flow of liquid fuel into the engine. The engine speed drops and the governor starts the flow of injection again. This results in a surging of engine speed and is an indication of over-fueling the engine with syngas. Reducing the flow of syngas immediately corrects surging. Fueling is normally controlled to 99.5% of the maximum speed or 1854 RPM to avoid surging. The engine automatically transitions from dual-fuel mode to 100% liquid fuel by stopping the flow of syngas into the intake air. Only a slight variation in engine performance is observed when making these transitions.

Modifying an engine to use less than 20% liquid fuel injection rate at full load is possible. SUNY Cobleskill has demonstrated operating mechanically injected diesels dual fueled with over 96% reduction in liquid fuel usage. Although this is possible, numerous technical problems arise. The greatest problem being pre-ignition and detonation that eventually causes internal engine damage. Fuel savings in excess of 80% are possible using electronic engine controls, but further research would be required, including the need for altering engine electronic control systems.

Turbo charging increases the mass flow and compressive pressure within the engine. For every atmosphere of boost pressure, the flow doubles (if intercooled to the original temperature before injecting into the engine). A 3.0 liter naturally aspirated engine will have a suction air flow of 95 cubic feet per minute at standard conditions (SCFM). Applying a turbo charger to boost the air pressure in the intake manifold to 14.7 psi gauge will result in an isentropic discharge temperature of 186 °F. If an intercooler is not used to cool the air, the flow into the engine increases to 156 SCFM. If an intercooler cools the air to 100 °F before entering the engine, the flow further increases to 180 SCFM. Intercooling increases the density of the air, which increases the aspiration rate.

The cylinder pressure at top dead center also varies with the turbo pressure. An engine that has a compression ratio of 18:1 will have maximum cylinder pressure of 250 psi naturally aspirated. Turbo charging the intake manifold on the same engine to 14.7 psi gauge will increase the cylinder pressure to 515 psi, resulting in a significant power increase. The main purpose of a turbo charger is to get significantly more power out of a smaller engine. Turbo charging also helps to regulate emissions on modern engines.

Ultra-low energy syngas has a specific gravity of 0.9 to 0.95 with thermodynamic properties similar to air (ratio of specific heats). Feeding syngas into a turbo charged engine has negligible effect on the aspiration, other than displacing air.

A turbo charger normally operates at a rotational speed of 70,000 to 90,000 rpm. The syngas must be free of condensable tars and particulates to prevent accumulation on the turbine blades of the compressor. Any accumulation will cause the turbine to operate out of balance, causing vibration, bearing damage, and eventual failure. A naturally aspirated engine* is desirable over turbo charged engines due to this concern. Figure C-2 shows the gas feed controls for a turbo charged diesel engine.

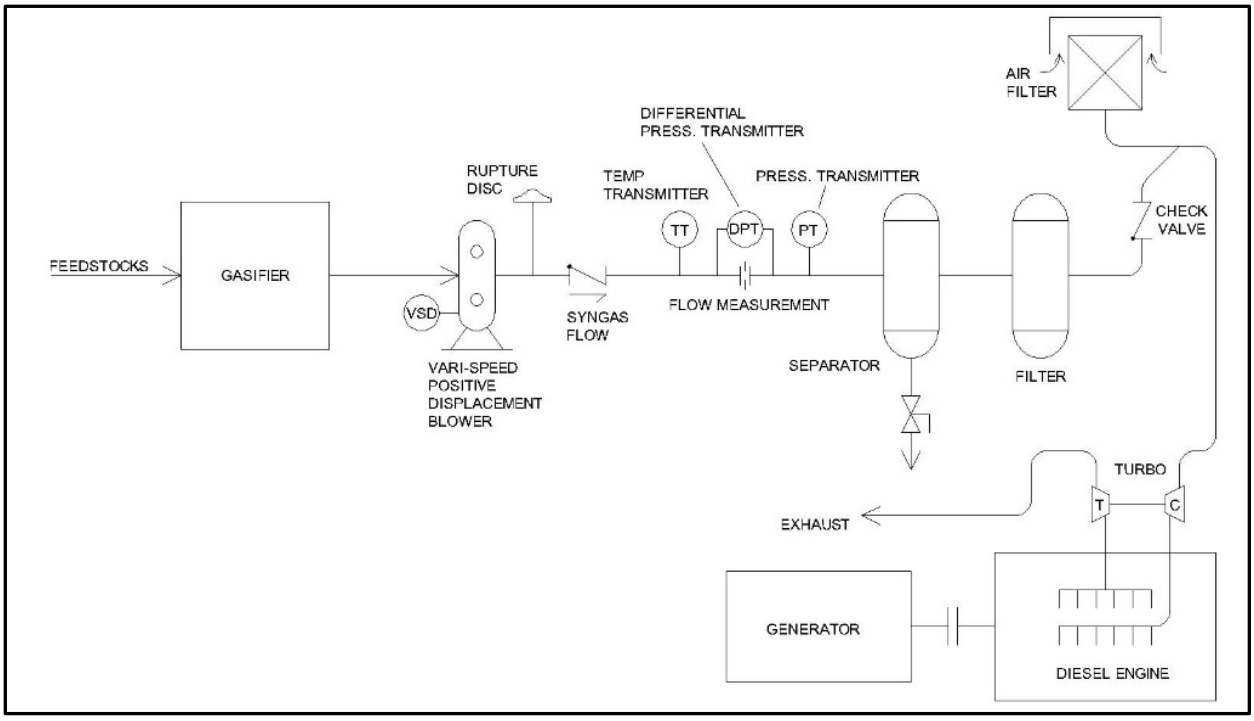



**Figure C-2. Feeding Syngas into a Turbo Charged Diesel Engine.**

Diesel engines operate with almost no power loss (less than 10%) when dual fueled on ultra-low energy syngas using this method. The governor maintains engine power by varying the liquid fueling rate to maintain the required crankshaft speeds. The engine must operate with excess oxygen in the exhaust stream to maintain power. Excessively weak syngas will displace

* Unfortunately, naturally aspirated diesel engines are not readily available commercially, as manufacturers move towards universal turbo-charging to obtain higher power with smaller displacement.

combustion air and could cause the engine to crash stop due to the lack of adequate oxygen. An oxygen sensor is normally used in the exhaust to avoid over-fueling with syngas.

## C.5 Comparing Diesel and Otto Spark Ignition Engines

Diesel engines are commonly preferred for generator applications over Otto I/C spark ignition engines mostly due to the ability of the engine to increase torque while maintaining shaft speed under sudden increases in load. Diesel engines operate under an entirely different thermodynamic cycle than do I/C spark ignition engines. Diesel engines operate at constant pressure (isobaric) for a significant portion of the stroke as the piston travels from top dead center to bottom dead center in the cylinder. This allows the greatest amount of torque to be placed onto the crankshaft by applying full force at the mid-stroke position.

The thermodynamic efficiency of most modern diesel engines varies from 30 to 43%. Otto I/C spark ignition engines vary from 15 to 28%. The thermodynamic cycle of the Otto engine varies dramatically from a diesel. Ignition in an Otto engine results in a severe pressure spike that rapidly decreases as the piston travels from top dead center to bottom dead center. This provides significantly less torque at the mid-stroke position.

Test data indicates a loss of thermodynamic efficiency when operating diesel engines dual-fuel on syngas. The hypothesis conclusion is the engine transitions from a diesel to an Otto when increasing the fueling rate of syngas. Dual fueling may result in a quasi “Otto-diesel” cycle. The gross thermodynamic efficiency of a Yanmar 4TNV88 naturally aspirated diesel engine drops from 38% to 26% when operating on 83% gaseous syngas and 17% liquid fuel.

## C.6 Otto Spark Ignition Engines

Numerous parameters must be considered when applying spark ignition engines. Octane number is the resistance to pre-ignition used for gasoline engines. Traditionally, high octane fuels explode at a slower rate, allowing the use of high compression engines and the advancement of spark ignition. This increases power output without pre-ignition or detonation.

Pre-ignition and detonation are abnormal forms of combustion within the cylinder. Pre-ignition is when the mixture explodes in the cylinder before the spark plug fires. Detonation is unexpected accelerated combustion after the spark plug fires. The result of these problems is knocking, which eventually causes severe internal engine damage.

Octane is not a representative reference for gaseous fuels. The gas engine industry has adopted the methane number system as a means to equate a fuels resistance to pre-ignition and detonation. The methane number scale equates the value of 100 with methane and 0 (zero) with hydrogen. Hydrogen is a very fast burning gas prone to pre-ignition and detonation. Mixtures of gases fall between.

The main design issues to avoid pre-ignition and detonation are the following:

- compression ratio
- ignition timing
- air temperature entering the cylinder

- engine power de-rating.

The engine timing must be adjusted to avoid pre-ignition and detonation. This adjustment is normally made based on methane number. Modern engines use sensors and electronic engine controls to vary the ignition timing to avoid these problems. Advancing ignition timing increases engine power and retarding ignition timing reduces engine power. A gas with a low methane number (with appreciable hydrogen content) will require the retarding the ignition timing, resulting in a power loss.

The second parameter of concern is Relative Power Capacity (RPC). RPC is used to determine the power loss of an engine due to fueling energy loss. RPC is the ratio of specific LHV of the fuel-air mixture (SLHV) of the fuel gas compared to natural gas. SLHV is the energy content of the fuel gas divided by the total flow into the engine (units are BTU/SCF). The ratio is a direct representative of power loss.

As discussed previously, maintaining crankshaft speed is nearly impossible when using intake throttling when fueling the engine on 100% ultra-low energy syngas. Figure C-3 shows the minimum gas controls that are necessary to feed syngas into an internal combustion spark ignition engine. Although, this arrangement is possible, fast response of gas controls to meet changes is power demand is highly questionable, even using the most modern electronic controls. A main gas energy (BTU adjustment) valve is required to change the flow of gas based on the LHV. The changes of gas flow and combustion air are dramatic for ultra-low energy syngas. A combustion based gas analyzer would be required to determine the LHV of the gas on a continual basis to maintain proper fuel metering. Gas controls also requires extensive use of pressure regulation devices for precision metering. In theory, the use of multiple pressure regulators is an acceptable means for gas regulation, but in practice, regulators have numerous mechanical problems when operating on syngas and have been found to be unreliable.

The presence of hydrogen within the syngas mixture presents numerous problems with operating spark ignition engines. Most of the gaseous fuel engines operating on natural gas, landfill gas, and digester gas are high compression diesel engines modified to operate as Otto spark ignition engines. High hydrogen content in the syngas mixture will lower the methane number and may prevent a traditional high compression gas engine from operating properly on syngas.

## C.7 Power Loss of Otto Spark Ignition Engines

Unlike diesel engines, Otto spark ignition engines experience a significant power loss when operating on ultra-low energy syngas. The main power loss is from RPC. Ultra-low energy syngas requires a high flow of both fuel gas and air to enter the engine to develop power. Power loss results from the SLHV being too dilute. Partial power gains are possible by turbo or super charging.

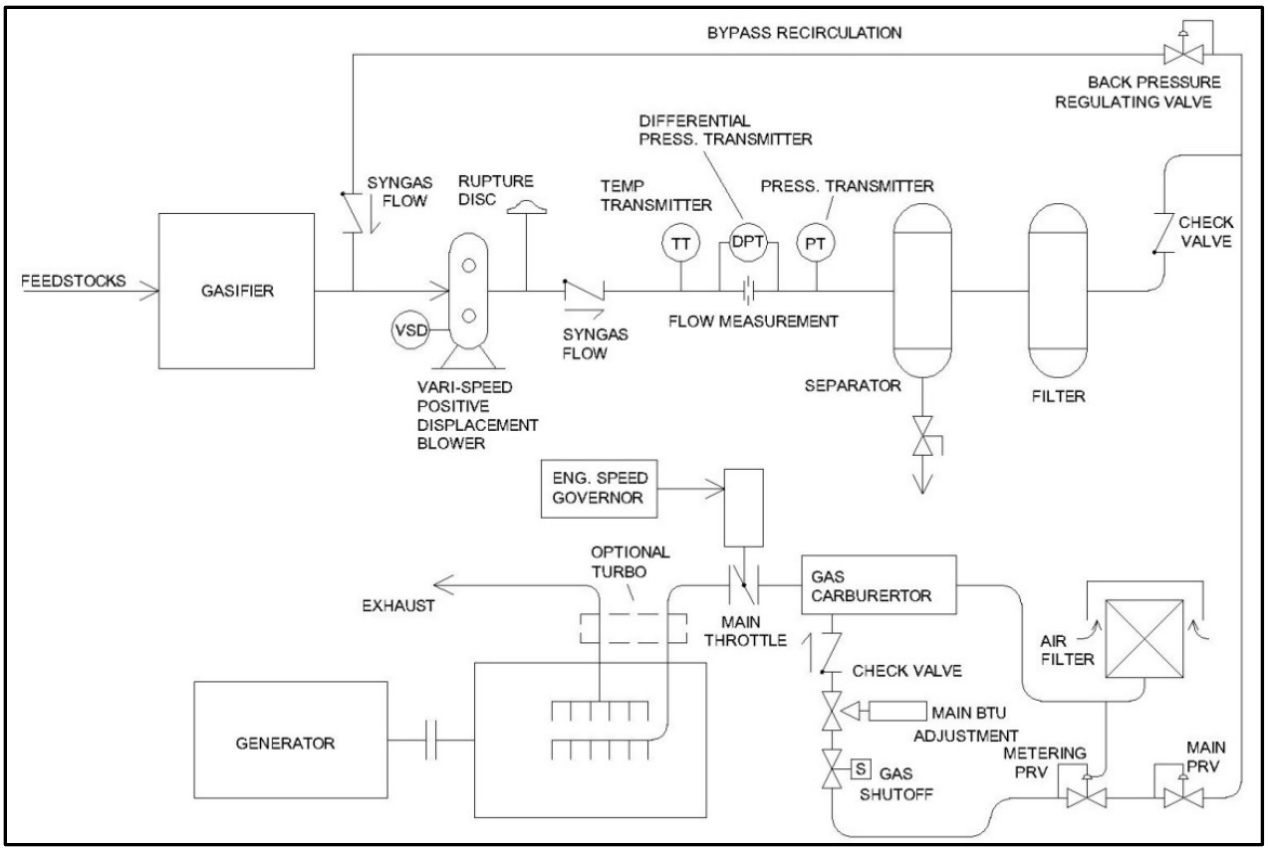



**Figure C-3. Minimum Controls to Feed Ultra-Low Energy Syngas into and I/C Spark Ignition. Engine**

The second main cause for power loss is pre-ignition and detonation (methane number). Engines must operate at retarded ignition timing and at lower compression ratios.

## C.8 Hybrid Otto – Diesel Spark Ignition Engines

The hybrid Otto-Diesel spark ignition engine was developed by SUNY Cobleskill* to address the problems of operating an Otto spark ignition engine on ultra-low energy syngas. The advantages of both engines were combined. The primary focus was to modify the Otto spark ignition engine to handle gaseous fuel mixing and air control identical to a diesel.

The SUNY engine is designed to operate without a governor. Crankshaft speed is electrically controlled by the natural induction properties of the generator. The flammability limit of syngas is approximately 4.5% to 75%, allowing a wide range of air to fuel ratios where the engine will run.

The induction generator acts as a motor and spins the engine when grid power is applied. Syngas is fed into the intake air, ignition occurs, and the engine runs over a wide range of air to fuel ratios. The amount of syngas flow increases, allowing the engine to put mechanical power into

* Note that this work is not being pursued under SERDP funding, but is discussed here to fully address the topic. This technology may be pursued for military application at a later date under a separate program.

the electric motor. The induction motor transitions into a generator when the crankshaft exceeds the synchronous speed. Electrical power is pushed backwards from the generator onto the local grid for baseline use. The amount of power generated varies with the energy content and flow of the syngas fuel provided to the air intake. The engine continues to operate as long as the air to fuel ratio is within the wide range of flammability limits of the syngas. Research has determined this would be a very efficient method for electrical generation using ultra-low energy waste derived syngas.

The mixture of air and gaseous fuel enter the engine un-throttled. The flow of gaseous fuel is metered into the engine based on the engine speed. The flow of syngas increases until the engine reaches the speed that provides the maximum power output of the generator (synchronous speed plus the slip or the rated full load amps of the motor). The second limitation is sufficient excess air must exist for complete combustion. The limitation is to operate the engine similar to a diesel, with at least 3% excess oxygen in the exhaust stream. Figure C-4 shows the configuration required for the SUNY generating system.

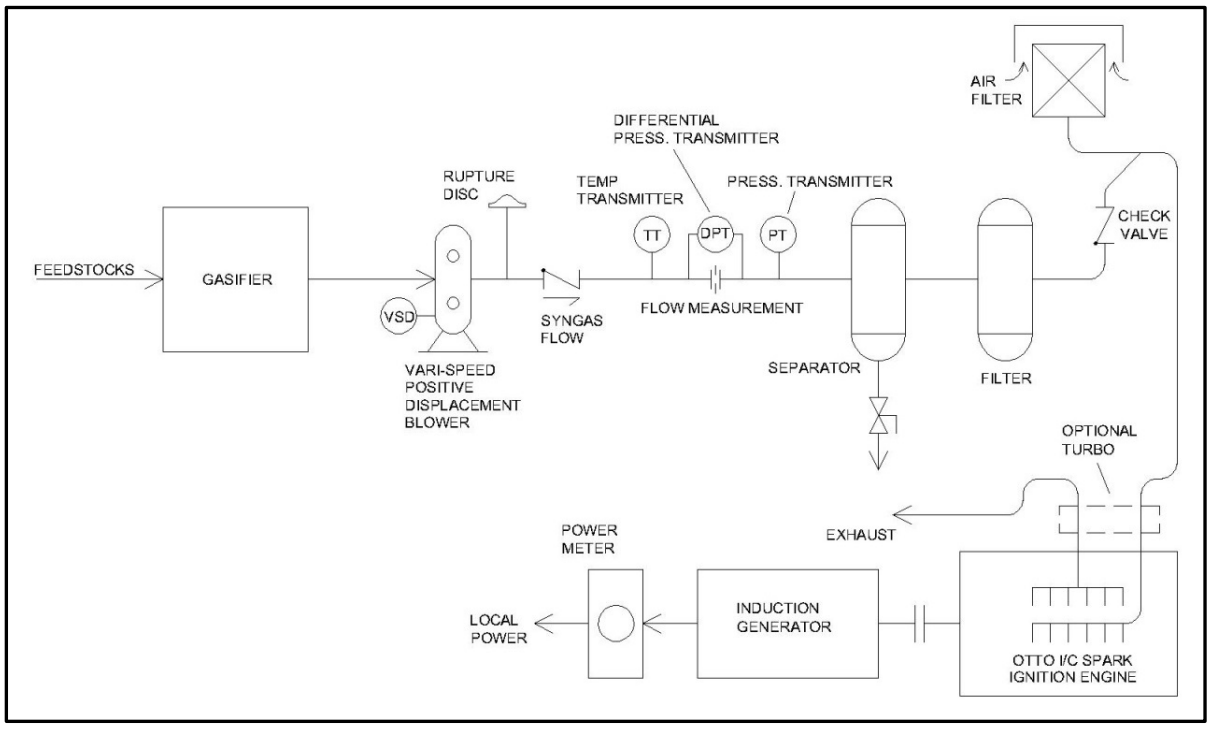



**Figure C-4. Hybrid Diesel-Otto Generating System for Ultra-Low Energy Syngas.**

The design approach is as follows:

1. Use a naturally aspirated engine to avoid turbo problems operating on syngas.
2. Use a standard gasoline engine with a low compression ratio (7:1 to 8.5:1) to avoid pre-ignition and detonation problems operating on syngas with a low methane number.
3. Oversize the engine (with a gasoline power rating 2.2 times) larger than the generator to accommodate for power loss and to minimize NOx formation.
4. Operate the engine at 3600 rpm to maximize power output.

This generation method is perfect for micro-grid applications. The application of smart grid technologies can enable precision load matching to regulate the syngas production of the WTE system to meet the baseline generation needs of the micro-grid. Battery / inverter based alternative energy systems can be tied directly to the induction generator for syncing power. This arrangement allows the SUNY generation system to meet the power demands and simultaneously back feed through the inverter to charge the battery bank.

A 2.2 kW hybrid Otto-Diesel generator was developed by SUNY Cobleskill and tested for over 200 hours on downdraft syngas by an intern. The results of operating this generator on various fuel gases are available in a separate report.

## C.9 Generating Electricity

Most applications require alternating current (AC) electrical power. Power is generated at either 50 or 60 Hz. Most power in the Americas is 60 Hz. 50 Hz is prevalent in some foreign countries. Common generating voltages for 60 Hz applications are 480 VAC for 3-phase applications under 250 kW. Residential applications use smaller generators that operate on single phase 120/240 VAC power.

### *C.9.1. Alternating Current*

Alternating current that changes polarity at a rate of 60 times per second (60 Hz) is required in the United States. Generators must operate at constant synchronous speed to provide frequency control based on the windings of the generator head as follows:

- Two Pole – 3600 rpm
- Four Pole – 1800 rpm
- Six Pole – 1200 rpm.

Most generator engines have a precision governor that regulates the engine speed within 2% of the required synchronous speed of the generator. For example, a four pole generator with a traditional mechanical governor will operate at 1860 rpm at no load and 1785 rpm at full load. The frequency varies from 62 Hz at no load to 59.5 Hz at full load.

Modern generators use electronic governor control. The electronic engine control module (ECM) uses with proportional integral derivative (PID) logic to regulate the engine speed at exactly at the synchronous speed. Frequency control can be within 0.1 Hz at varying electrical loads.

### *C.9.2. Inductive and Resistive AC Loads*

The type of load must be considered when applying a generator. Inductive loads are applications where the electricity is used to drive magnetic devices, such as electric motors. Resistive loads are applications where the electricity is used for lighting or resistive heating.

Inductive loads create numerous electrical issues. Electric motors take a significant amount of inrush current to start, especially if the motor is connected to a high inertial load. The generator must be able to maintain synchronous speed when starting electric motors. Normal inrush current

can be over six times the full load operating current when direct starting across the line. The inrush current can be reduced using more complex switchgear or soft starters.

If the engine cannot provide enough power to maintain synchronous speed when starting an inductive load, the frequency and voltage will also drop with the generator speed, causing the electric motor to draw significantly more current. The result could turn into a runaway situation where the generator engine may not be able to create sufficient shaft power, causing the engine to lug or crash stall before electrical safety equipment disconnects the load.

Unlike inductive loads, resistive loads have minimal or no inrush current when starting. The starting inrush current is normally equal to the operating current. A properly sized generator can easily maintain synchronous speeds when energizing resistive loads.

A severe voltage spike may occur if the electrical load suddenly disconnects when the engine is lugging under the synchronous speed. Significant electrical damage may occur to wiring, busses, switchgear, and sensitive electronics when the generator is momentarily operating more than 3% over or under the synchronous speed.

### *C.9.3. Selecting Generators*

The generator size is selected based on the sum of inductive and resistive loads. Common practice is to operate a generator at 20% to 30% load to provide sufficient reserve to start inductive loads.

Load control must be considered to ensure the generator has enough reserve power to start inductive loads. Most generators are sized for 3 to 6 times more capacity than the largest inductive load. For example, a 45 kW generator will provide ample power to start an air conditioner compressor with a 10 HP motor across the line if no other loads are connected. The generator will run at 17% load once the compressor is running. Resistive loads can be added after the inductive load is running. Load management is necessary for equipment that starts and stops automatically. Soft starters or variable frequency drives will allow the use of a smaller generator, but these devices are sensitive to generator power variations due to poor speed control.

### *C.9.4. Grid Power*

Grid power provides an essentially infinite amount of energy to start inductive loads. The flow of electricity is limited only by transformer, wire, and switchgear capacities. Grid power provides a significant advantage over rotary generators by providing infinite resources to maintain frequency control at exactly 60 Hz when drawing heavy inrush current after connecting an inductive load.

### *C.9.5. Direct Current Power Generation*

Generating direct current (DC) provides numerous advantages when operating a generator on syngas. The main advantage is dramatic engine speed variations do not matter when using a rectified field excited alternator. This type of system normally requires a battery bank and a DC to AC solid state inverter. This equipment is complex and is not well suited for military applications due to extensive use of solid state circuitry that is sensitive to static and dirty power.

Direct power generating systems are ideally suited for joint alternative energy systems (wind, solar, etc.) that normally operate on DC power. An internal combustion engine-driven DC generator can be used to provide baseline power and quick battery charging.

The overall feasibility of a DC power grid for contingency operations could be the subject of a future study.

### C.10 Summary and Conclusions

Diesel generators are the most simple and reliable method to generate power from waste derived syngas, making them the obvious choice for military applications. Unfortunately, liquid fuel is required to operate a diesel generator on syngas, albeit at much lower usage rate for a given electrical output. Given the robust and flexible diesel engine generators, the present project team recommends, and will continue to develop a diesel WTE solution.

Otto spark ignition engines offer the ability to operate on 100% syngas without the need for secondary pilot fuels. Unfortunately, operating a spark ignition engine with a traditional gaseous fuel delivery system on ultra-low energy syngas is difficult and complex. Significant electrical damage will occur if the engine speed is not kept within 3%. A momentary over-speed or under-speed condition will cause power spikes that can severely damage electrical equipment.

The SUNY generating concept uses a hybrid Diesel – Otto engine directly coupled to an induction generator to address the issues with operating a spark ignition engine on ultra-low energy syngas. The generator operates nearly identical to a diesel driven unit without the need for a secondary fuel. This system does require an existing power network, and cannot operate independently.

# Appendix D: Patent Application

The research team is pursuing intellectual property rights for the IIFPRG technology. The intention is that the DoD would have complete rights to develop and deploy this system, while the SUNY Research Foundation could pursue commercial or municipal markets. This section contains the Record of Invention forms, filed through the Research, Development, and Engineering Command (RDECOM).

**INSTRUCTIONS FOR PATENT DISCLOSURE DATA RECORD**
**AMCCOM FORM 384-R**

The following Technical Requirements must be included in the Descriptive Write Up Section:

The Patent Disclosure Data Record should contain replies to the following:

1. What problem does your invention solve? How long has the problem existed?
2. What old ways are available for solving the problem?
3. Why were the old ways unsatisfactory for solving the problem?
4. What are the new results and advantages of your invention?
5. Describe your invention. Include:
    a. Reproduction of drawings or sketches – number all elements.
    b. Name, reference, and describe function of numbered elements.
    c. List changes, additions, or improvements over the old ways.
    d. Indicate briefly, alternate methods of construction or composition.
    e. For basic inventions – note scientific principle upon which it is based, if known.
6. State sequence of operation of your invention, if applicable and not already included under (5).

Each inventor must sign and date each sheet of the disclosure and each reproduction of drawings. Also, two (2) witnesses who have read and understand the disclosure must sign and date each sheet of the disclosure and each reproduction of drawings.

Attach any pertinent literature, such as reports, which may aid in the preparation of a patent application.

NOTE: Reports are useful in preparing the patent application and should be supplied where available. However, reports cannot take the pace of this disclosure, and should not be provided for that purpose only.

NOTE: In cases in which there is more than one inventor, all inventors must have contributed to the invention in order to be included as joint inventors. Improper joinder of inventors can result in the invalidity of any resulting patent. Any questions in this regard should be referred to the ARDEC attorney handling the case.

Electronic Instructions:

Fill out the gray areas of the forms USING Microsoft Word.

Reproductions of pertinent drawings or sketches can be attached to the printed forms. These drawing must also be submitted electronically. Sign and date each sheet of disclosure and each reproduction of drawings. Forward the completed forms to lorilee.andrews@us.army.mil

**PATENT DISCLOSURE DATA RECORD**
**(FOR ATTACHMENT TO MILITARY INVENTION RECORD)**
**(AMCCOMR 27-2)**

| Page Number: | Number of Pages: | Docket Number (Filled in by Legal Office: | |
|---|---|---|---|
| Title of Invention: Inclined Indirect Flaming Pyrolysis Rotary Gasifier (IIFPRG) | | | |
| REFERENCE DATA<br>LABORATORY OR ENGINEERING NOTEBOOK NUMBER PAGES<br>OTHER | | | |
| DESCRIPTIVE WRITE UP (Include sketches separately)(This box will expand as needed, please hit returns at end of line)<br>Please see write up below. | | | |
| INVENTOR(S) | | WITNESSED AND UNDERSTOOD BY: | |
| SIGNATURE | DATE 6/11/13 | SIGNATURE | DATE 6/11/13 |
| SIGNATURE Paul Redner | DATE 6/11/13 | SIGNATURE | DATE |
| SIGNATURE | DATE 6/11/13 | SIGNATURE | DATE 6/11/13 |
| SIGNATURE | DATE 8-5-13 | SIGNATURE | DATE 8/5/13 |

AMCCOM FORM 384-R, 1 SEP 85

8-5-13 8-5-13

AMCCOM FORM 384-R
CONTINUATION PAGE FOR DESCRIPTIVE WRITE UP (AS NECESSARY)

1) Problem Solved:

Converts solid and liquid wastes to a synthetic fuel gas similar to natural gas with minimal or no feedstock preparation. Possible feedstocks include fuel crops, wood chips / byproducts, hay, straw, coal, agricultural wastes, municipal solid wastes, tires, lubricants, plastics, munitions, sewage sludge, construction and demolition debris, etc. Any feedstock that burns with an open flame can be processed. Technology will handle dripping wet feedstock, which is a common problem with most wastes. Produces a gas that can fuel an engine, allowing the only emission source to be engine exhaust, not incinerator flue gas. Flammable liquids, such as waste lubricants, can be added to feedstock. Metals, glass, soils, and other inert items simply pass through the gasifer and discharge with the ash. The only products from the process are ash and synthetic fuel gas.

2/3) Old Ways/ Competitive or Alternative Products

Stratified downdraft gasifiers (CPC, ISG). Rotary kiln gasifiers (direct and indirect). Plasma gasifiers. These alternative products are less effective and have operational issues when dealing with product waste streams.

4) Advantages:

No feedstock preparation (garbage truck approach). Handles dripping wet feedstock. Converts wastes to electrical and heat energy, or liquid fuels. Reduces mass of wastes by 80 to 98%. Reduces volume of wastes by up to 98%. Reduces volume of wastes sent to landfills and associated trucking costs. Reactor operates at intense temperatures, insuring full thermal processing. Gas is scrubbed clean prior to final combustion. Waste heat can be recovered for space and water heating. Only emission source is engine exhaust. Significantly different approach to incineration. Fully automated, does not require human operator.

a) Disadvantages

May be maintenance intensive. Diesel engine emissions are a problem with new stringent EPA regulations. Co fueling is not economical. Waste water disposal may be a problem. Long term reliability must be proven.

5) Description of the Technology

Main purpose is to convert solid and liquid feedstocks into a synthetic fuel gas that burns similar to natural gas, but at a lower heating value. Gasifier is a rotating drum mounted on an incline. Feedstock is fed into the reactor from the downhill end. Reacting feedstock is used to seal the rotating drum, eliminating the need for mechanical seals and packing. Inert items such as metals, glass, soils, etc. pass thru the system quickly and discharge with the ash. Un-reacted feedstock tumbling inside the rotating drum scrubs the syngas clean of ash, tars, and aerosols. Tars are re-gasified when the feedstock reaches the reaction zone. Hot syngas passes through cool feedstock, heating and drying the feedstock. Moisture flashes off to slightly superheated steam and exits

the gasifier with the syngas. Steam is condensed back to a liquid within the scrubber. See Appendix A for further details.

Potential Products/Services

Military purposes, including waste to energy and hydrogen powered equipment. Combined heat and power for commercial and municipal buildings, schools, and colleges. Reduces landfill usage by processing municipal solid wastes at the transfer station. Sewage sludge processing. Clean coal. Ultra clean hydrogen combustion. Waste to liquid fuels. Waste to asphalt. Carbon sequestration. Distributed power generation.

Appendix A
Inclined Indirect Flaming Pyrolysis Rotary Gasifier Introduction
The Inclined Indirect Flaming Pyrolysis Rotary Gasifier (IIFPRG) converts any solid feedstock directly into synthetic fuel gas (syngas) that can be used similar to natural gas, but with cleaner combustion properties. The only byproduct of the process is ash. Any flammable solid feedstock that burns with an open flame can be processed, including, but not limited to wood, energy crops, construction and demolition wastes, agricultural wastes, and municipal solid wastes. The unique inclined rotational property of the gasifier allows inert non-flammable items to be mixed with the feedstock, avoiding the need to prepare and separate feedstock prior to processing. Inert items such as metals, glass, stone products, and soils simply pass thru the system and are discharge out of the gasifier with the ash. The gasifier is able to process solid feedstock without the need of pre-drying. The feedstock handling system uses a hydraulically powered piston to compact the wastes to drive feedstock into the gasifier and mechanically squeeze out excess water. The compressed feedstock acts as a material seal to prevent the entrance of air into the rotary gasifier at the feed point. The gasifier incorporates an inclined rotating drum that is mounted on an aggressive incline, allowing feedstock mixed with inert items to tumble downhill toward the reaction zone. Hot syngas must pass thru raw tumbling feedstock. Feedstock moisture is evaporated to steam that exits the gasifier with the syngas. Steam is condensed back to liquid water in the condenser portion of the scrubber. Hot syngas also directly contacts cool raw tumbling feedstock. Complex hydrocarbon aerosols, in the form of tars, condense on the cool raw and tumbling feedstock to scrub the gas clean as it exits the gasifier. The gasifier automatically cracks these tars as the feedstock is processed within the reaction zone. Flammable liquids, such as used engine oil and lubricants, can be mixed with the solid feedstock and gasified or injected separately. The gasifier consists of a totally enclosed rotating shell that is mounted on a substantial incline. All thermo-chemical reactions occur within the rotating shell. The design does not use any mechanical seals to prevent the leakage of air into the reactor. The reacting feedstock within the shell acts as the seal between stationary and rotating elements. The IIFPRG also has a non-rotating cylindrical chamber that encloses the rotating shell. Extra thermal energy is transferred into the rotating shell to dry wet feedstock. Thermal energy is provided preferably from engine exhaust or by cyclonically combusting a portion of the syngas within the annulus between the stationary and rotating shells. If the thermal energy required to vaporize feedstock moisture exceeds the available energy in the fixed carbon, a portion of the gas produced by the gasifier can be burned on the outside of the gasifier shell to provide additional thermal energy. The unique design of the IIFPRG allows the processing of dripping wet feedstock for the following reasons:

1. Excess water is removed using super-compression prior to feeding feedstock into the

gasifier.

2. Remaining moisture within the feedstock vaporizes to steam that is slightly superheated.

3. A non-rotating cylindrical chamber encloses the rotating shell allowing heat to transfer into the rotating shell to support the drying of wet feedstock. Thermal energy can be provided from engine exhaust or by combusting un-used syngas. Steam immediately mixes with the exiting syngas and leaves the gasifier. The design prevents steam escaping from feedstock moisture from reacting with the red hot burning char zone, saving about 65% of the thermal energy to superheat the steam to 1800 deg. F and thermo-chemically split the steam into additional hydrogen and carbon monoxide.

4. Steam that is slightly superheated, mixes with the syngas exiting the gasifier and is condensed to liquid water in the scrubbing system.

5. The recovered condensate (waste water) may be injected into the back of the IIFPRG to force the highly endothermic water-gas reaction, where water passing over hot carbon is split into flammable gas using the chemical reaction of $H2O + C \rightarrow H2 + CO$. Water also generates additional hydrogen gas by the slightly exothermic water gas shift reaction of $H2O + CO \rightarrow H2 + CO2$.

6. Remaining waste water is vaporized to steam using engine exhaust.
The flammable gas created by the IIFPRG must be quenched in temperature, cleaned of particulates and tar aerosols, and dried prior to feeding an engine. The scrubber is a unique design that quenches the temperature of the gas from high temperatures, power washes the gas multiple times using high pressure oil, pumps the gas using a unique jet arrangement, and then dries the gas to remove excess moisture all in one vessel. Depending on the application, high sulfur feedstock may require the removal of sulfur from the fuel gas using a dry powder fluid bed scrubber. The resulting syngas can be used in a manner similar to natural gas, but is most ideally suited to operate a stationary internal combustion engine driven generator. Other uses for the syngas include direct combustion for heating purposes, powering steam turbines, and fueling gas turbines. The IIFPRG is ideal to generate a syngas that is rich in hydrogen content when blown with oxygen instead of air. Hydrogen rich syngas is ideal for military purposes, such as propellants, fuel cells, and liquid fuel synthesis. Hydrogen fuels for combustion are of interest since the main combustion product is water vapor.

Main Features

1. Directly converts wet wastes into a flammable gas that can be used to fuel combustion equipment and engines.

2. Able to process dripping wet wastes by management of thermal energy.

3. Non-flammable feedstock does not need to be separated from flammable feedstock.

4. Gasifier is infinitely scalable.

5. The size of the feedstock handling system is proportionate to the gasifier size. Shredding feedstock on larger systems is not necessary, since the feedstock handling system will be able to handle large chunk sizes.

6. The rotating drum allows feedstock to continually tumble, allowing complete exposure to reaction surfaces.

7. Design allows tar to condense on un-reacted feedstock entering the gasifier, partially scrubbing the gas prior to exiting the gasifier.

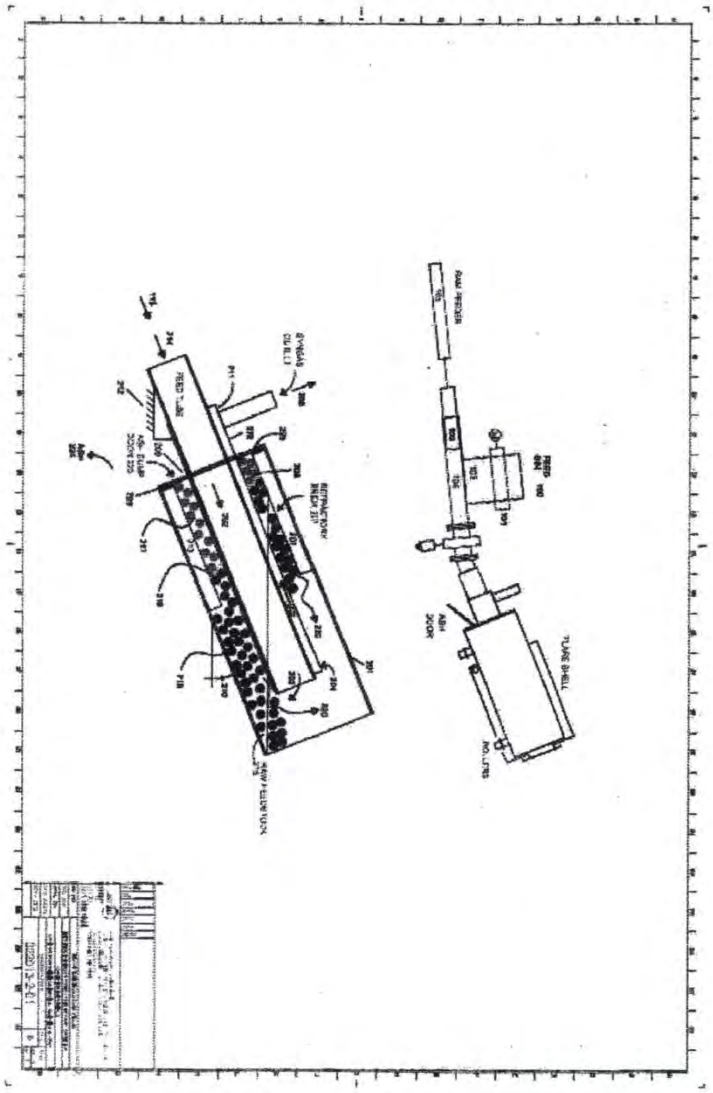
8. Gasifier has no mechanical rotating seals. Reacted feedstock is used to seal between rotating and stationary elements.
9. The high heating valve of the gas is improved by removing in excess of 95% of the moisture in the syngas fuel prior to final combustion.

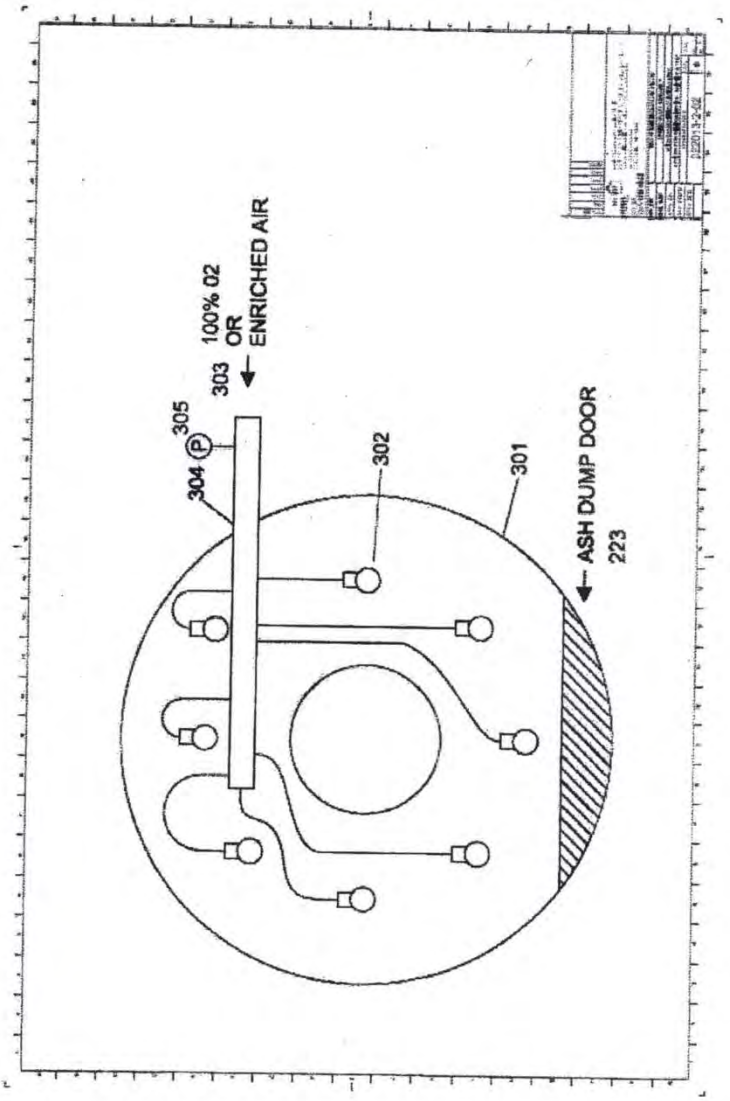
10. Operating on carbon rich feedstock, using oxygen as blowing gas, and injecting water into the combustion zone of the gasifier allows the generation of syngas that consists primarily of hydrogen gas and carbon dioxide. Carbon dioxide can be separated, resulting in a fuel gas consisting primarily of hydrogen for military purposes, fuel cells, liquid fuels, and ultra clean combustion processes.

Detailed Process Description Rotary Gasifier
Refer to drawing SUNY Cobleskill Center for Environmental Science and Technology Drawing # 010713-2-03.
The Inclined Indirect Flaming Pyrolysis Rotary Gasifier (IIFPRG) consists of a rotating cylindrical shell 201 that is mounted on incline angle 210. The preferred angle is about 22 degrees, but may be more or less depending on the geometry of the unit. Shell 201 rotates by a chain drive, but a variety of other driving methods may be used, including traction drive and bull gear. A stationary center tube 211 is mounted as a cantilever in the exact center of rotation of rotating shell 201 and is anchored at 212.
The inside diameter of rotating shell 201 is lined with refractory 207 for length 213. Feedstock 113 is pushed up stationary feed tube 202 and enters at 214. The area of the feed tube increases by at least 80% at 214 to allow feedstock to decompress and spread apart. Chunks of partially decompressed feedstock are pushed up stationary feed tube 202. Heat from hot exiting syngas 205 transfers into the incoming raw feedstock to dry and de-volatilize by indirect pyrolysis. Steam, gas, and feedstock discharge at the end of the feed pipe 202 at point 203. Feedstock 203 falls into rotating shell 201 and tumbles downhill 215 toward refractory lined section 207. Air enters the gasifier thru small gaps 216 and burns de-volatilized feedstock as fixed carbon with red hot burning coals 217. An abrupt line between raw feedstock and red hot burning coals forms at 218. High levels of heat from burning coals 217 directly contacts raw feedstock 219 tumbling downhill, causing flash gasification of feedstock on gasification interface line 218. Syngas 220 laden with tars must flow thru raw tumbling feedstock 219. Tar aerosols in syngas 220 condense on the raw tumbling feedstock 219, scrubbing the gas of aerosols and particulates prior to exiting the gasifier chamber at port 204. Tars and ash that become imbedded in the raw feedstock are reprocessed when the feedstock 219 tumbles down to gasification interface 218. Raw feedstock 219 is continually gasified to burning char coals 217, which are evenly dispersed around the entire annulus. Ash 224 discharges from the bottom spring plate 225, either thru the air entrance gaps or thru ash dump door 223. Slag, metals, glass, soil, etc. also withdraw from the gasifier thru ash dump door 223. Partially scrubbed syngas enters the gas withdrawal pipe 222 thru discharge port 204 and flows down eccentric annulus 205 between feed tube 202 and gas withdrawal tube 222. Gas exits the gasifier using pipe 206.
The energy value of the syngas produced can be improved by using oxygen enriched air or 100% oxygen as blowing gas instead of using air. The use of oxygen instead of air reduces the amount of nitrogen that enters the system with the air. Nitrogen dilutes the syngas and lowers the heating value. Refer to drawing 011513-2-01. Oxygen is injected

thru multiple tuyeres evenly spaced on flexible spring plate 301, which is mounted on the bottom end of gasifier 201. The flow of oxygen or enriched air 303, enters pipe 304 at pressure 305, and is evenly distributed around the annulus using injection tuyeres 302. The flow of blowing gas is based on pressure 305 and is varied until the pressure on the opposite side of spring plate 301 is slightly positive on the inside surface of spring plate 301 within the gasifier.

David Waage
Research Foundation of SUNY
SUNY Cobleskill
Date: 2-20-13




100% 02
OR
ENRICHED AIR
303
305
304
P
302
301
ASH DUMP DOOR
223

RECORD OF INVENTION
(AMC-R 825-2)
(To be attached as cover sheet to detailed description of the invention)

| 1. NAME OF INVENTOR(S) | 2. HOME ADDRESS OF INVENTOR(S) WITH ZIP CODE | 3. E-mail address + work phone number |
|---|---|---|
| David Waage | SUNY Cobleskill | 5182555312 |
| Gary Collins | SUNY Cobleskill | 5182555312 |
| Philip Darcy | Benet Labs | 5182664534 |
| Paul Redner (more inventors listed below under #6) | ARDEC | |

4. Invention Title: Inclined Indirect Flaming Pyrolysis Rotary Gasifier (IIFPRG)

| 5. Invention History: | Date | Place of Action or Name of Persons |
|---|---|---|
| (a) Conception of Invention | 2/20/13 | W15QKN-08-1-0001 SUNY Cobleskill |
| (b) First Sketch or drawing | | |
| (c) First written description | | |
| (d) Disclosure to others | | |
| (e) Completion of model | | |
| (f) Completion of full-scale item | | |
| (g) First test of inventive item | | |

6. Individuals having first hand knowledge of any of the features of the invention history:

| NAME | ADDRESS | FEATURE |
|---|---|---|
| | | |
| COL R. Lachance (Also an Inventor) | USMA | all |
| Steve Cosper (Also an Inventor) | ERDC CERL | |
| | L | l |
| | | |

7. Results of test (check block that applies):

Successful ☐ Marginally Successful ☐ Unsuccessful ☐ No Tests Run ☒

8. Repositories of Invention Data:

| Document Title | Location |
|---|---|
| | |
| | |
| | |
| | |
| | |

AMC FORM 1255-R-E JUL 94

| 9. Invention Publication (Disclosure Outside of Government): | |
|---|---|
| Publication Media | Date of Publication |
| N/A | |
| | |
| | |
| | |
| | |

| 10. Known Related Patents and Applications (if applicable): | |
|---|---|
| Patent or Application | Patent or Serial Number (If known) |
| SUNY RF | 1901-370 |
| | |
| | |
| | |
| | |

11. THE ATTACHED INVENTION DISCLOSURE HAS BEEN READ AND UNDERSTOOD BY TWO WITNESS WHO HAVE SIGNED A STATEMENT TO THIS EFFECT AT THE END THEREOF.

Date: 8-5-13 Inventor Signature:

Date: 6/11/13 Inventor Signature:

Date: 8-5-13 Inventor Signature:

Date: 6/11/13 Inventor Signature:

Date: 6/11/13 Inventor Signature:

WITNESS SIGNATURES and DATE: 06/11/13

(Witness) 7/31/13

12. Jurisdictional Patent Activity:

(Name) (Date of Receipt)

AMC FORM 1255-R-E JUL 94

# Appendix E Analysis of Syngas and Exhaust

NEW YORK STATE OF OPPORTUNITY. Department of Health

ANDREW M. CUOMO
Governor

HOWARD A. ZUCKER, M.D., J.D.
Commissioner

SALLY DRESLIN, M.S., R.N.
Executive Deputy Commissioner

## Gasification of Forward Operating Base Wastes

Strategic Environmental Research and Development Plan – US Army Corps of Engineers

State University of New York Research Foundation, Cobleskill, NY

**Wadsworth Center for Laboratories and Research**

**Analysis of Syngas and Diesel Exhaust Gas Samples Summary**

The following is a summary of the analysis of whole air gaseous samples submitted to the New York State Department of Health Wadsworth Center in support of a research project investigating the conversion of combustible waste into a flammable synthetic gas (Syngas) suitable for the operation of diesel engines.

**Sample Collection:** The Syngas and Diesel exhaust gas samples were collected in certified pre-cleaned 6-liter whole air Summa® canister, (Fig.1) supplied by the Wadsworth Center.



Fig 1. Summa canister for Syngas sampling

Upon sample receipt, the canisters were allowed to sit overnight to equilibrate before making appropriate sample dilutions. Dilutions were made directly, canister to canister, by removing known volumes from the source canister to the dilution canister through the use of a critical orifice flow restrictor fitting. Fig 2. The diluted samples were allowed to stand overnight at room temperature to equilibrate before being analyzed.



Fig 2. Canister dilution with critical orifice fitting

**Sample Analysis:** The canister samples were analyzed using whole air instrument #1, following USEPA TO-15 methodologies. The system consists of an Agilent 6890+/5975B GC/MSD (fig 3) connected to an Entech 7150/7500A/7016C pre-concentrator, autosampler inlet system. (fig 4 & fig 5).



Fig 3. Agilent 6890+/5975B GC/MSD



Fig.4 Entech 7150/7500A sample pre-concentrator/inlet system



Fig 5. Entech 7016C canister autosampler

The canisters were attached to a numbered sampling position on the 7016C autosampler via a Swagelok fitting. A known volume of the sample was accurately and reproducibly removed from the canister through a closed loop system and concentrated at the cryogenically controlled trap. After equilibration, the trap was heated to move the sample onto the chromatographic column, leading to the mass selective detector.

The total ion chromatograms are located on pages 39 to 50. The results are listed on the following pages.

**Data Analysis:** Analysis of the GC/MSD data was accomplished using Agilent Environmental MSD Chemstation build 75, NIST Mass Spectral 2002 database and NIST AMDIS v2.1. The results calculated for the target analytes are based on the total area counts for a specific mass at a precise retention time as compared to the reference standard analyzed under the same conditions at different concentrations.

**Target analyte results for the SynGas Long Term Mix**

| | SynGas_Long Term Mix 1 | | | SynGas_Long Term Mix 2 | |
|---|---|---|---|---|---|
| | **Analyte** | **ppmV** | | **Analyte** | **ppmV** |
| **2** | Propene | 45086.40 | **2** | Propene | 17847.36 |
| **7** | 1,3-Butadiene | 5520.96 | **7** | 1,3-Butadiene | 1645.44 |
| **12** | ISOPRENE | 12730.56 | **12** | ISOPRENE | 3312.96 |
| **14** | ACETONE | 1661.76 | **14** | ACETONE | 2001.60 |
| **15** | n-HEXANE | 188.16 | **15** | n-HEXANE | 66.24 |
| **21** | METHYL ETHYL KETONE | 454.08 | **21** | METHYL ETHYL KETONE | 512.64 |
| **27** | CYCLOHEXANE | 0.00 | **27** | CYCLOHEXANE | 15.36 |
| **31** | n-HEPTANE | 82.56 | **31** | n-HEPTANE | 92.16 |
| **33** | BENZENE | 17110.08 | **33** | BENZENE | 8544.00 |
| **35** | METHYLCYCLOHEXANE | 0.00 | **35** | METHYLCYCLOHEXANE | 7008.00 |
| **42** | TOLUENE | 3370.56 | **42** | TOLUENE | 2724.48 |
| **51** | n-NONANE | 256.32 | **51** | n-NONANE | 272.64 |
| **53** | ETHYLBENZENE | 205.44 | **53** | ETHYLBENZENE | 800.64 |
| **54** | M,P-XYLENE | 247.68 | **54** | M,P-XYLENE | 337.92 |
| **55** | O-XYLENE | 54.72 | **55** | O-XYLENE | 125.76 |
| **56** | STYRENE | 207.36 | **56** | STYRENE | 2669.76 |
| **59** | ISOPROPYLBENZENE | 25.92 | **59** | ISOPROPYLBENZENE | 238.08 |
| **61** | n-DECANE | 116.16 | **61** | n-DECANE | 365.76 |
| **62** | n-PROPYLBENZENE | 72.96 | **62** | n-PROPYLBENZENE | 356.16 |
| **63** | 1,3,5-TRIMETHYLBENZENE | 3.84 | **63** | 1,3,5-TRIMETHYLBENZENE | 21.12 |
| **65** | 1,2,4-TRIMETHYLBENZENE | 4.80 | **65** | 1,2,4-TRIMETHYLBENZENE | 51.84 |
| **67** | d-LIMONENE | 65.28 | **67** | d-LIMONENE | 560.64 |
| **68** | p-ISOPROPYLTOLUENE | 65.28 | **68** | p-ISOPROPYLTOLUENE | 84.48 |
| **70** | 1,2,3-TRIMETHYLBENZENE | 20.16 | **70** | 1,2,3-TRIMETHYLBENZENE | 126.72 |
| **72** | n-UNDECANE | 30.72 | **72** | n-UNDECANE | 170.88 |
| **75** | n-DODECANE | 7.68 | **75** | n-DODECANE | 41.28 |
| **78** | Naphthalene | 5.76 | **78** | Naphthalene | 6.72 |

## Target analyte results for the SynGas_100% Construction Mix

| | SynGas_100% Construction Mix 1 | | | SynGas_100% Construction Mix 2 | |
|---|---|---|---|---|---|
| | Analyte | ppmV | | Analyte | ppmV |
| 2 | Propene | 24061.44 | 2 | Propene | 8682.24 |
| 7 | 1,3-Butadiene | 3793.92 | 7 | 1,3-Butadiene | 1085.76 |
| 12 | ISOPRENE | 5611.20 | 12 | ISOPRENE | 1588.80 |
| 14 | ACETONE | 6401.28 | 14 | ACETONE | 2314.56 |
| 15 | n-HEXANE | 305.28 | 15 | n-HEXANE | 56.64 |
| 21 | METHYL ETHYL KETONE | 2133.12 | 21 | METHYL ETHYL KETONE | 502.08 |
| 27 | CYCLOHEXANE | 18.24 | 27 | CYCLOHEXANE | 0.00 |
| 31 | n-HEPTANE | 224.64 | 31 | n-HEPTANE | 48.96 |
| 33 | BENZENE | 11040.96 | 33 | BENZENE | 4993.92 |
| 35 | METHYLCYCLOHEXANE | 195.84 | 35 | METHYLCYCLOHEXANE | 74.88 |
| 42 | TOLUENE | 3431.04 | 42 | TOLUENE | 2048.64 |
| 51 | n-NONANE | 1550.40 | 51 | n-NONANE | 725.76 |
| 53 | ETHYLBENZENE | 526.08 | 53 | ETHYLBENZENE | 589.44 |
| 54 | M,P-XYLENE | 663.36 | 54 | M,P-XYLENE | 386.88 |
| 55 | O-XYLENE | 258.24 | 55 | O-XYLENE | 154.56 |
| 56 | STYRENE | 776.64 | 56 | STYRENE | 1738.56 |
| 59 | ISOPROPYLBENZENE | 340.80 | 59 | ISOPROPYLBENZENE | 215.04 |
| 61 | n-DECANE | 2269.44 | 61 | n-DECANE | 500.16 |
| 62 | n-PROPYLBENZENE | 1057.92 | 62 | n-PROPYLBENZENE | 24.00 |
| 63 | 1,3,5-TRIMETHYLBENZENE | 117.12 | 63 | 1,3,5-TRIMETHYLBENZENE | 35.52 |
| 65 | 1,2,4-TRIMETHYLBENZENE | 350.40 | 65 | 1,2,4-TRIMETHYLBENZENE | 92.16 |
| 67 | d-LIMONENE | 0.00 | 67 | d-LIMONENE | 511.68 |
| 68 | p-ISOPROPYLTOLUENE | 503.04 | 68 | p-ISOPROPYLTOLUENE | 139.20 |
| 70 | 1,2,3-TRIMETHYLBENZENE | 834.24 | 70 | 1,2,3-TRIMETHYLBENZENE | 218.88 |
| 72 | n-UNDECANE | 766.08 | 72 | n-UNDECANE | 509.76 |
| 75 | n-DODECANE | 104.64 | 75 | n-DODECANE | 87.36 |
| 78 | Naphthalene | 59.52 | 78 | Naphthalene | 17.28 |

## Target analyte results for the SynGas 50% Food Mix

| | SynGas_50% Food Mix 1 | | | SynGas_50% Food Mix 2 | |
|---|---|---|---|---|---|
| | Analyte | ppmV | | Analyte | ppmV |
| 2 | Propene | 25226.88 | 2 | Propene | 30874.56 |
| 7 | 1,3-Butadiene | 4177.92 | 7 | 1,3-Butadiene | 5475.84 |
| 12 | ISOPRENE | 7556.16 | 12 | ISOPRENE | 16854.72 |
| 14 | ACETONE | 2443.20 | 14 | ACETONE | 2334.72 |
| 15 | n-HEXANE | 60.48 | 15 | n-HEXANE | 212.16 |
| 21 | METHYL ETHYL KETONE | 774.72 | 21 | METHYL ETHYL KETONE | 554.88 |
| 27 | CYCLOHEXANE | 0.00 | 27 | CYCLOHEXANE | 0.00 |
| 31 | n-HEPTANE | 63.36 | 31 | n-HEPTANE | 157.44 |
| 33 | BENZENE | 17493.12 | 33 | BENZENE | 10201.92 |
| 35 | METHYLCYCLOHEXANE | 0.00 | 35 | METHYLCYCLOHEXANE | 225.60 |
| 42 | TOLUENE | 4141.44 | 42 | TOLUENE | 3555.84 |
| 51 | n-NONANE | 842.88 | 51 | n-NONANE | 557.76 |
| 53 | ETHYLBENZENE | 596.16 | 53 | ETHYLBENZENE | 1767.36 |
| 54 | M,P-XYLENE | 601.92 | 54 | M,P-XYLENE | 431.04 |
| 55 | O-XYLENE | 218.88 | 55 | O-XYLENE | 158.40 |
| 56 | STYRENE | 1081.92 | 56 | STYRENE | 5640.96 |
| 59 | ISOPROPYLBENZENE | 180.48 | 59 | ISOPROPYLBENZENE | 719.04 |
| 61 | n-DECANE | 1764.48 | 61 | n-DECANE | 546.24 |
| 62 | n-PROPYLBENZENE | 642.24 | 62 | n-PROPYLBENZENE | 650.88 |
| 63 | 1,3,5-TRIMETHYLBENZENE | 43.20 | 63 | 1,3,5-TRIMETHYLBENZENE | 20.16 |
| 65 | 1,2,4-TRIMETHYLBENZENE | 112.32 | 65 | 1,2,4-TRIMETHYLBENZENE | 50.88 |
| 67 | d-LIMONENE | 680.64 | 67 | d-LIMONENE | 1723.20 |
| 68 | p-ISOPROPYLTOLUENE | 165.12 | 68 | p-ISOPROPYLTOLUENE | 150.72 |
| 70 | 1,2,3-TRIMETHYLBENZENE | 298.56 | 70 | 1,2,3-TRIMETHYLBENZENE | 156.48 |
| 72 | n-UNDECANE | 1135.68 | 72 | n-UNDECANE | 332.16 |
| 75 | n-DODECANE | 160.32 | 75 | n-DODECANE | 63.36 |
| 78 | Naphthalene | 36.48 | 78 | Naphthalene | 22.08 |

**Target analyte results for the SynGas 33% POL Mix**

| | SynGas_33% POL Mix 1 Analyte | ppmV | | SynGas_33% POL Mix 2 Analyte | ppmV |
|---|---|---|---|---|---|
| **2** | Propene | 12192.96 | **2** | Propene | 31661.76 |
| **7** | 1,3-Butadiene | 2664.96 | **7** | 1,3-Butadiene | 8566.08 |
| **12** | ISOPRENE | 23710.08 | **12** | ISOPRENE | 27994.56 |
| **14** | ACETONE | 2446.08 | **14** | ACETONE | 2560.32 |
| **15** | n-HEXANE | 45.12 | **15** | n-HEXANE | 128.64 |
| **21** | METHYL ETHYL KETONE | 685.44 | **21** | METHYL ETHYL KETONE | 856.32 |
| **27** | CYCLOHEXANE | 35.52 | **27** | CYCLOHEXANE | 4416.00 |
| **31** | n-HEPTANE | 72.00 | **31** | n-HEPTANE | 95.04 |
| **33** | BENZENE | 7187.52 | **33** | BENZENE | 14492.16 |
| **35** | METHYLCYCLOHEXANE | 0.00 | **35** | METHYLCYCLOHEXANE | 0.00 |
| **42** | TOLUENE | 2846.40 | **42** | TOLUENE | 4820.16 |
| **51** | n-NONANE | 310.08 | **51** | n-NONANE | 951.36 |
| **53** | ETHYLBENZENE | 515.52 | **53** | ETHYLBENZENE | 1015.68 |
| **54** | M,P-XYLENE | 431.04 | **54** | M,P-XYLENE | 413.76 |
| **55** | O-XYLENE | 237.12 | **55** | O-XYLENE | 194.88 |
| **56** | STYRENE | 1037.76 | **56** | STYRENE | 3101.76 |
| **59** | ISOPROPYLBENZENE | 225.60 | **59** | ISOPROPYLBENZENE | 443.52 |
| **61** | n-DECANE | 1344.00 | **61** | n-DECANE | 878.40 |
| **62** | n-PROPYLBENZENE | 6144.00 | **62** | n-PROPYLBENZENE | 549.12 |
| **63** | 1,3,5-TRIMETHYLBENZENE | 48.96 | **63** | 1,3,5-TRIMETHYLBENZENE | 21.12 |
| **65** | 1,2,4-TRIMETHYLBENZENE | 139.20 | **65** | 1,2,4-TRIMETHYLBENZENE | 55.68 |
| **67** | d-LIMONENE | 934.08 | **67** | d-LIMONENE | 1637.76 |
| **68** | p-ISOPROPYLTOLUENE | 197.76 | **68** | p-ISOPROPYLTOLUENE | 99.84 |
| **70** | 1,2,3-TRIMETHYLBENZENE | 317.76 | **70** | 1,2,3-TRIMETHYLBENZENE | 161.28 |
| **72** | n-UNDECANE | 891.84 | **72** | n-UNDECANE | 609.60 |
| **75** | n-DODECANE | 107.52 | **75** | n-DODECANE | 98.88 |
| **78** | Naphthalene | 26.88 | **78** | Naphthalene | 24.00 |

**Target analyte results for the SynGas 40% Tire Mix**

| | SynGas_40% Tire Mix 1 | | | SynGas_40% Tire Mix 2 | |
|---|---|---|---|---|---|
| | Analyte | ppmV | | Analyte | ppmV |
| 2 | Propene | 16114.56 | 2 | Propene | 12248.64 |
| 7 | 1,3-Butadiene | 4106.88 | 7 | 1,3-Butadiene | 3944.64 |
| 12 | ISOPRENE | 52316.16 | 12 | ISOPRENE | 57312.00 |
| 14 | ACETONE | 1848.96 | 14 | ACETONE | 57361.92 |
| 15 | n-HEXANE | 444.48 | 15 | n-HEXANE | 106.56 |
| 21 | METHYL ETHYL KETONE | 480.96 | 21 | METHYL ETHYL KETONE | 430.08 |
| 27 | CYCLOHEXANE | 152.64 | 27 | CYCLOHEXANE | 0.00 |
| 31 | n-HEPTANE | 88.32 | 31 | n-HEPTANE | 120.00 |
| 33 | BENZENE | 16025.28 | 33 | BENZENE | 11876.16 |
| 35 | METHYLCYCLOHEXANE | 702.72 | 35 | METHYLCYCLOHEXANE | 202.56 |
| 42 | TOLUENE | 7536.96 | 42 | TOLUENE | 5771.52 |
| 51 | n-NONANE | 1365.12 | 51 | n-NONANE | 639.36 |
| 53 | ETHYLBENZENE | 2199.36 | 53 | ETHYLBENZENE | 2071.68 |
| 54 | M,P-XYLENE | 555.84 | 54 | M,P-XYLENE | 568.32 |
| 55 | O-XYLENE | 206.40 | 55 | O-XYLENE | 192.96 |
| 56 | STYRENE | 6240.00 | 56 | STYRENE | 6325.44 |
| 59 | ISOPROPYLBENZENE | 4992.00 | 59 | ISOPROPYLBENZENE | 589.44 |
| 61 | n-DECANE | 918.72 | 61 | n-DECANE | 1064.64 |
| 62 | n-PROPYLBENZENE | 559.68 | 62 | n-PROPYLBENZENE | 617.28 |
| 63 | 1,3,5-TRIMETHYLBENZENE | 29.76 | 63 | 1,3,5-TRIMETHYLBENZENE | 30.72 |
| 65 | 1,2,4-TRIMETHYLBENZENE | 85.44 | 65 | 1,2,4-TRIMETHYLBENZENE | 74.88 |
| 67 | d-LIMONENE | 1108.80 | 67 | d-LIMONENE | 935.04 |
| 68 | p-ISOPROPYLTOLUENE | 282.24 | 68 | p-ISOPROPYLTOLUENE | 132.48 |
| 70 | 1,2,3-TRIMETHYLBENZENE | 212.16 | 70 | 1,2,3-TRIMETHYLBENZENE | 187.20 |
| 72 | n-UNDECANE | 814.08 | 72 | n-UNDECANE | 698.88 |
| 75 | n-DODECANE | 141.12 | 75 | n-DODECANE | 101.76 |
| 78 | Naphthalene | 51.84 | 78 | Naphthalene | 32.64 |

**Target analyte results for the SynGas 50% Plastics Mix**

| | SynGas_50% Plastics Mix | |
|---|---|---|
| | **Analyte** | **ppmV** |
| **2** | Propene | 40676.16 |
| **7** | 1,3-Butadiene | 6714.24 |
| **12** | ISOPRENE | 17664.00 |
| **14** | ACETONE | 2304.00 |
| **15** | n-HEXANE | 158.40 |
| **21** | METHYL ETHYL KETONE | 260.16 |
| **27** | CYCLOHEXANE | 0.00 |
| **31** | n-HEPTANE | 107.52 |
| **33** | BENZENE | 16671.36 |
| **35** | METHYLCYCLOHEXANE | 284.16 |
| **42** | TOLUENE | 2063.04 |
| **51** | n-NONANE | 275.52 |
| **53** | ETHYLBENZENE | 148.80 |
| **54** | M,P-XYLENE | 157.44 |
| **55** | O-XYLENE | 49.92 |
| **56** | STYRENE | 165.12 |
| **59** | ISOPROPYLBENZENE | 52.80 |
| **61** | n-DECANE | 457.92 |
| **62** | n-PROPYLBENZENE | 131.52 |
| **63** | 1,3,5-TRIMETHYLBENZENE | 11.52 |
| **65** | 1,2,4-TRIMETHYLBENZENE | 29.76 |
| **67** | d-LIMONENE | 31.68 |
| **68** | p-ISOPROPYLTOLUENE | 45.12 |
| **70** | 1,2,3-TRIMETHYLBENZENE | 82.56 |
| **72** | n-UNDECANE | 166.08 |
| **75** | n-DODECANE | 65.28 |
| **78** | Naphthalene | 21.12 |

## Target Analyte Results for the Diesel Exhaust Samples

### Target Analyte Results for the Diesel Exhaust Long Term Mix

| | SynGas_Exhaust_Long Term Mix 1 | | | SynGas_Exhaust_Long Term Mix 2 | |
|---|---|---|---|---|---|
| | Analyte | ppbV | | Analyte | ppbV |
| 2 | Propene | 4425.60 | 2 | Propene | 7214.40 |
| 7 | 1,3-Butadiene | <10. | 7 | 1,3-Butadiene | <10. |
| 12 | ISOPRENE | <10. | 12 | ISOPRENE | <10. |
| 14 | ACETONE | 993.60 | 14 | ACETONE | 1797.60 |
| 15 | n-HEXANE | 74.40 | 15 | n-HEXANE | 127.20 |
| 21 | METHYL ETHYL KETONE | <10. | 21 | METHYL ETHYL KETONE | 256.80 |
| 27 | CYCLOHEXANE | <10. | 27 | CYCLOHEXANE | <10. |
| 31 | n-HEPTANE | <10. | 31 | n-HEPTANE | 33.60 |
| 33 | BENZENE | 13166.40 | 33 | BENZENE | 14188.80 |
| 35 | METHYLCYCLOHEXANE | 57.60 | 35 | METHYLCYCLOHEXANE | 117.60 |
| 42 | TOLUENE | 856.80 | 42 | TOLUENE | 1207.20 |
| 51 | n-NONANE | 57.60 | 51 | n-NONANE | 542.40 |
| 53 | ETHYLBENZENE | 158.40 | 53 | ETHYLBENZENE | 386.40 |
| 54 | M,P-XYLENE | 86.40 | 54 | M,P-XYLENE | 220.80 |
| 55 | O-XYLENE | 33.60 | 55 | O-XYLENE | 91.20 |
| 56 | STYRENE | 427.20 | 56 | STYRENE | 244.80 |
| 59 | ISOPROPYLBENZENE | 103.20 | 59 | ISOPROPYLBENZENE | 184.80 |
| 61 | n-DECANE | 218.40 | 61 | n-DECANE | 556.80 |
| 62 | n-PROPYLBENZENE | 220.80 | 62 | n-PROPYLBENZENE | 278.40 |
| 63 | 1,3,5-TRIMETHYLBENZENE | 26.40 | 63 | 1,3,5-TRIMETHYLBENZENE | 28.80 |
| 65 | 1,2,4-TRIMETHYLBENZENE | 40.80 | 65 | 1,2,4-TRIMETHYLBENZENE | 57.60 |
| 67 | d-LIMONENE | <10. | 67 | d-LIMONENE | <10. |
| 68 | p-ISOPROPYLTOLUENE | 607.20 | 68 | p-ISOPROPYLTOLUENE | 103.20 |
| 70 | 1,2,3-TRIMETHYLBENZENE | 292.80 | 70 | 1,2,3-TRIMETHYLBENZENE | 180.00 |
| 72 | n-UNDECANE | 331.20 | 72 | n-UNDECANE | 403.20 |
| 75 | n-DODECANE | 115.20 | 75 | n-DODECANE | 112.80 |
| 78 | Naphthalene | 38.40 | 78 | Naphthalene | 38.40 |

## Target Analyte Results for the Diesel Exhaust 100% Construction Mix

| | SynGas_Exhaust_100% Construction Mix 1 | | | SynGas_Exhaust_100% Construction Mix 2 | |
|---|---|---|---|---|---|
| | Analyte | ppbV | | Analyte | ppbV |
| 2 | Propene | 1716.00 | 2 | Propene | 6184.80 |
| 7 | 1,3-Butadiene | <10. | 7 | 1,3-Butadiene | <10. |
| 12 | ISOPRENE | <10. | 12 | ISOPRENE | <10. |
| 14 | ACETONE | 806.40 | 14 | ACETONE | 2479.20 |
| 15 | n-HEXANE | 38.40 | 15 | n-HEXANE | 36.00 |
| 21 | METHYL ETHYL KETONE | 146.40 | 21 | METHYL ETHYL KETONE | 290.40 |
| 27 | CYCLOHEXANE | <10. | 27 | CYCLOHEXANE | <10. |
| 31 | n-HEPTANE | <10. | 31 | n-HEPTANE | 26.40 |
| 33 | BENZENE | 2668.80 | 33 | BENZENE | 16514.40 |
| 35 | METHYLCYCLOHEXANE | <10. | 35 | METHYLCYCLOHEXANE | 110.40 |
| 42 | TOLUENE | 468.00 | 42 | TOLUENE | 1039.20 |
| 51 | n-NONANE | 163.20 | 51 | n-NONANE | 580.80 |
| 53 | ETHYLBENZENE | 148.80 | 53 | ETHYLBENZENE | 141.60 |
| 54 | M,P-XYLENE | 64.80 | 54 | M,P-XYLENE | 163.20 |
| 55 | O-XYLENE | 33.60 | 55 | O-XYLENE | 76.80 |
| 56 | STYRENE | 475.20 | 56 | STYRENE | 206.40 |
| 59 | ISOPROPYLBENZENE | 84.00 | 59 | ISOPROPYLBENZENE | 91.20 |
| 61 | n-DECANE | 177.60 | 61 | n-DECANE | 616.80 |
| 62 | n-PROPYLBENZENE | 139.20 | 62 | n-PROPYLBENZENE | 256.80 |
| 63 | 1,3,5-TRIMETHYLBENZENE | 12.00 | 63 | 1,3,5-TRIMETHYLBENZENE | 38.40 |
| 65 | 1,2,4-TRIMETHYLBENZENE | 33.60 | 65 | 1,2,4-TRIMETHYLBENZENE | 69.60 |
| 67 | d-LIMONENE | <10. | 67 | d-LIMONENE | <10. |
| 68 | p-ISOPROPYLTOLUENE | 50.40 | 68 | p-ISOPROPYLTOLUENE | 127.20 |
| 70 | 1,2,3-TRIMETHYLBENZENE | 98.40 | 70 | 1,2,3-TRIMETHYLBENZENE | 228.00 |
| 72 | n-UNDECANE | 105.60 | 72 | n-UNDECANE | 616.80 |
| 75 | n-DODECANE | 55.20 | 75 | n-DODECANE | 124.80 |
| 78 | Naphthalene | 45.60 | 78 | Naphthalene | 93.60 |

## Target Analyte Results for the Diesel Exhaust 50% Food Mix

| | SynGas_Exhaust_50% Food Mix 1 | | | SynGas_Exhaust_50% Food Mix 2 | |
|---|---|---|---|---|---|
| | Analyte | ppbV | | Analyte | ppbV |
| 2 | Propene | 5642.40 | 2 | Propene | 2155.20 |
| 7 | 1,3-Butadiene | <10. | 7 | 1,3-Butadiene | <10. |
| 12 | ISOPRENE | <10. | 12 | ISOPRENE | <10. |
| 14 | ACETONE | 1641.60 | 14 | ACETONE | 415.20 |
| 15 | n-HEXANE | 91.20 | 15 | n-HEXANE | <10. |
| 21 | METHYL ETHYL KETONE | 141.60 | 21 | METHYL ETHYL KETONE | <10. |
| 27 | CYCLOHEXANE | <10. | 27 | CYCLOHEXANE | <10. |
| 31 | n-HEPTANE | 26.40 | 31 | n-HEPTANE | 7.20 |
| 33 | BENZENE | 13024.80 | 33 | BENZENE | 4024.80 |
| 35 | METHYLCYCLOHEXANE | <10. | 35 | METHYLCYCLOHEXANE | <10. |
| 42 | TOLUENE | 837.60 | 42 | TOLUENE | 1070.40 |
| 51 | n-NONANE | 105.60 | 51 | n-NONANE | 297.60 |
| 53 | ETHYLBENZENE | 211.20 | 53 | ETHYLBENZENE | 1946.40 |
| 54 | M,P-XYLENE | 146.40 | 54 | M,P-XYLENE | 580.80 |
| 55 | O-XYLENE | 52.80 | 55 | O-XYLENE | 256.80 |
| 56 | STYRENE | 429.60 | 56 | STYRENE | 8707.20 |
| 59 | ISOPROPYLBENZENE | 93.60 | 59 | ISOPROPYLBENZENE | 1677.60 |
| 61 | n-DECANE | 657.60 | 61 | n-DECANE | 2258.40 |
| 62 | n-PROPYLBENZENE | 182.40 | 62 | n-PROPYLBENZENE | 1084.80 |
| 63 | 1,3,5-TRIMETHYLBENZENE | 21.60 | 63 | 1,3,5-TRIMETHYLBENZENE | 81.60 |
| 65 | 1,2,4-TRIMETHYLBENZENE | 40.80 | 65 | 1,2,4-TRIMETHYLBENZENE | 206.40 |
| 67 | d-LIMONENE | <10. | 67 | d-LIMONENE | 9204.00 |
| 68 | p-ISOPROPYLTOLUENE | <10. | 68 | p-ISOPROPYLTOLUENE | 2529.60 |
| 70 | 1,2,3-TRIMETHYLBENZENE | 127.20 | 70 | 1,2,3-TRIMETHYLBENZENE | 777.60 |
| 72 | n-UNDECANE | 729.60 | 72 | n-UNDECANE | 3026.40 |
| 75 | n-DODECANE | 295.20 | 75 | n-DODECANE | 847.20 |
| 78 | Naphthalene | 26.40 | 78 | Naphthalene | 376.80 |

## Target Analyte Results for the Diesel Exhaust 33% POL Mix

| | SynGas_Exhaust_33% POL Mix 1 | | | SynGas_Exhaust_33% POL Mix 2 | |
|---|---|---|---|---|---|
| | Analyte | ppbV | | Analyte | ppbV |
| 2 | Propene | 16970.40 | 2 | Propene | 5380.80 |
| 7 | 1,3-Butadiene | <10. | 7 | 1,3-Butadiene | <10. |
| 12 | ISOPRENE | <10. | 12 | ISOPRENE | <10. |
| 14 | ACETONE | 5882.40 | 14 | ACETONE | 1137.60 |
| 15 | n-HEXANE | 81.60 | 15 | n-HEXANE | 12.00 |
| 21 | METHYL ETHYL KETONE | 751.20 | 21 | METHYL ETHYL KETONE | 103.20 |
| 27 | CYCLOHEXANE | <10. | 27 | CYCLOHEXANE | <10. |
| 31 | n-HEPTANE | 74.40 | 31 | n-HEPTANE | 12.00 |
| 33 | BENZENE | 24357.60 | 33 | BENZENE | 13812.00 |
| 35 | METHYLCYCLOHEXANE | 328.80 | 35 | METHYLCYCLOHEXANE | <10. |
| 42 | TOLUENE | 2978.40 | 42 | TOLUENE | 1108.80 |
| 51 | n-NONANE | 1620.00 | 51 | n-NONANE | 350.40 |
| 53 | ETHYLBENZENE | 518.40 | 53 | ETHYLBENZENE | 290.40 |
| 54 | M,P-XYLENE | 513.60 | 54 | M,P-XYLENE | 132.00 |
| 55 | O-XYLENE | 343.20 | 55 | O-XYLENE | 76.80 |
| 56 | STYRENE | 434.40 | 56 | STYRENE | 194.40 |
| 59 | ISOPROPYLBENZENE | 434.40 | 59 | ISOPROPYLBENZENE | 151.20 |
| 61 | n-DECANE | 3055.20 | 61 | n-DECANE | 508.80 |
| 62 | n-PROPYLBENZENE | 1192.80 | 62 | n-PROPYLBENZENE | 228.00 |
| 63 | 1,3,5-TRIMETHYLBENZENE | 136.80 | 63 | 1,3,5-TRIMETHYLBENZENE | 16.80 |
| 65 | 1,2,4-TRIMETHYLBENZENE | 324.00 | 65 | 1,2,4-TRIMETHYLBENZENE | 26.40 |
| 67 | d-LIMONENE | <10. | 67 | d-LIMONENE | <10. |
| 68 | p-ISOPROPYLTOLUENE | 60.00 | 68 | p-ISOPROPYLTOLUENE | 84.00 |
| 70 | 1,2,3-TRIMETHYLBENZENE | 1094.40 | 70 | 1,2,3-TRIMETHYLBENZENE | 134.40 |
| 72 | n-UNDECANE | 3806.40 | 72 | n-UNDECANE | 532.80 |
| 75 | n-DODECANE | 1454.40 | 75 | n-DODECANE | 170.40 |
| 78 | Naphthalene | 381.60 | 78 | Naphthalene | 38.40 |

## Target Analyte Results for the Diesel Exhaust 40% Tire Mix

| | SynGas_Exhaust_40% Tire Mix 1 | | | SynGas_Exhaust_40% Tire Mix 2 | |
|---|---|---|---|---|---|
| | Analyte | ppbV | | Analyte | ppbV |
| 2 | Propene | 7576.80 | 2 | Propene | 3837.60 |
| 7 | 1,3-Butadiene | <10. | 7 | 1,3-Butadiene | <10. |
| 12 | ISOPRENE | <10. | 12 | ISOPRENE | <10. |
| 14 | ACETONE | 2006.40 | 14 | ACETONE | 1221.60 |
| 15 | n-HEXANE | 151.20 | 15 | n-HEXANE | 67.20 |
| 21 | METHYL ETHYL KETONE | 175.20 | 21 | METHYL ETHYL KETONE | 60.00 |
| 27 | CYCLOHEXANE | 0.00 | 27 | CYCLOHEXANE | <10. |
| 31 | n-HEPTANE | 19.20 | 31 | n-HEPTANE | <10. |
| 33 | BENZENE | 16910.40 | 33 | BENZENE | 10231.20 |
| 35 | METHYLCYCLOHEXANE | 146.40 | 35 | METHYLCYCLOHEXANE | <10. |
| 42 | TOLUENE | 2356.80 | 42 | TOLUENE | 1156.80 |
| 51 | n-NONANE | 501.60 | 51 | n-NONANE | 249.60 |
| 53 | ETHYLBENZENE | 631.20 | 53 | ETHYLBENZENE | 345.60 |
| 54 | M,P-XYLENE | 218.40 | 54 | M,P-XYLENE | 110.40 |
| 55 | O-XYLENE | 108.00 | 55 | O-XYLENE | 50.40 |
| 56 | STYRENE | 595.20 | 56 | STYRENE | 139.20 |
| 59 | ISOPROPYLBENZENE | 223.20 | 59 | ISOPROPYLBENZENE | 148.80 |
| 61 | n-DECANE | 717.60 | 61 | n-DECANE | 199.20 |
| 62 | n-PROPYLBENZENE | 304.80 | 62 | n-PROPYLBENZENE | 122.40 |
| 63 | 1,3,5-TRIMETHYLBENZENE | 28.80 | 63 | 1,3,5-TRIMETHYLBENZENE | <10. |
| 65 | 1,2,4-TRIMETHYLBENZENE | 81.60 | 65 | 1,2,4-TRIMETHYLBENZENE | 16.80 |
| 67 | d-LIMONENE | <10. | 67 | d-LIMONENE | 22154.40 |
| 68 | p-ISOPROPYLTOLUENE | 141.60 | 68 | p-ISOPROPYLTOLUENE | 26.40 |
| 70 | 1,2,3-TRIMETHYLBENZENE | 252.00 | 70 | 1,2,3-TRIMETHYLBENZENE | 62.40 |
| 72 | n-UNDECANE | 633.60 | 72 | n-UNDECANE | <10. |
| 75 | n-DODECANE | 122.40 | 75 | n-DODECANE | <10. |
| 78 | Naphthalene | 55.20 | 78 | Naphthalene | 14.40 |

**Target Analyte Results for the Diesel Exhaust 50% Plastics Mix**

| | SynGas_Exhaust_50% Plastics Mix | |
|---|---|---|
| | **Analyte** | **ppbV** |
| **2** | Propene | 6393.60 |
| **7** | 1,3-Butadiene | <10. |
| **12** | ISOPRENE | <10. |
| **14** | ACETONE | 1034.40 |
| **15** | n-HEXANE | 124.80 |
| **21** | METHYL ETHYL KETONE | 84.00 |
| **27** | CYCLOHEXANE | 12.00 |
| **31** | n-HEPTANE | 33.60 |
| **33** | BENZENE | 12938.40 |
| **35** | METHYLCYCLOHEXANE | <10. |
| **42** | TOLUENE | 828.00 |
| **51** | n-NONANE | 276.00 |
| **53** | ETHYLBENZENE | 182.40 |
| **54** | M,P-XYLENE | 76.80 |
| **55** | O-XYLENE | 28.80 |
| **56** | STYRENE | 458.40 |
| **59** | ISOPROPYLBENZENE | 76.80 |
| **61** | n-DECANE | 292.80 |
| **62** | n-PROPYLBENZENE | 98.40 |
| **63** | 1,3,5-TRIMETHYLBENZENE | 9.60 |
| **65** | 1,2,4-TRIMETHYLBENZENE | 21.60 |
| **67** | d-LIMONENE | <10. |
| **68** | p-ISOPROPYLTOLUENE | <10. |
| **70** | 1,2,3-TRIMETHYLBENZENE | 64.80 |
| **72** | n-UNDECANE | 338.40 |
| **75** | n-DODECANE | 105.60 |

| | | |
|---|---|---|
| **78** | Naphthalene | 12.00 |

Two commercial diesel fuel samples were run through the 60kW diesel engine collecting the exhaust for use as a reference to the Syngas exhaust samples. Target analyte results listed below:

**Target Analyte Results for the Diesel Fuel Exhaust Reference**

| | SynGas_Diesel_Exhaust_Ref_1 | | | SynGas_Diesel_Exhaust_Ref_2 | |
|---|---|---|---|---|---|
| | **Analyte** | **ppbV** | | **Analyte** | **ppbV** |
| **2** | Propene | <10. | **2** | Propene | <10. |
| **7** | 1,3-Butadiene | <10. | **7** | 1,3-Butadiene | <10. |
| **9** | ISOPRENE | <10. | **9** | ISOPRENE | <10. |
| **11** | ACETONE | <10. | **11** | ACETONE | <10. |
| **15** | n-HEXANE | <10. | **15** | n-HEXANE | <10. |
| **18** | METHYL ETHYL KETONE | <10. | **18** | METHYL ETHYL KETONE | <10. |
| **23** | CYCLOHEXANE | <10. | **23** | CYCLOHEXANE | <10. |
| **27** | n-HEPTANE | <10. | **27** | n-HEPTANE | <10. |
| **29** | BENZENE | 202.28 | **29** | BENZENE | 194.56 |
| **31** | METHYLCYCLOHEXANE | 29.08 | **31** | METHYLCYCLOHEXANE | 21.88 |
| **37** | TOLUENE | 89.29 | **37** | TOLUENE | 68.76 |
| **45** | n-NONANE | 134.92 | **45** | n-NONANE | 89.52 |
| **47** | ETHYLBENZENE | <10. | **47** | ETHYLBENZENE | 32.12 |
| **48** | M,P-XYLENE | 44.92 | **48** | M,P-XYLENE | <10. |
| **49** | O-XYLENE | 24.84 | **49** | O-XYLENE | <10. |
| **50** | STYRENE | <10. | **50** | STYRENE | 56.48 |
| **52** | ISOPROPYLBENZENE | <10. | **52** | ISOPROPYLBENZENE | 20.36 |
| **54** | n-DECANE | 214.04 | **54** | n-DECANE | 123.48 |
| **55** | n-PROPYLBENZENE | 61.28 | **55** | n-PROPYLBENZENE | 45.84 |
| **56** | 1,3,5-TRIMETHYLBENZENE | <10. | **56** | 1,3,5-TRIMETHYLBENZENE | <10. |
| **58** | 1,2,4-TRIMETHYLBENZENE | 23.56 | **58** | 1,2,4-TRIMETHYLBENZENE | <10. |

| | | | | | |
|---|---|---|---|---|---|
| **60** | d-LIMONENE | <10. | **60** | d-LIMONENE | <10. |
| **61** | p-ISOPROPYLTOLUENE | <10. | **61** | p-ISOPROPYLTOLUENE | <10. |
| **63** | 1,2,3-TRIMETHYLBENZENE | 72.92 | **63** | 1,2,3-TRIMETHYLBENZENE | 28.76 |
| **65** | n-UNDECANE | 361.64 | **65** | n-UNDECANE | 191.32 |
| **68** | n-DODECANE | 252.84 | **68** | n-DODECANE | 135.52 |
| **78** | Naphthalene | 38.36 | **78** | Naphthalene | 22.76 |

## Target Analyte Response as a Percentage of the Total Sample Response

### Target analyte % results for the SynGas Long Term Mix

| SynGas_Long Term Mix 1 | | SynGas_Long Term Mix 2 | |
|---|---|---|---|
| **Analyte** | **% of T** | **Analyte** | **% of T** |
| Propene | 7.91 | Propene | 5.67 |
| 1,3-Butadiene | 3.17 | 1,3-Butadiene | 1.75 |
| ISOPRENE | 0.43 | ISOPRENE | 0.26 |
| ACETONE | 1.14 | ACETONE | 1.53 |
| n-HEXANE | 5.11 | n-HEXANE | 4.58 |
| METHYL ETHYL KETONE | 2.07 | METHYL ETHYL KETONE | 0.79 |
| CYCLOHEXANE | 0.21 | CYCLOHEXANE | 0.09 |
| n-HEPTANE | 2.11 | n-HEPTANE | 1.99 |
| BENZENE | 7.81 | BENZENE | 7.59 |
| METHYLCYCLOHEXANE | 0.39 | METHYLCYCLOHEXANE | 0.34 |
| TOLUENE | 3.14 | TOLUENE | 3.66 |
| n-NONANE | 0.71 | n-NONANE | 1.32 |
| ETHYLBENZENE | 0.56 | ETHYLBENZENE | 2.31 |
| M,P-XYLENE | 1.13 | M,P-XYLENE | 2.14 |
| O-XYLENE | 0.29 | O-XYLENE | 1.46 |
| STYRENE | 0.72 | STYRENE | 4.83 |
| ISOPROPYLBENZENE | 0.03 | ISOPROPYLBENZENE | 0.25 |
| n-DECANE | 0.46 | n-DECANE | 1.05 |
| n-PROPYLBENZENE | 0.04 | n-PROPYLBENZENE | 0.71 |
| 1,3,5-TRIMETHYLBENZENE | 0.09 | 1,3,5-TRIMETHYLBENZENE | 0.19 |
| 1,2,4-TRIMETHYLBENZENE | 0.29 | 1,2,4-TRIMETHYLBENZENE | 0.61 |
| d-LIMONENE | 0.02 | d-LIMONENE | 0.68 |

| | | | |
|---|---|---|---|
| p-ISOPROPYLTOLUENE | 0.07 | p-ISOPROPYLTOLUENE | 0.31 |
| 1,2,3-TRIMETHYLBENZENE | 0.02 | 1,2,3-TRIMETHYLBENZENE | 0.26 |
| n-UNDECANE | 0.06 | n-UNDECANE | 0.67 |
| n-DODECANE | 0.02 | n-DODECANE | 0.31 |
| Naphthalene | 0.03 | Naphthalene | 0.12 |
| **Total of Chromatogram** | **38.03** | **Total %** | **45.47** |

**Target analyte % results for the SynGas 100% Construction Mix**

**SynGas_Target Analyte Percent of Total Response (100% Construction Mix)**

| SynGas_100% Construction Mix 1 | | SynGas_100% Construction Mix 2 | |
|---|---|---|---|
| **Analyte** | **% of T** | **Analyte** | **% of T** |
| Propene | 6.77 | Propene | 4.52 |
| 1,3-Butadiene | 1.84 | 1,3-Butadiene | 1.18 |
| ISOPRENE | 0.32 | ISOPRENE | 0.14 |
| ACETONE | 1.91 | ACETONE | 1.84 |
| n-HEXANE | 3.52 | n-HEXANE | 2.54 |
| METHYL ETHYL KETONE | 0.91 | METHYL ETHYL KETONE | 0.86 |
| CYCLOHEXANE | 0.00 | CYCLOHEXANE | 0.07 |
| n-HEPTANE | 1.97 | n-HEPTANE | 1.38 |
| BENZENE | 6.78 | BENZENE | 6.84 |
| METHYLCYCLOHEXANE | 1.11 | METHYLCYCLOHEXANE | 0.32 |
| TOLUENE | 3.21 | TOLUENE | 4.04 |
| n-NONANE | 1.54 | n-NONANE | 2.01 |
| ETHYLBENZENE | 1.49 | ETHYLBENZENE | 3.15 |
| M,P-XYLENE | 1.96 | M,P-XYLENE | 2.71 |
| O-XYLENE | 0.98 | O-XYLENE | 1.34 |
| STYRENE | 3.17 | STYRENE | 5.37 |
| ISOPROPYLBENZENE | 0.18 | ISOPROPYLBENZENE | 0.31 |

| | | | |
|---|---|---|---|
| n-DECANE | 1.73 | n-DECANE | 1.94 |
| n-PROPYLBENZENE | 0.67 | n-PROPYLBENZENE | 0.68 |
| 1,3,5-TRIMETHYLBENZENE | 0.45 | 1,3,5-TRIMETHYLBENZENE | 0.39 |
| 1,2,4-TRIMETHYLBENZENE | 1.48 | 1,2,4-TRIMETHYLBENZENE | 1.12 |
| d-LIMONENE | 0.52 | d-LIMONENE | 0.81 |
| p-ISOPROPYLTOLUENE | 0.25 | p-ISOPROPYLTOLUENE | 0.43 |
| 1,2,3-TRIMETHYLBENZENE | 0.28 | 1,2,3-TRIMETHYLBENZENE | 0.48 |
| n-UNDECANE | 0.93 | n-UNDECANE | 1.37 |
| n-DODECANE | 0.28 | n-DODECANE | 0.42 |
| Naphthalene | 0.09 | Naphthalene | 0.27 |
| **Total of Chromatogram** | **44.34** | **Total %** | **46.53** |

**Target analyte % results for the SynGas 50% Food Mix**

| SynGas_50% Food Mix 1 | | SynGas_50% Food Mix 2 | |
|---|---|---|---|
| **Analyte** | **% of T** | **Analyte** | **% of T** |
| Propene | 5.63 | Propene | 6.72 |
| 1,3-Butadiene | 2.43 | 1,3-Butadiene | 2.92 |
| ISOPRENE | 0.22 | ISOPRENE | 0.36 |
| ACETONE | 1.21 | ACETONE | 1.21 |
| n-HEXANE | 2.69 | n-HEXANE | 3.38 |
| METHYL ETHYL KETONE | 2.25 | METHYL ETHYL KETONE | 1.26 |
| CYCLOHEXANE | 0.15 | CYCLOHEXANE | 0.19 |
| n-HEPTANE | 1.56 | n-HEPTANE | 2.22 |
| BENZENE | 8.18 | BENZENE | 6.59 |
| METHYLCYCLOHEXANE | 0.91 | METHYLCYCLOHEXANE | 0.27 |
| TOLUENE | 3.55 | TOLUENE | 3.04 |
| n-NONANE | 1.73 | n-NONANE | 1.01 |
| ETHYLBENZENE | 1.55 | ETHYLBENZENE | 2.73 |
| M,P-XYLENE | 2.18 | M,P-XYLENE | 1.81 |
| O-XYLENE | 1.22 | O-XYLENE | 2.08 |
| STYRENE | 3.08 | STYRENE | 4.85 |
| ISOPROPYLBENZENE | 0.18 | ISOPROPYLBENZENE | 0.46 |
| n-DECANE | 1.46 | n-DECANE | 1.05 |
| n-PROPYLBENZENE | 0.44 | n-PROPYLBENZENE | 0.77 |

| | | | |
|---|---|---|---|
| 1,3,5-TRIMETHYLBENZENE | 0.26 | 1,3,5-TRIMETHYLBENZENE | 0.71 |
| 1,2,4-TRIMETHYLBENZENE | 0.76 | 1,2,4-TRIMETHYLBENZENE | 0.39 |
| d-LIMONENE | 0.53 | d-LIMONENE | 1.22 |
| p-ISOPROPYLTOLUENE | 0.32 | p-ISOPROPYLTOLUENE | 0.28 |
| 1,2,3-TRIMETHYLBENZENE | 0.31 | 1,2,3-TRIMETHYLBENZENE | 0.22 |
| n-UNDECANE | 0.88 | n-UNDECANE | 0.52 |
| n-DODECANE | 0.29 | n-DODECANE | 0.21 |
| Naphthalene | 0.08 | Naphthalene | 0.08 |
| **Total of Chromatogram** | **44.05** | **Total %** | **46.55** |

**Target analyte % results for the SynGas 33% POL Mix**

| SynGas_33% POL Mix 1 | | SynGas_33% POL Mix 2 | |
|---|---|---|---|
| **Analyte** | **% of T** | **Analyte** | **% of T** |
| Propene | 5.11 | Propene | 5.73 |
| 1,3-Butadiene | 2.12 | 1,3-Butadiene | 3.07 |
| ISOPRENE | 3.99 | ISOPRENE | 0.33 |
| ACETONE | 1.47 | ACETONE | 1.04 |
| n-HEXANE | 1.45 | n-HEXANE | 2.58 |
| METHYL ETHYL KETONE | 1.19 | METHYL ETHYL KETONE | 1.08 |
| CYCLOHEXANE | 0.21 | CYCLOHEXANE | 0.29 |
| n-HEPTANE | 1.08 | n-HEPTANE | 2.16 |
| BENZENE | 5.86 | BENZENE | 7.08 |
| METHYLCYCLOHEXANE | 1.05 | METHYLCYCLOHEXANE | 0.41 |
| TOLUENE | 3.07 | TOLUENE | 3.09 |
| n-NONANE | 1.34 | n-NONANE | 1.04 |
| ETHYLBENZENE | 2.12 | ETHYLBENZENE | 1.63 |
| M,P-XYLENE | 2.16 | M,P-XYLENE | 1.41 |
| O-XYLENE | 1.24 | O-XYLENE | 1.46 |
| STYRENE | 3.69 | STYRENE | 3.35 |
| ISOPROPYLBENZENE | 0.27 | ISOPROPYLBENZENE | 0.24 |

| | | | |
|---|---|---|---|
| n-DECANE | 1.58 | n-DECANE | 0.88 |
| n-PROPYLBENZENE | 0.69 | n-PROPYLBENZENE | 0.58 |
| 1,3,5-TRIMETHYLBENZENE | 0.39 | 1,3,5-TRIMETHYLBENZENE | 0.56 |
| 1,2,4-TRIMETHYLBENZENE | 1.08 | 1,2,4-TRIMETHYLBENZENE | 0.31 |
| d-LIMONENE | 0.92 | d-LIMONENE | 0.85 |
| p-ISOPROPYLTOLUENE | 0.29 | p-ISOPROPYLTOLUENE | 0.21 |
| 1,2,3-TRIMETHYLBENZENE | 0.41 | 1,2,3-TRIMETHYLBENZENE | 0.18 |
| n-UNDECANE | 0.99 | n-UNDECANE | 0.52 |
| n-DODECANE | 0.49 | n-DODECANE | 0.18 |
| Naphthalene | 0.21 | Naphthalene | 0.09 |
| **Total of Chromatogram** | **44.47** | **Total %** | **40.35** |

**Target analyte % results for the SynGas 40% Tire Mix**

| SynGas_40% Tire Mix 1 | | SynGas_40% Tire Mix 2 | |
|---|---|---|---|
| **Analyte** | **% of T** | **Analyte** | **% of T** |
| Propene | 4.37 | Propene | 3.95 |
| 1,3-Butadiene | 2.78 | 1,3-Butadiene | 2.51 |
| ISOPRENE | 4.83 | ISOPRENE | 0.18 |
| ACETONE | 0.92 | ACETONE | 1.11 |
| n-HEXANE | 2.26 | n-HEXANE | 1.71 |
| METHYL ETHYL KETONE | 0.39 | METHYL ETHYL KETONE | 0.82 |
| CYCLOHEXANE | 0.29 | CYCLOHEXANE | 0.33 |
| n-HEPTANE | 1.77 | n-HEPTANE | 1.31 |
| BENZENE | 7.07 | BENZENE | 6.53 |
| METHYLCYCLOHEXANE | 0.49 | METHYLCYCLOHEXANE | 0.46 |
| TOLUENE | 3.67 | TOLUENE | 3.51 |
| n-NONANE | 0.96 | n-NONANE | 1.07 |
| ETHYLBENZENE | 2.48 | ETHYLBENZENE | 2.94 |
| M,P-XYLENE | 1.78 | M,P-XYLENE | 1.93 |
| O-XYLENE | 1.29 | O-XYLENE | 2.34 |

| | | | |
|---|---|---|---|
| STYRENE | 4.41 | STYRENE | 4.51 |
| ISOPROPYLBENZENE | 0.27 | ISOPROPYLBENZENE | 0.37 |
| n-DECANE | 0.84 | n-DECANE | 1.01 |
| n-PROPYLBENZENE | 0.73 | n-PROPYLBENZENE | 0.76 |
| 1,3,5-TRIMETHYLBENZENE | 0.17 | 1,3,5-TRIMETHYLBENZENE | 0.17 |
| 1,2,4-TRIMETHYLBENZENE | 0.49 | 1,2,4-TRIMETHYLBENZENE | 0.41 |
| d-LIMONENE | 0.68 | d-LIMONENE | 0.61 |
| p-ISOPROPYLTOLUENE | 0.68 | p-ISOPROPYLTOLUENE | 0.63 |
| 1,2,3-TRIMETHYLBENZENE | 0.21 | 1,2,3-TRIMETHYLBENZENE | 0.18 |
| n-UNDECANE | 0.51 | n-UNDECANE | 0.45 |
| n-DODECANE | 0.25 | n-DODECANE | 0.17 |
| Naphthalene | 0.11 | Naphthalene | 0.06 |
| **Total %** | **44.70** | **Total %** | **40.03** |

**Target analyte % results for the SynGas 50% Plastics Mix**

| SynGas_50% Plastics Mix | |
|---|---|
| **Analyte** | **% of T** |
| Propene | 9.48 |
| 1,3-Butadiene | 4.39 |
| ISOPRENE | 0.49 |
| ACETONE | 0.76 |
| n-HEXANE | 5.15 |
| METHYL ETHYL KETONE | 0.55 |
| CYCLOHEXANE | 0.21 |
| n-HEPTANE | 1.82 |
| BENZENE | 8.84 |
| METHYLCYCLOHEXANE | 0.31 |
| TOLUENE | 6.50 |
| n-NONANE | 0.57 |
| ETHYLBENZENE | 0.52 |

| | |
|---|---|
| M,P-XYLENE | 0.98 |
| O-XYLENE | 0.31 |
| STYRENE | 1.01 |
| ISOPROPYLBENZENE | 0.04 |
| n-DECANE | 0.41 |
| n-PROPYLBENZENE | 0.12 |
| 1,3,5-TRIMETHYLBENZENE | 0.09 |
| 1,2,4-TRIMETHYLBENZENE | 0.26 |
| d-LIMONENE | 0.06 |
| p-ISOPROPYLTOLUENE | 0.05 |
| 1,2,3-TRIMETHYLBENZENE | 0.08 |
| n-UNDECANE | 0.22 |
| n-DODECANE | 0.06 |
| Naphthalene | 0.02 |
| **Total of Chromatogram** | **43.30** |

**Target Analyte Response as a Percentage of the Total Sample Response**

**Target Analyte % Results for the Diesel Exhaust Long Term Mix**

| Exhaust_Long Term Mix 1 | | Exhaust_Long Term Mix 2 | |
|---|---|---|---|
| **Analyte** | **% of T** | **Analyte** | **% of T** |
| Propene | 10.93 | Propene | 16.01 |
| 1,3-Butadiene | 0.00 | 1,3-Butadiene | 0.00 |
| ISOPRENE | 0.00 | ISOPRENE | 0.00 |
| ACETONE | 1.39 | ACETONE | 1.89 |
| n-HEXANE | 0.91 | n-HEXANE | 1.59 |
| METHYL ETHYL KETONE | 0.00 | METHYL ETHYL KETONE | 0.42 |
| CYCLOHEXANE | 0.00 | CYCLOHEXANE | 0.00 |
| n-HEPTANE | 0.26 | n-HEPTANE | 0.67 |
| BENZENE | 38.83 | BENZENE | 32.79 |
| METHYLCYCLOHEXANE | 0.00 | METHYLCYCLOHEXANE | 0.17 |
| TOLUENE | 3.42 | TOLUENE | 0.35 |

| | | | |
|---|---|---|---|
| n-NONANE | 0.26 | n-NONANE | 0.58 |
| ETHYLBENZENE | 1.15 | ETHYLBENZENE | 2.52 |
| M,P-XYLENE | 0.77 | M,P-XYLENE | 1.59 |
| O-XYLENE | 0.21 | O-XYLENE | 0.89 |
| STYRENE | 2.11 | STYRENE | 1.48 |
| ISOPROPYLBENZENE | 0.08 | ISOPROPYLBENZENE | 0.14 |
| n-DECANE | 0.41 | n-DECANE | 0.74 |
| n-PROPYLBENZENE | 0.31 | n-PROPYLBENZENE | 0.24 |
| 1,3,5-TRIMETHYLBENZENE | 0.14 | 1,3,5-TRIMETHYLBENZENE | 0.15 |
| 1,2,4-TRIMETHYLBENZENE | 0.31 | 1,2,4-TRIMETHYLBENZENE | 0.48 |
| d-LIMONENE | 0.00 | d-LIMONENE | 0.00 |
| p-ISOPROPYLTOLUENE | 0.29 | p-ISOPROPYLTOLUENE | 0.11 |
| 1,2,3-TRIMETHYLBENZENE | 0.02 | 1,2,3-TRIMETHYLBENZENE | 0.15 |
| n-UNDECANE | 0.37 | n-UNDECANE | 0.52 |
| n-DODECANE | 0.19 | n-DODECANE | 0.12 |
| Naphthalene | 0.18 | Naphthalene | 0.17 |
| **Total of Chromatogram** | **62.54** | **Total %** | **63.77** |

## Target Analyte % Results for the Diesel Exhaust 100% Construction Mix

| Exhaust_100% Construction Mix 1 | | Exhaust_100% Construction Mix 2 | |
|---|---|---|---|
| **Analyte** | **% of T** | **Analyte** | **% of T** |
| Propene | 27.56 | Propene | 7.91 |
| 1,3-Butadiene | 0.00 | 1,3-Butadiene | 0.00 |
| ISOPRENE | 0.00 | ISOPRENE | 0.00 |
| ACETONE | 1.48 | ACETONE | 2.47 |
| n-HEXANE | 0.81 | n-HEXANE | 1.14 |
| METHYL ETHYL KETONE | 0.28 | METHYL ETHYL KETONE | 0.31 |
| CYCLOHEXANE | 0.00 | CYCLOHEXANE | 0.07 |
| n-HEPTANE | 0.00 | n-HEPTANE | 0.59 |

| | | | |
|---|---|---|---|
| BENZENE | 10.64 | BENZENE | 32.88 |
| METHYLCYCLOHEXANE | 0.00 | METHYLCYCLOHEXANE | 0.17 |
| TOLUENE | 3.01 | TOLUENE | 3.14 |
| n-NONANE | 0.38 | n-NONANE | 0.65 |
| ETHYLBENZENE | 1.37 | ETHYLBENZENE | 1.02 |
| M,P-XYLENE | 0.94 | M,P-XYLENE | 1.18 |
| O-XYLENE | 0.81 | O-XYLENE | 0.46 |
| STYRENE | 3.47 | STYRENE | 1.36 |
| ISOPROPYLBENZENE | 0.18 | ISOPROPYLBENZENE | 0.08 |
| n-DECANE | 0.85 | n-DECANE | 0.21 |
| n-PROPYLBENZENE | 0.31 | n-PROPYLBENZENE | 0.25 |
| 1,3,5-TRIMETHYLBENZENE | 0.17 | 1,3,5-TRIMETHYLBENZENE | 0.26 |
| 1,2,4-TRIMETHYLBENZENE | 0.32 | 1,2,4-TRIMETHYLBENZENE | 0.55 |
| d-LIMONENE | 0.00 | d-LIMONENE | 0.00 |
| p-ISOPROPYLTOLUENE | 0.06 | p-ISOPROPYLTOLUENE | 0.08 |
| 1,2,3-TRIMETHYLBENZENE | 0.12 | 1,2,3-TRIMETHYLBENZENE | 0.11 |
| n-UNDECANE | 0.24 | n-UNDECANE | 0.58 |
| n-DODECANE | 0.18 | n-DODECANE | 0.16 |
| Naphthalene | 0.36 | Naphthalene | 0.38 |
| **Total of Chromatogram** | **53.54** | **Total %** | **56.01** |

## Target Analyte % Results for the Diesel Exhaust 50% Food Mix

| **Exhaust_50% Food Mix 1** | | **Exhaust_50% Food Mix 2** | |
|---|---|---|---|
| **Analyte** | **% of T** | **Analyte** | **% of T** |
| Propene | 15.69 | Propene | 1.05 |
| 1,3-Butadiene | 0.00 | 1,3-Butadiene | 0.00 |
| ISOPRENE | 0.00 | ISOPRENE | 0.00 |
| ACETONE | 1.62 | ACETONE | 0.23 |
| n-HEXANE | 0.91 | n-HEXANE | 0.26 |
| METHYL ETHYL KETONE | 0.06 | METHYL ETHYL KETONE | 0.00 |
| CYCLOHEXANE | 0.00 | CYCLOHEXANE | 0.00 |
| n-HEPTANE | 0.41 | n-HEPTANE | 0.18 |

| | | | |
|---|---|---|---|
| BENZENE | 26.32 | BENZENE | 5.56 |
| METHYLCYCLOHEXANE | 0.00 | METHYLCYCLOHEXANE | 0.00 |
| TOLUENE | 2.51 | TOLUENE | 2.26 |
| n-NONANE | 0.68 | n-NONANE | 1.22 |
| ETHYLBENZENE | 1.77 | ETHYLBENZENE | 5.21 |
| M,P-XYLENE | 1.11 | M,P-XYLENE | 2.64 |
| O-XYLENE | 0.11 | O-XYLENE | 0.11 |
| STYRENE | 1.92 | STYRENE | 21.05 |
| ISOPROPYLBENZENE | 0.09 | ISOPROPYLBENZENE | 0.71 |
| n-DECANE | 1.01 | n-DECANE | 3.12 |
| n-PROPYLBENZENE | 0.22 | n-PROPYLBENZENE | 0.75 |
| 1,3,5-TRIMETHYLBENZENE | 0.07 | 1,3,5-TRIMETHYLBENZENE | 0.41 |
| 1,2,4-TRIMETHYLBENZENE | 0.36 | 1,2,4-TRIMETHYLBENZENE | 1.26 |
| d-LIMONENE | 0.00 | d-LIMONENE | 5.01 |
| p-ISOPROPYLTOLUENE | 0.00 | p-ISOPROPYLTOLUENE | 1.14 |
| 1,2,3-TRIMETHYLBENZENE | 0.09 | 1,2,3-TRIMETHYLBENZENE | 0.87 |
| n-UNDECANE | 0.62 | n-UNDECANE | 2.54 |
| n-DODECANE | 0.58 | n-DODECANE | 1.05 |
| Naphthalene | 0.11 | Naphthalene | 1.12 |
| **Total of Chromatogram** | **56.26** | **Total %** | **57.75** |

**Target Analyte % Results for the Diesel Exhaust 33% POL Mix**

| **Exhaust_33% POL Mix 1** | | **Exhaust_33% POL Mix 2** | |
|---|---|---|---|
| **Analyte** | **% of T** | **Analyte** | **% of T** |
| Propene | 12.06 | Propene | 11.89 |
| 1,3-Butadiene | 0.00 | 1,3-Butadiene | 0.00 |
| ISOPRENE | 0.00 | ISOPRENE | 0.00 |
| ACETONE | 2.74 | ACETONE | 1.51 |
| n-HEXANE | 0.24 | n-HEXANE | 0.82 |
| METHYL ETHYL KETONE | 0.41 | METHYL ETHYL KETONE | 0.19 |

| | | | |
|---|---|---|---|
| CYCLOHEXANE | 0.00 | CYCLOHEXANE | 0.00 |
| n-HEPTANE | 0.59 | n-HEPTANE | 0.43 |
| BENZENE | 26.00 | BENZENE | 36.59 |
| METHYLCYCLOHEXANE | 18.00 | METHYLCYCLOHEXANE | 0.00 |
| TOLUENE | 3.75 | TOLUENE | 4.17 |
| n-NONANE | 0.72 | n-NONANE | 0.42 |
| ETHYLBENZENE | 1.72 | ETHYLBENZENE | 2.25 |
| M,P-XYLENE | 1.36 | M,P-XYLENE | 1.17 |
| O-XYLENE | 1.24 | O-XYLENE | 0.36 |
| STYRENE | 1.94 | STYRENE | 1.24 |
| ISOPROPYLBENZENE | 0.15 | ISOPROPYLBENZENE | 0.14 |
| n-DECANE | 1.61 | n-DECANE | 1.09 |
| n-PROPYLBENZENE | 0.39 | n-PROPYLBENZENE | 0.29 |
| 1,3,5-TRIMETHYLBENZENE | 0.34 | 1,3,5-TRIMETHYLBENZENE | 0.41 |
| 1,2,4-TRIMETHYLBENZENE | 1.21 | 1,2,4-TRIMETHYLBENZENE | 0.16 |
| d-LIMONENE | 0.00 | d-LIMONENE | 0.00 |
| p-ISOPROPYLTOLUENE | 0.18 | p-ISOPROPYLTOLUENE | 0.15 |
| 1,2,3-TRIMETHYLBENZENE | 0.44 | 1,2,3-TRIMETHYLBENZENE | 0.09 |
| n-UNDECANE | 1.91 | n-UNDECANE | 0.55 |
| n-DODECANE | 0.64 | n-DODECANE | 0.28 |
| Naphthalene | 0.75 | Naphthalene | 0.21 |
| **Total of Chromatogram** | **78.39** | **Total %** | **64.41** |

**Target Analyte % Results for the Diesel Exhaust 40% Tire Mix**

| **Exhaust_40% Tire Mix 1** | | **Exhaust_40% Tire Mix 2** | |
|---|---|---|---|
| **Analyte** | **% of T** | **Analyte** | **% of T** |
| Propene | 11.91 | Propene | 5.95 |
| 1,3-Butadiene | 0.00 | 1,3-Butadiene | 0.00 |
| ISOPRENE | 0.00 | ISOPRENE | 0.00 |
| ACETONE | 1.81 | ACETONE | 1.93 |

| | | | |
|---|---|---|---|
| n-HEXANE | 0.87 | n-HEXANE | 0.91 |
| METHYL ETHYL KETONE | 0.16 | METHYL ETHYL KETONE | 0.16 |
| CYCLOHEXANE | 0.00 | CYCLOHEXANE | 0.00 |
| n-HEPTANE | 0.55 | n-HEPTANE | 0.52 |
| BENZENE | 36.68 | BENZENE | 33.21 |
| METHYLCYCLOHEXANE | 0.11 | METHYLCYCLOHEXANE | 0.00 |
| TOLUENE | 5.77 | TOLUENE | 5.33 |
| n-NONANE | 0.12 | n-NONANE | 0.38 |
| ETHYLBENZENE | 2.11 | ETHYLBENZENE | 2.11 |
| M,P-XYLENE | 1.31 | M,P-XYLENE | 1.09 |
| O-XYLENE | 0.11 | O-XYLENE | 0.29 |
| STYRENE | 2.37 | STYRENE | 0.97 |
| ISOPROPYLBENZENE | 0.14 | ISOPROPYLBENZENE | 0.17 |
| n-DECANE | 0.74 | n-DECANE | 0.84 |
| n-PROPYLBENZENE | 0.31 | n-PROPYLBENZENE | 0.15 |
| 1,3,5-TRIMETHYLBENZENE | 0.12 | 1,3,5-TRIMETHYLBENZENE | 0.33 |
| 1,2,4-TRIMETHYLBENZENE | 0.53 | 1,2,4-TRIMETHYLBENZENE | 0.34 |
| d-LIMONENE | 0.00 | d-LIMONENE | 0.00 |
| p-ISOPROPYLTOLUENE | 0.09 | p-ISOPROPYLTOLUENE | 0.26 |
| 1,2,3-TRIMETHYLBENZENE | 0.21 | 1,2,3-TRIMETHYLBENZENE | 0.11 |
| n-UNDECANE | 0.66 | n-UNDECANE | 0.19 |
| n-DODECANE | 0.09 | n-DODECANE | 0.09 |
| Naphthalene | 0.21 | Naphthalene | 0.09 |
| **Total %** | **66.98** | **Total %** | **55.42** |

**Target Analyte % Results for the Diesel 50% Plastics Mix**

| Exhaust_50% Plastics Mix | |
|---|---|
| **Analyte** | **% of T** |
| Propene | 11.39 |
| 1,3-Butadiene | 0.00 |

| | |
|---|---|
| ISOPRENE | 0.00 |
| ACETONE | 1.29 |
| n-HEXANE | 1.44 |
| METHYL ETHYL KETONE | 0.11 |
| CYCLOHEXANE | 0.00 |
| n-HEPTANE | 0.69 |
| BENZENE | 43.24 |
| METHYLCYCLOHEXANE | 0.00 |
| TOLUENE | 2.91 |
| n-NONANE | 0.42 |
| ETHYLBENZENE | 1.31 |
| M,P-XYLENE | 0.63 |
| O-XYLENE | 0.18 |
| STYRENE | 2.11 |
| ISOPROPYLBENZENE | 0.00 |
| n-DECANE | 0.42 |
| n-PROPYLBENZENE | 0.15 |
| 1,3,5-TRIMETHYLBENZENE | 0.14 |
| 1,2,4-TRIMETHYLBENZENE | 0.15 |
| d-LIMONENE | 0.06 |
| p-ISOPROPYLTOLUENE | 0.05 |
| 1,2,3-TRIMETHYLBENZENE | 0.08 |
| n-UNDECANE | 0.14 |
| n-DODECANE | 0.18 |
| Naphthalene | 0.36 |
| **Total of Chromatogram** | **67.45** |

The percentages of total hydrocarbons as carbon atom units ($C_3$, $C_4$, etc) were calculated based on mass and retention time. The results are as follows:

**SynGas Total Response as % Carbon Atom units**

| C_Units | SynGas_Long Term Mix 1 | C_Units | SynGas_Long Term Mix 2 |
|---|---|---|---|
| C3 | 10.42 | C3 | 6.37 |
| C4 | 12.79 | C4 | 8.74 |
| C5 | 21.64 | C5 | 13.05 |

| | | | |
|---|---|---|---|
| C6 | 28.50 | C6 | 21.45 |
| C7 | 7.88 | C7 | 8.16 |
| C8 | 13.31 | C8 | 13.91 |
| C9 | 4.35 | C9 | 15.67 |
| C10 | 0.89 | C10 | 7.49 |
| C11 | 0.17 | C11 | 3.42 |
| C12 | 0.04 | C12 | 1.38 |

| C_Units | SynGas_100% Construction Mix 1 | C_Units | SynGas_100% Construction Mix 2 |
|---|---|---|---|
| C3 | 8.01 | C3 | 5.25 |
| C4 | 8.66 | C4 | 5.06 |
| C5 | 12.25 | C5 | 8.74 |
| C6 | 19.54 | C6 | 16.98 |
| C7 | 6.59 | C7 | 6.80 |
| C8 | 15.03 | C8 | 16.37 |
| C9 | 12.33 | C9 | 19.22 |
| C10 | 11.29 | C10 | 12.71 |
| C11 | 4.76 | C11 | 6.77 |
| C12 | 1.25 | C12 | 2.12 |

| C_Units | SynGas_50% Food Mix 1 | C_Units | SynGas_50% Food Mix 2 |
|---|---|---|---|
| C3 | 6.62 | C3 | 8.60 |
| C4 | 9.38 | C4 | 11.42 |
| C5 | 11.30 | C5 | 15.29 |
| C6 | 22.75 | C6 | 18.92 |
| C7 | 6.56 | C7 | 7.46 |
| C8 | 16.23 | C8 | 11.43 |
| C9 | 12.95 | C9 | 15.66 |
| C10 | 8.73 | C10 | 7.92 |
| C11 | 4.29 | C11 | 2.54 |
| C12 | 1.20 | C12 | 0.78 |

**SynGas Total Response as % Carbon Atom units**

| C_Units | SynGas_33% POL Mix 1 | C_Units | SynGas_33% POL Mix 2 |
|---|---|---|---|
| C3 | 6.29 | C3 | 7.51 |
| C4 | 10.10 | C4 | 11.29 |
| C5 | 14.34 | C5 | 16.87 |

| | | | |
|---|---|---|---|
| C6 | 16.90 | C6 | 22.72 |
| C7 | 7.37 | C7 | 9.58 |
| C8 | 12.65 | C8 | 11.21 |
| C9 | 14.21 | C9 | 11.17 |
| C10 | 10.78 | C10 | 5.95 |
| C11 | 5.27 | C11 | 2.27 |
| C12 | 2.17 | C12 | 0.71 |

| C_Units | SynGas_40% Tire Mix 1 | C_Units | SynGas_40% Tire Mix 2 |
|---|---|---|---|
| C3 | 5.00 | C3 | 4.97 |
| C4 | 9.65 | C4 | 10.60 |
| C5 | 16.04 | C5 | 16.78 |
| C6 | 21.36 | C6 | 19.52 |
| C7 | 10.92 | C7 | 9.91 |
| C8 | 12.52 | C8 | 12.72 |
| C9 | 14.67 | C9 | 16.45 |
| C10 | 6.13 | C10 | 6.24 |
| C11 | 2.64 | C11 | 2.17 |
| C12 | 1.07 | C12 | 0.65 |

| C_Units | SynGas_50% Plastics Mix |
|---|---|
| C3 | 12.10 |
| C4 | 14.16 |
| C5 | 22.49 |
| C6 | 27.14 |
| C7 | 6.57 |
| C8 | 9.48 |
| C9 | 3.99 |
| C10 | 2.62 |
| C11 | 0.99 |
| C12 | 0.16 |

**SynGas Exhaust Total Response as % Carbon Atom units**

| C_Units | Exhaust_Long Term Mix 1 | C_Units | Exhaust_Long Term Mix 2 |
|---|---|---|---|
| C3 | 12.10 | C3 | 16.77 |

| | | | |
|---|---|---|---|
| C4 | 6.07 | C4 | 2.68 |
| C5 | 9.43 | C5 | 10.92 |
| C6 | 40.68 | C6 | 36.58 |
| C7 | 4.64 | C7 | 4.72 |
| C8 | 13.39 | C8 | 7.89 |
| C9 | 1.05 | C9 | 2.01 |
| C10 | 2.52 | C10 | 3.63 |
| C11 | 1.46 | C11 | 1.98 |
| C12 | 0.73 | C12 | 0.44 |

| C_Units | Exhaust_100% Construction Mix 1 | C_Units | Exhaust_100% Construction Mix 2 |
|---|---|---|---|
| C3 | 29.72 | C3 | 15.61 |
| C4 | 4.02 | C4 | 3.41 |
| C5 | 11.12 | C5 | 12.62 |
| C6 | 13.14 | C6 | 36.75 |
| C7 | 4.01 | C7 | 4.61 |
| C8 | 15.77 | C8 | 6.20 |
| C9 | 3.80 | C9 | 2.88 |
| C10 | 2.32 | C10 | 3.00 |
| C11 | 1.20 | C11 | 2.16 |
| C12 | 1.49 | C12 | 1.18 |

| C_Units | Exhaust_50% Food Mix 1 | C_Units | Exhaust_50% Food Mix 2 |
|---|---|---|---|
| C3 | 17.54 | C3 | 3.30 |
| C4 | 11.17 | C4 | 1.45 |
| C5 | 10.68 | C5 | 2.69 |
| C6 | 28.87 | C6 | 6.11 |
| C7 | 1.09 | C7 | 2.57 |
| C8 | 10.04 | C8 | 30.83 |
| C9 | 2.52 | C9 | 12.21 |
| C10 | 3.20 | C10 | 16.72 |
| C11 | 2.19 | C11 | 12.67 |
| C12 | 1.79 | C12 | 4.84 |

**SynGas Exhaust Total Response as % Carbon Atom units**

| C_Units | Exhaust_33% POL Mix 1 | C_Units | Exhaust_33% POL Mix 2 |
|---|---|---|---|

| | | | |
|---|---|---|---|
| C3 | 13.33 | C3 | 13.57 |
| C4 | 7.64 | C4 | 5.66 |
| C5 | 9.97 | C5 | 6.50 |
| C6 | 31.17 | C6 | 39.03 |
| C7 | 5.17 | C7 | 4.68 |
| C8 | 5.72 | C8 | 6.69 |
| C9 | 3.66 | C9 | 2.38 |
| C10 | 7.88 | C10 | 4.51 |
| C11 | 5.78 | C11 | 1.64 |
| C12 | 2.57 | C12 | 1.06 |

| C_Units | Exhaust_40% Tire Mix 1 | C_Units | Exhaust_40% Tire Mix 2 |
|---|---|---|---|
| C3 | 13.24 | C3 | 12.24 |
| C4 | 6.45 | C4 | 8.66 |
| C5 | 7.88 | C5 | 6.99 |
| C6 | 41.75 | C6 | 36.89 |
| C7 | 6.80 | C7 | 6.46 |
| C8 | 6.98 | C8 | 6.07 |
| C9 | 1.98 | C9 | 2.47 |
| C10 | 2.63 | C10 | 2.12 |
| C11 | 2.48 | C11 | 0.57 |
| C12 | 0.75 | C12 | 0.31 |

| C_Units | Exhaust_50% Plastics Mix |
|---|---|
| C3 | 12.13 |
| C4 | 5.22 |
| C5 | 10.16 |
| C6 | 46.46 |
| C7 | 1.07 |
| C8 | 7.78 |
| C9 | 3.09 |
| C10 | 1.43 |
| C11 | 0.51 |
| C12 | 0.01 |

The total responses of the chromatograms were grouped into classes using extracted ion chromatograms. The classes are based on specific molecular ions and are defined as Alkanes, Cycloalkanes, Alkenes, Alkylbenzenes, Indanes and Naphthalenes.

**SynGas Hydrocarbon Fuels Class Group Comparison as Percent of Total Response**

| Groups | Long Term 1 | Construction Mix 1 | 40% Tires 1 | 50% Food 1 | 33% POL 1 | 50% Plastics |
|---|---|---|---|---|---|---|
| Alkanes | 24.3 | 33.5 | 20.2 | 26.1 | 26.1 | 24.5 |
| CycloAlkanes | 42.7 | 33.4 | 38.4 | 33.7 | 35.3 | 43.8 |
| Alkenes | 22.2 | 14.7 | 21.0 | 16.0 | 15.9 | 21.4 |
| AlkylBenzenes | 9.8 | 15.4 | 16.9 | 22.1 | 19.1 | 9.2 |
| Indanes | 0.9 | 2.6 | 3.3 | 1.8 | 3.1 | 1.0 |
| Naphthalenes | 0.1 | 0.3 | 0.3 | 0.2 | 0.5 | 0.1 |

| Groups | Long Term 2 | Construction Mix 2 | 40% Tires 2 | 50% Food 2 | 33% POL 2 |
|---|---|---|---|---|---|
| Alkanes | 28.5 | 30.8 | 21.5 | 23.4 | 18.6 |
| CycloAlkanes | 32.3 | 28.8 | 38.6 | 36.8 | 39.8 |
| Alkenes | 16.7 | 13.3 | 20.9 | 19.0 | 24.3 |
| AlkylBenzenes | 18.8 | 22.3 | 15.9 | 15.9 | 14.4 |
| Indanes | 3.4 | 4.2 | 3.0 | 4.7 | 2.7 |
| Naphthalenes | 0.3 | 0.6 | 0.2 | 0.2 | 0.3 |

| Groups | Natural Gas | Reg Gasoline | Kerosine | JP-8 Fuel | #1 Diesel | Heating Oil |
|---|---|---|---|---|---|---|
| Alkanes | 57.2 | 36.1 | 32.6 | 27.4 | 35.6 | 28.0 |
| CycloAlkanes | 36.2 | 32.8 | 37.6 | 31.9 | 39.2 | 26.9 |
| Alkenes | 1.6 | 4.5 | 10.0 | 8.8 | 8.4 | 8.6 |
| AlkylBenzenes | 4.7 | 24.0 | 16.8 | 27.4 | 14.3 | 27.5 |
| Indanes | 0.3 | 2.3 | 2.6 | 4.1 | 2.0 | 8.0 |
| Naphthalenes | 0.0 | 0.4 | 0.5 | 0.4 | 0.5 | 1.1 |

**Exhaust Hydrocarbon Fuels Class Group Comparison as Percent of Total Response**

| Groups | Long Term_1 | Construction Mix_1 | 40% Tires_1 | 50% Food_1 | 33% POL_1 |
|---|---|---|---|---|---|
| Alkanes | 19.3 | 18.3 | 19.8 | 17.4 | 25.4 |
| CycloAlkanes | 25.3 | 22.8 | 31.4 | 32.5 | 33.1 |
| Alkenes | 4.5 | 10.6 | 8.6 | 4.2 | 8.4 |
| AlkylBenzenes | 46.5 | 41.2 | 36.8 | 43.7 | 29.3 |
| Indanes | 3.6 | 5.9 | 2.8 | 1.9 | 2.7 |
| Naphthalenes | 0.7 | 1.2 | 0.6 | 0.4 | 1.1 |

| Groups | Long Term 2 | Construction Mix_2 | 40% Tires_2 | 50% Food_2 | 33% POL_2 |
|---|---|---|---|---|---|
| Alkanes | 22.4 | 17.6 | 13.6 | 15.0 | 15.1 |
| CycloAlkanes | 32.1 | 24.5 | 20.7 | 17.0 | 20.7 |
| Alkenes | 6.4 | 6.0 | 10.1 | 10.1 | 6.6 |
| AlkylBenzenes | 36.6 | 49.5 | 54.1 | 36.4 | 55.7 |
| Indanes | 2.1 | 1.8 | 1.1 | 20.1 | 1.4 |
| Naphthalenes | 0.5 | 0.6 | 0.4 | 1.5 | 0.5 |

| Groups | 50% Plastics | Ref Diesel Exhaust_1 | Ref Diesel Exhaust_2 |
|---|---|---|---|
| Alkanes | 25.4 | 34.0 | 27.5 |
| CycloAlkanes | 37.6 | 33.3 | 30.6 |
| Alkenes | 6.9 | 9.6 | 8.4 |
| AlkylBenzenes | 26.9 | 17.9 | 25.1 |
| Indanes | 2.9 | 3.5 | 5.5 |
| Naphthalenes | 0.4 | 1.9 | 2.8 |

The graphical representation of hydrocarbon class results are in shown on the next two pages.

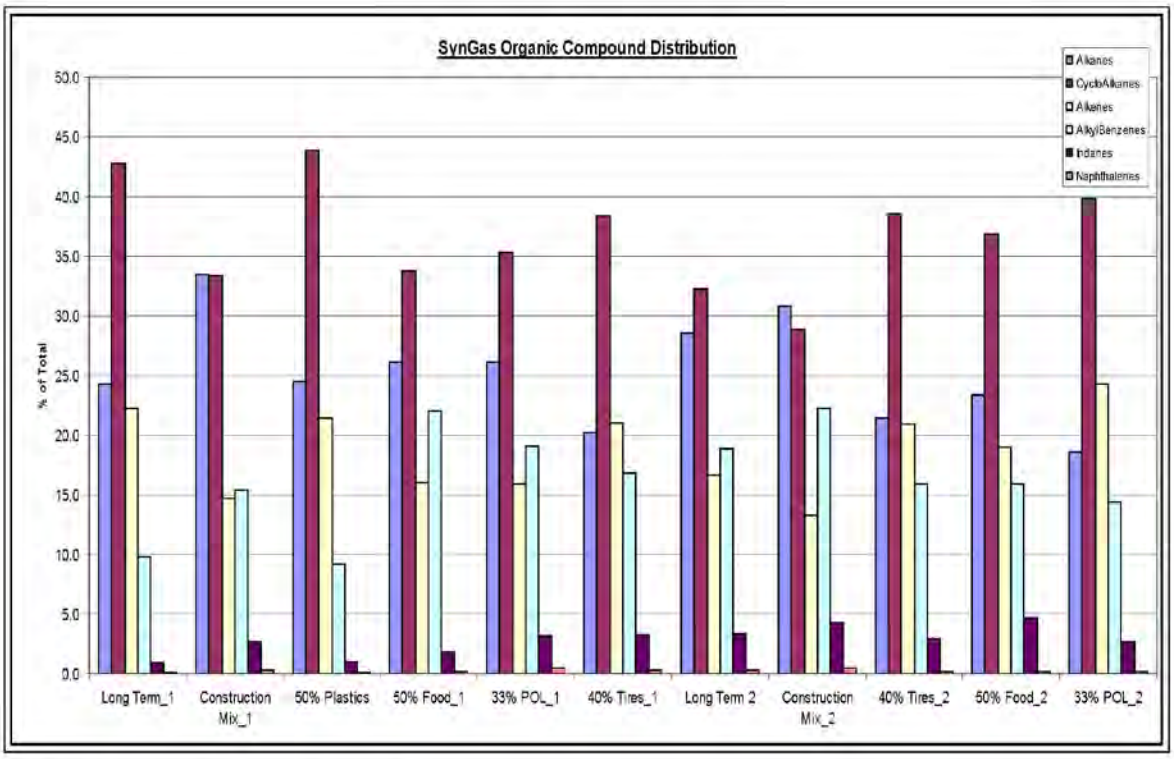



Fig 6.SynGas Organic Compound Distribution

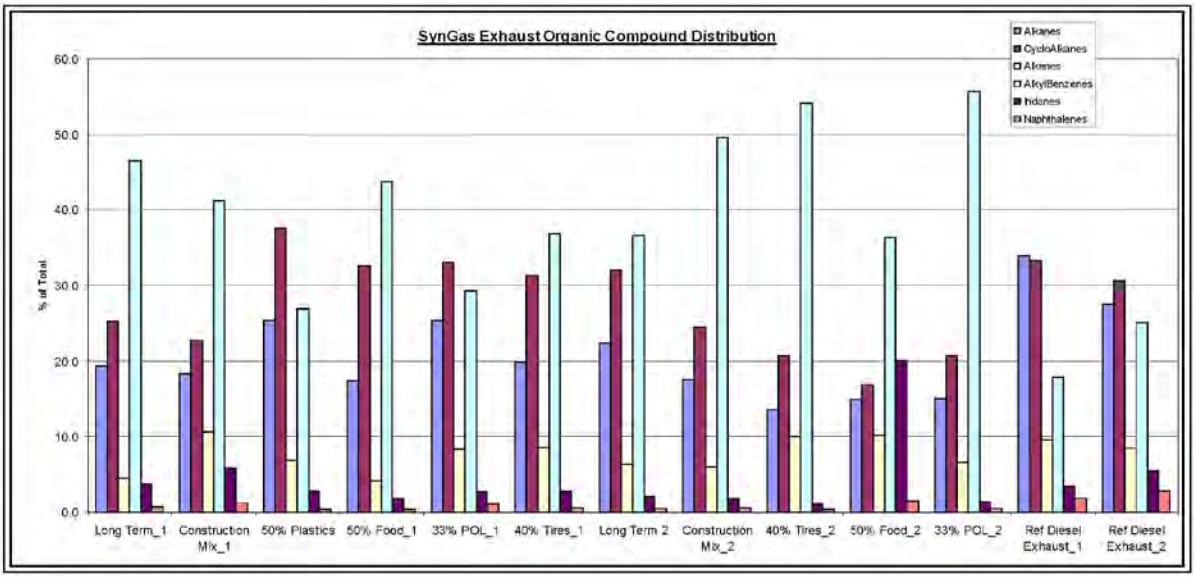
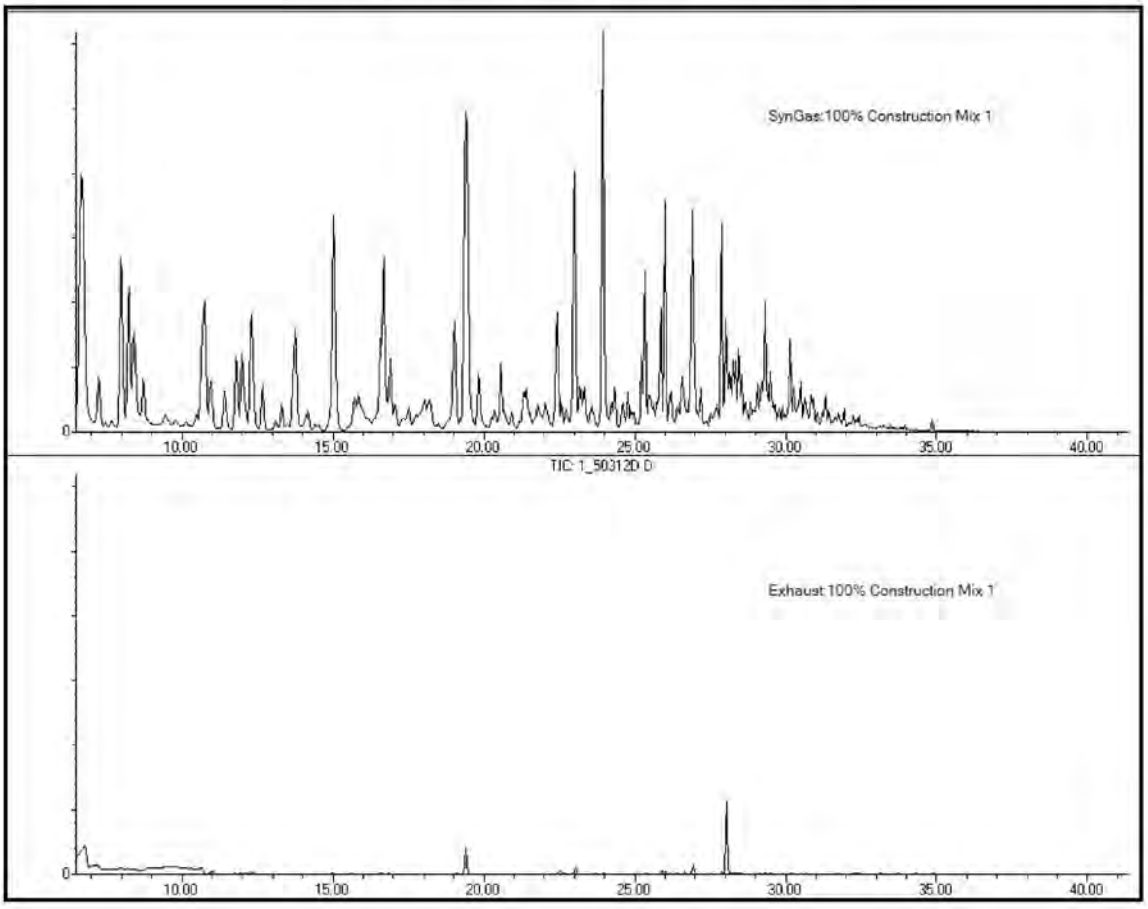
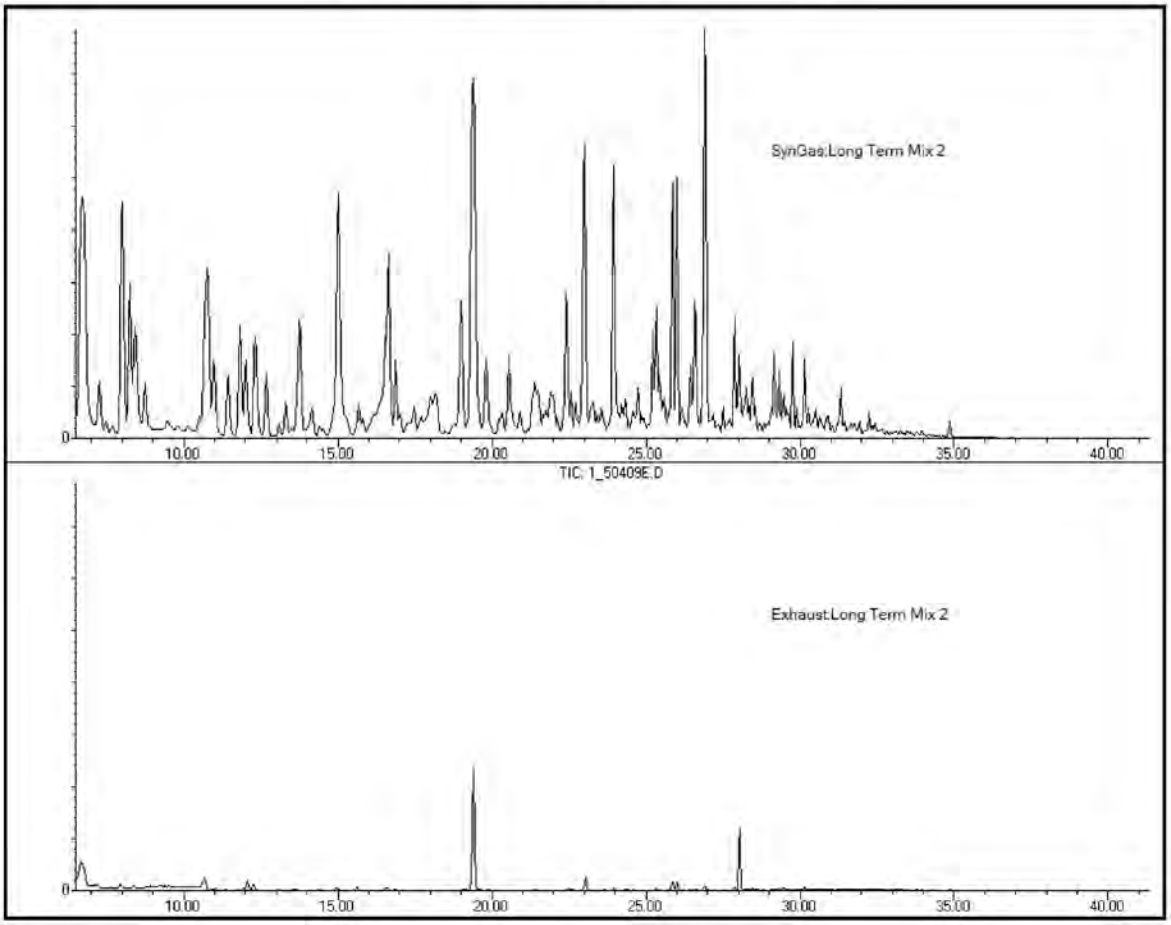



Fig 7. SynGas Exhaust Organic compound Distribution

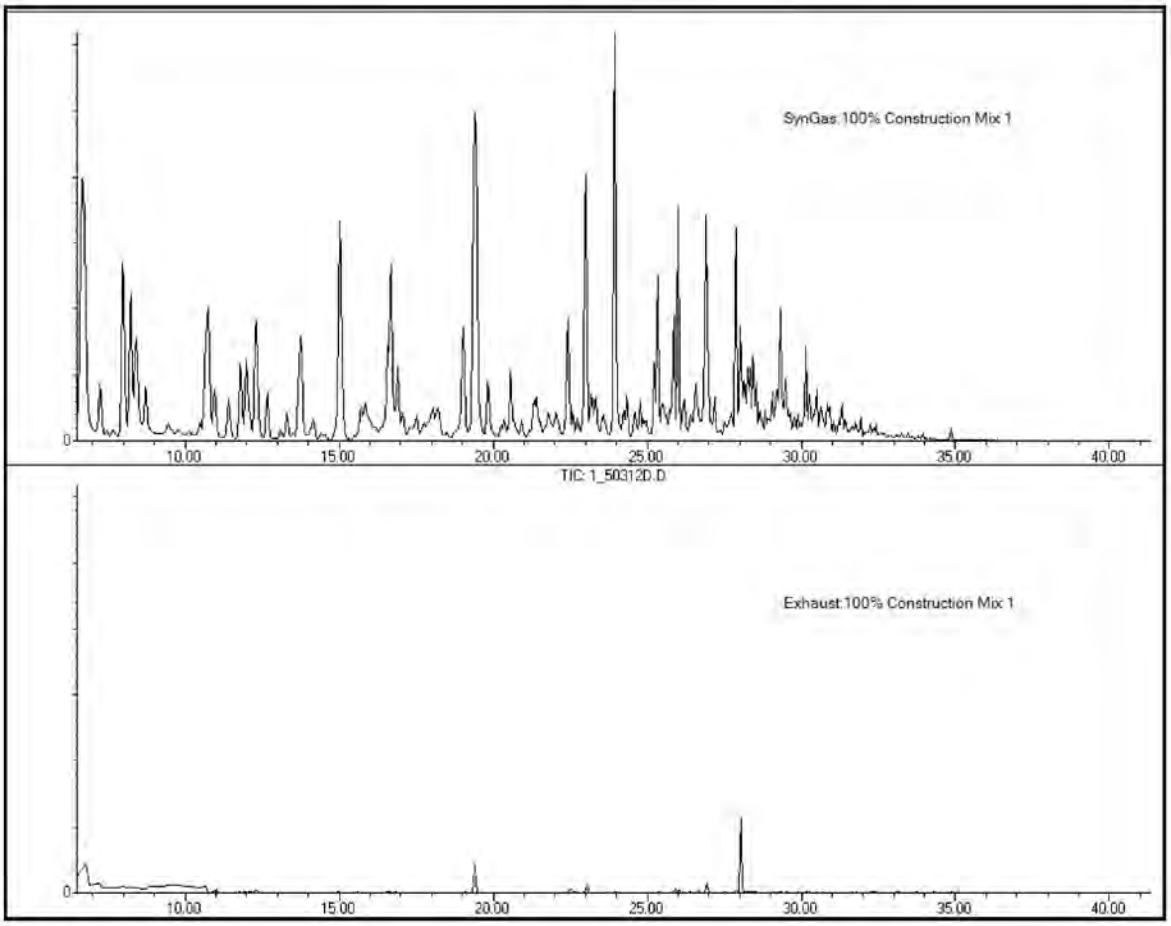
**Long Term Mix 1 Total Ion Chromatograms**



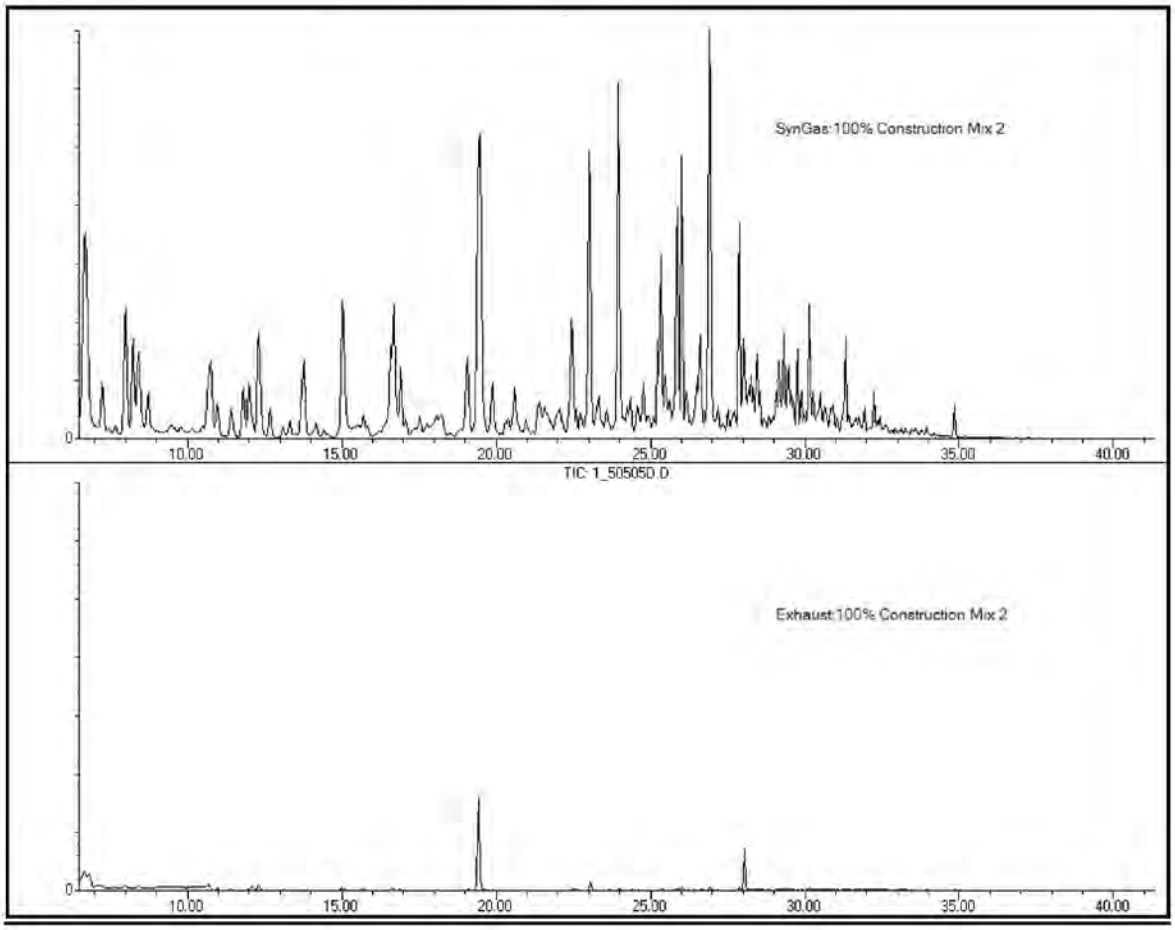
**Long Term Mix 2 Total Ion Chromatograms**



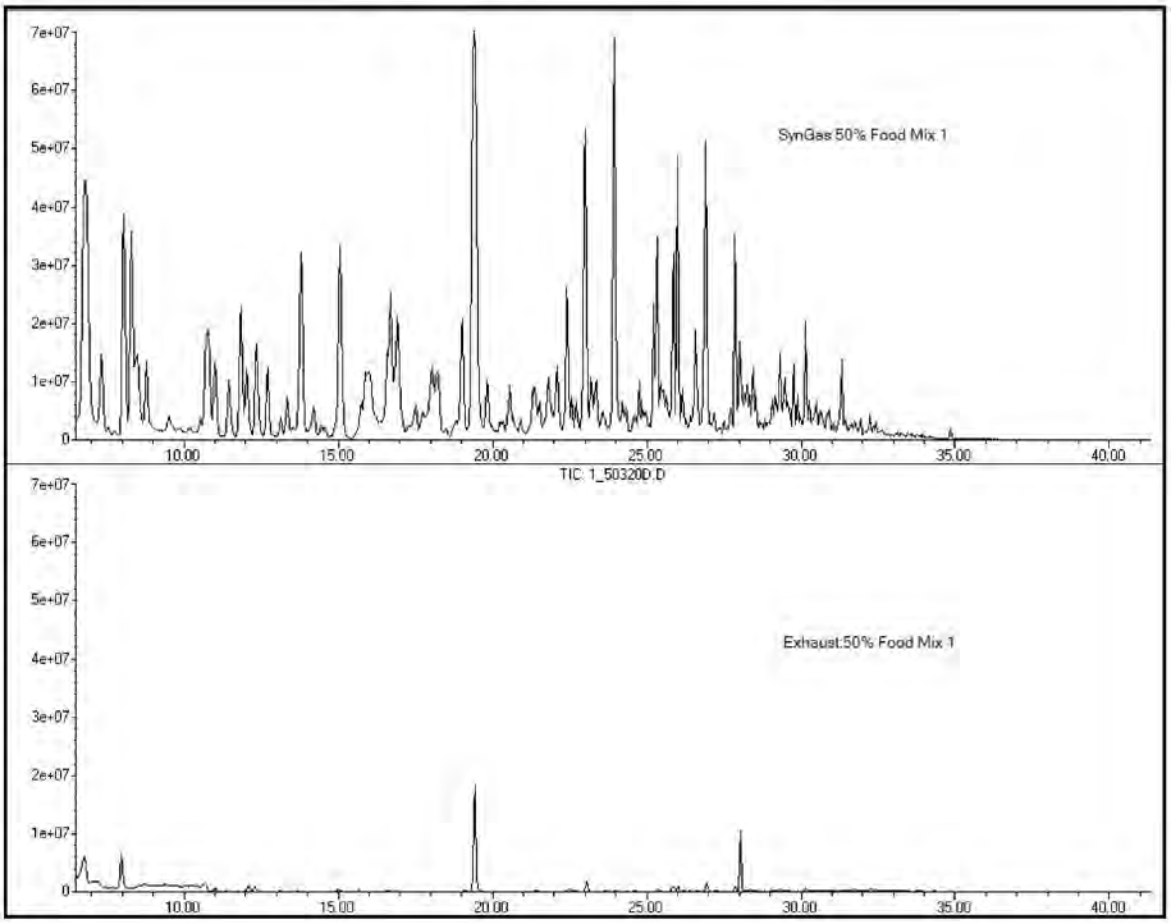
**Construction Mix 1 Total Ion Chromatograms**



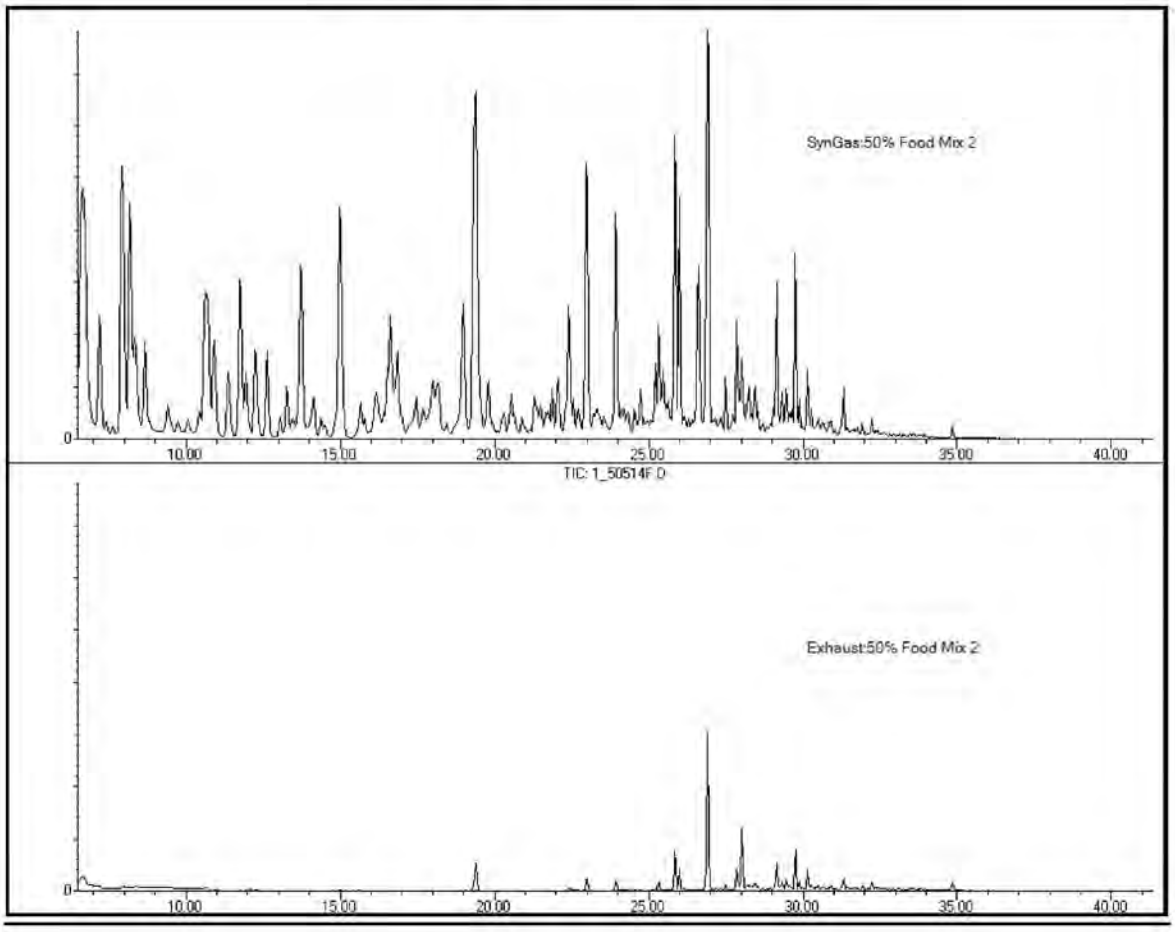
**Construction Mix 2 Total Ion Chromatograms**



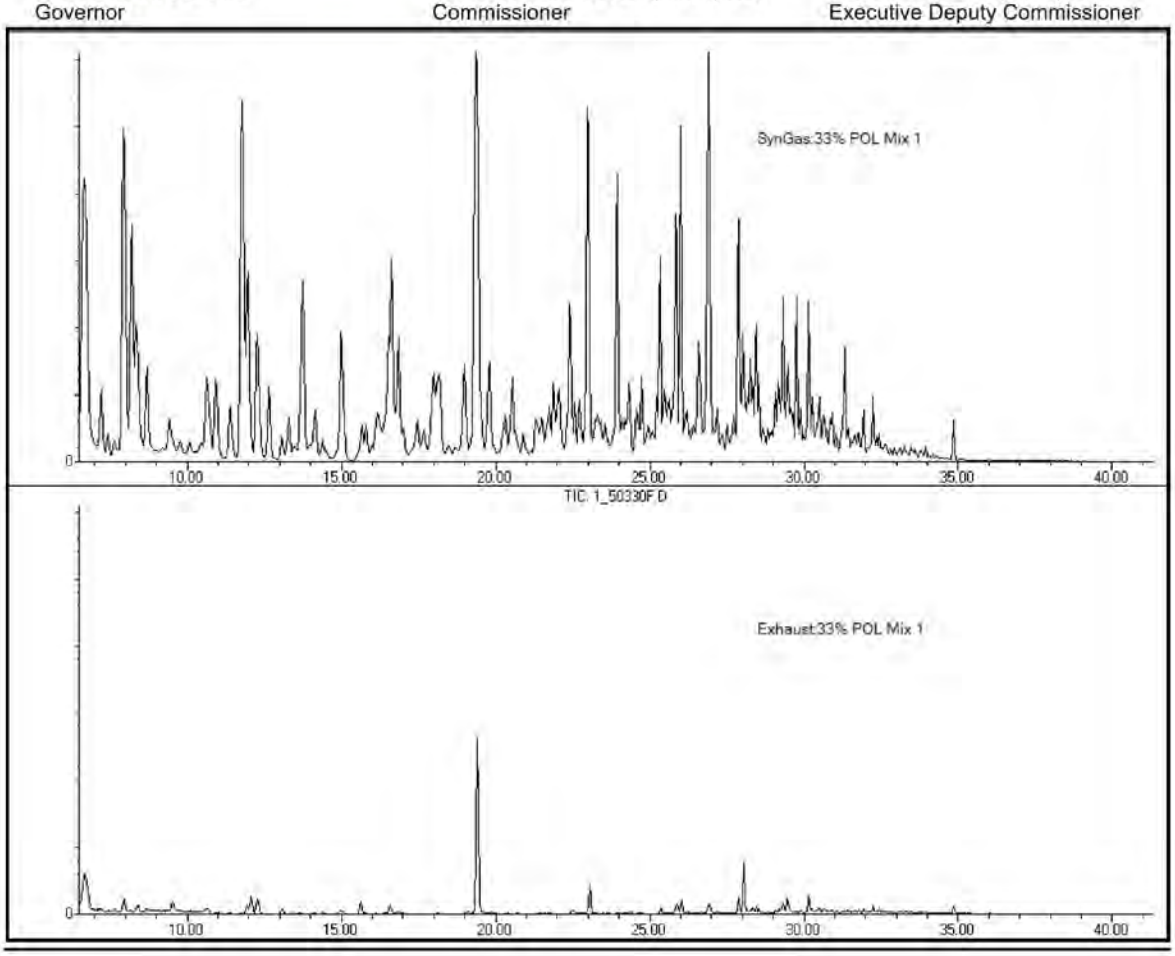
**50% Food Mix 1 Total Ion Chromatograms**



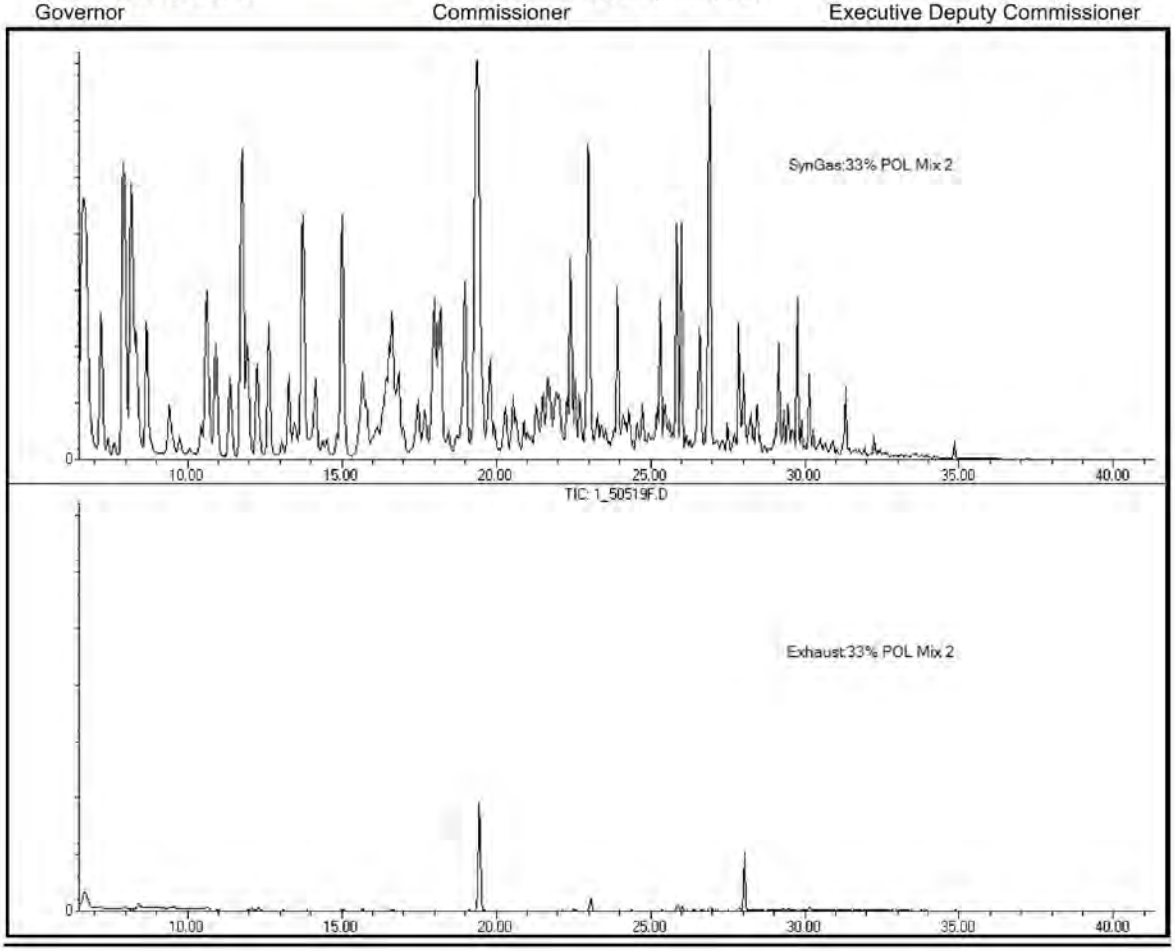
**50% Food Mix 2 Total Ion Chromatograms**



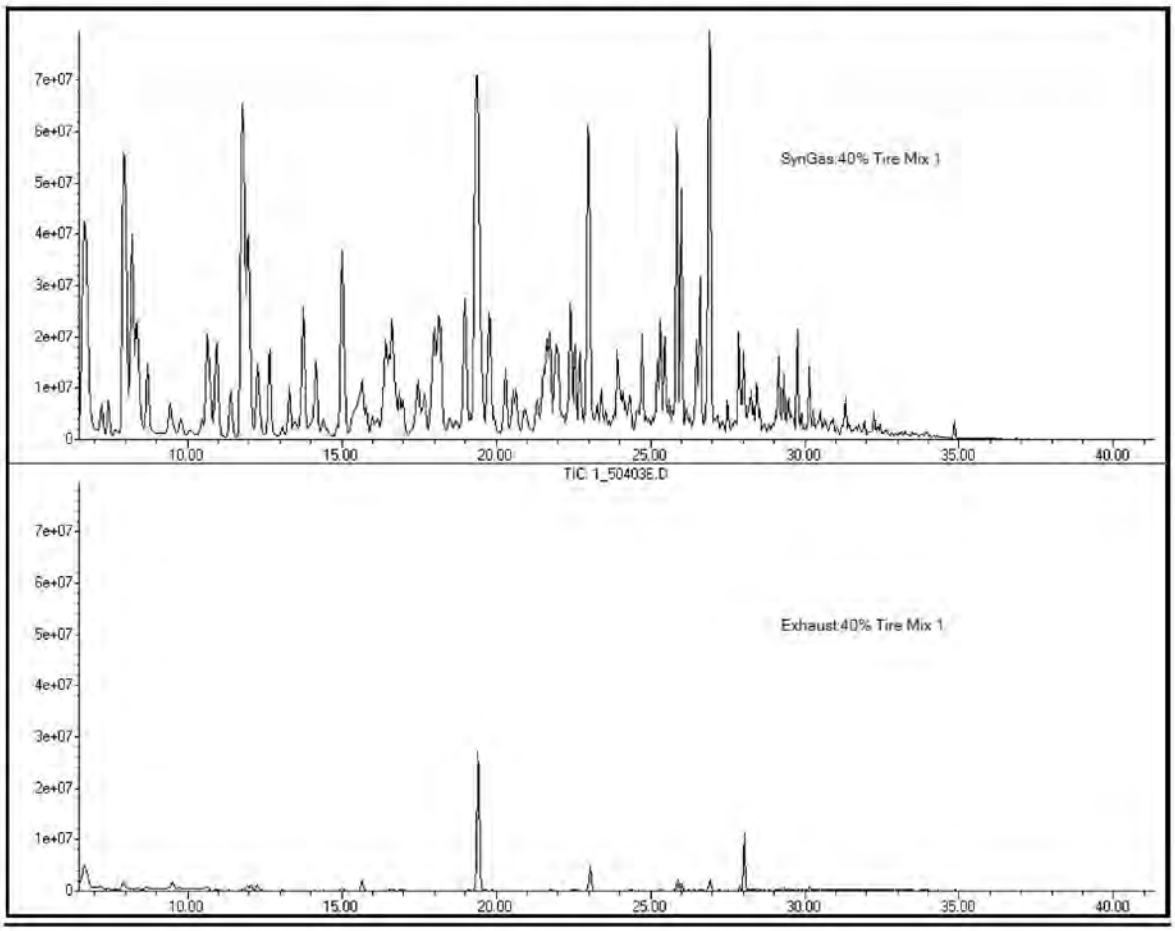
**33% POL Mix 1 Total Ion Chromatograms**



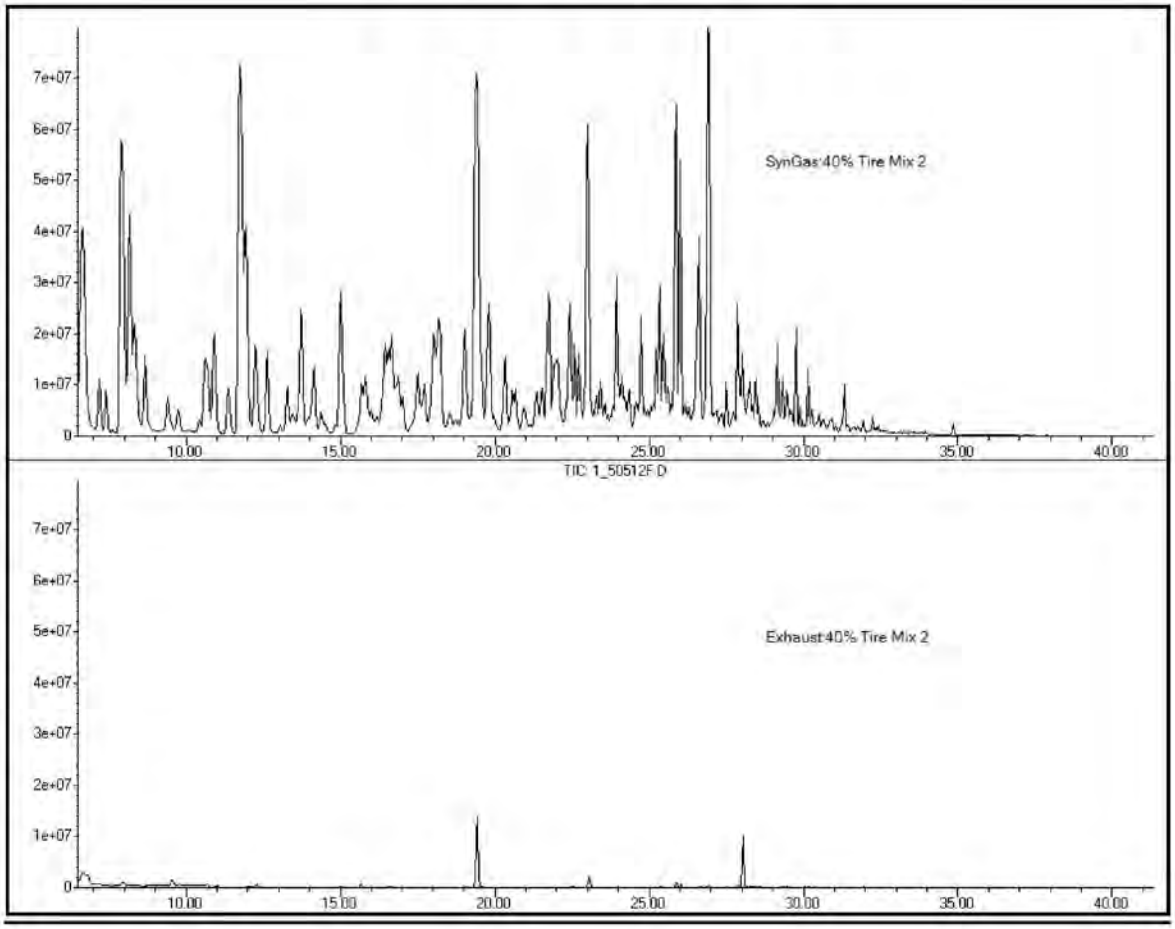

**33% POL Mix 2 Total Ion Chromatograms**


SynGas:33% POL Mix 2
0
10.00
15.00
20.00
25.00
30.00
35.00
40.00
TIC: 1_50519F.D
Exhaust:33% POL Mix 2
0
10.00
15.00
20.00
25.00
30.00
35.00
40.00

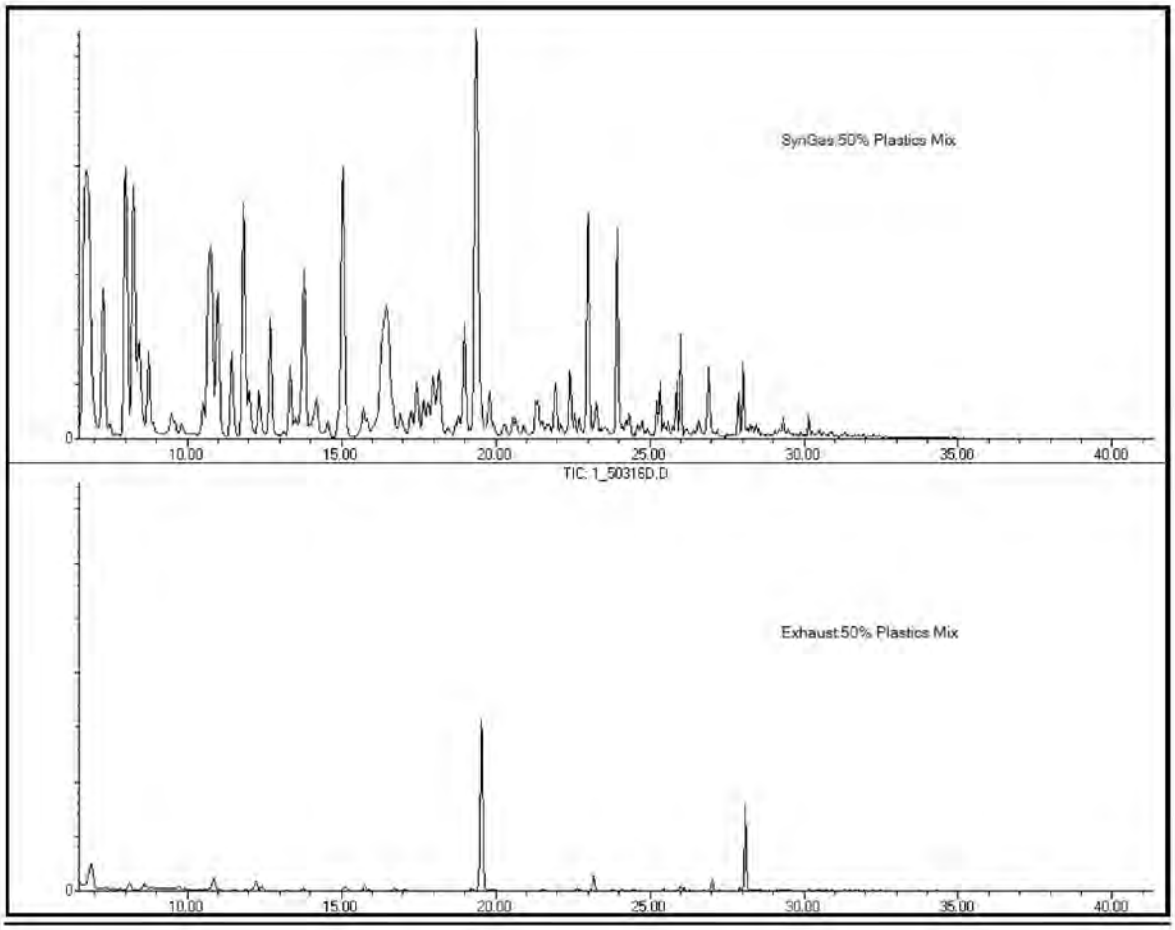
**40% Tire Mix 1 Total Ion Chromatograms**



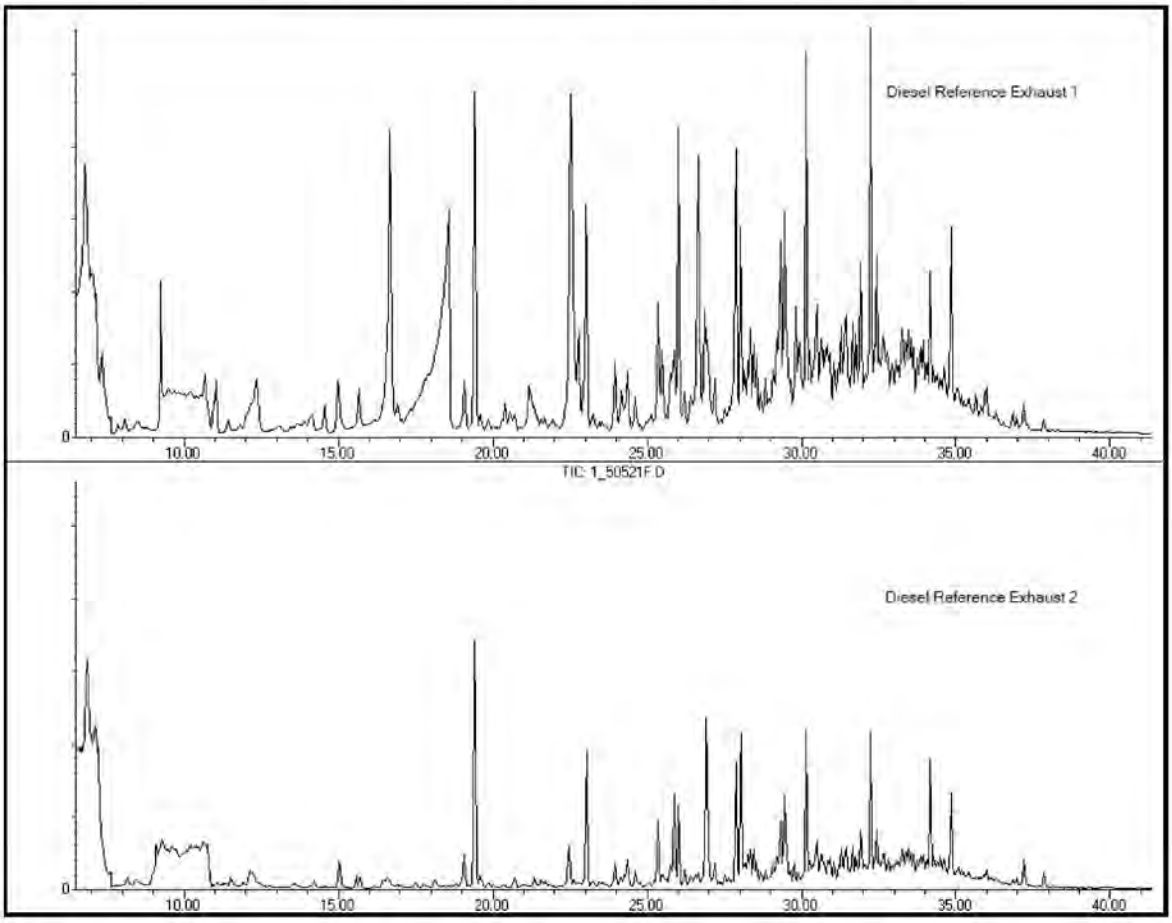
**40% Tire Mix 2 Total Ion Chromatograms**



**50% Plastics Mix 1 Total Ion Chromatograms**



**Diesel Fuel Reference Exhaust Total Ion Chromatograms**



## Summary

For all of the samples submitted for analysis, data collection began slightly after elution of $C_3$ due to it's co-elution with $CO_2$ and water vapor. It's likely the $C_3$ response is under reported by 15-20%. The Syngas chromatogram responses exhibit an n-alkane and olefin series (propane/propene, butane/butene, etc) to decane ($C_{10}$). Benzene and styrene are the two major contributors to the total aromatics in the samples. The cycloalkane series is a major contributor to the total response of the samples, which is similar to the volatile fraction of most commercial engine fuels. The target analytes accounted for approximately 45% of the total response of the Syngas samples.

The Syngas exhaust samples are relatively cleaner overall when compared to commercial diesel fuel exhaust samples. The presence of benzene and to some extent, styrene is very large in the Syngas exhaust samples, but the presence of the higher methyl substituted aromatic compounds is not present in the Syngas exhaust samples.

Visible diesel particulate matter (DPM) was observed in the engine exhaust stream at the time when exhaust samples were acquired. A particulate filter was not used at the exhaust sampling point, allowing DPM to freely enter the Summa container at the time of sampling. DPM is known to contain significant amounts of organic carbon, including benzene soluble fractions, which may have partially devolatilized out of the DPM and eluted as unburnt benzene in the diesel exhaust.

# Appendix F Ash Analysis for Metals

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

Job Number: 480-89453-1

Job Description: Cerl Gasifier - Research Project

For:
U.S. Army Construction Engineering Resea
2902 Newmark Drive
Champaign, IL 61822

Attention: Mr. Stephen Cosper

Joseph V. Giaconazza

Approved for release
Joe V Giaconazza
Project Management Assistant II
11/11/2015 10:05 AM

Designee for
Brian J Fischer, Manager of Project Management
10 Hazelwood Drive, Amherst, NY, 14228-2298
(716)504-9835
brian.fischer@testamericainc.com
11/11/2015

The test results in this report meet all NELAP requirements for analytes for which accreditation is required or available. Any exceptions to the NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory. All questions regarding this test report should be directed to the TestAmerica Project Manager who has signed this report.

TestAmerica Buffalo NELAC Certifications: CADPH 01169CA, FLDOH E87672, ILEPA 200003, KSDOH E-10187, LADEQ 30708, MDH 036-999-337, NHELAP 2973, NJDEP NY455, NHDOH 10026, ORELAP NY200003, PADEP 68-00281, TXCEQ T-104704412-10-1

**TestAmerica Laboratories, Inc.**
TestAmerica Buffalo 10 Hazelwood Drive, Amherst, NY 14228-2298
Tel (716) 691-2600 Fax (716) 691-7991 www.testamericainc.com

# Table of Contents


Cover Title Page . . . . . 1
Data Summaries . . . . . 4
Report Narrative . . . . . 4
Sample Summary . . . . . 5
Executive Summary . . . . . 6
Method Summary . . . . . 8
Method / Analyst Summary . . . . . 9
Sample Datasheets . . . . . 10
QC Data Summary . . . . . 22
Data Qualifiers . . . . . 33
QC Association Summary . . . . . 34
Lab Chronicle . . . . . 37
Reagent Traceability . . . . . 42
Certification Summary . . . . . 50
Inorganic Sample Data . . . . . 52
Metals Data . . . . . 52
Met Cover Page . . . . . 53
Met Sample Data . . . . . 55
Met QC Data . . . . . 67
Met ICV/CCV . . . . . 67
Met CRQL . . . . . 81
Met Blanks . . . . . 82
Met ICSA/ICSAB . . . . . 94
Met MS/MSD/PDS . . . . . 100
Met LCS/LCSD . . . . . 105
Met Serial Dilution . . . . . 110

# Table of Contents


Met MDL . . . . . 113
Met IECF . . . . . 121
Met Linear Ranges . . . . . 124
Met Preparation Log . . . . . 127
Met Analysis Run Log . . . . . 131
Met ICP/MS Int Stds . . . . . 140
Met Prep Data . . . . . 142
General Chemistry Data . . . . . 156
Gen Chem Cover Page . . . . . 157
Gen Chem MDL . . . . . 158
Gen Chem Analysis Run Log . . . . . 160
Gen Chem Prep Data . . . . . 161
Subcontracted Data . . . . . 162
Shipping and Receiving Documents . . . . . 163
Client Chain of Custody . . . . . 164
Sample Receipt Checklist . . . . . 165

**Job Narrative**
**480-89453-1**

**Receipt**
The samples were received on 10/20/2015 9:20 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 20.0° C.

**Metals**
Method(s) 7470A: The following samples were received outside the holding time for method 7470A (TCLP Mercury): A-01-020415-1600 (480-89453-1), A-01-031915-1600 (480-89453-2), A-01-040215-1505 (480-89453-3), A-01-050815-1600 (480-89453-4), (480-89453-A-4-G MS), (480-89453-A-4-H MSD) and (480-89453-A-4-F SD ^).

Method(s) 6010C: The following samples were diluted for TCLP Selenium due to the nature of the sample matrix: A-01-020415-1600 (480-89453-1), A-01-031915-1600 (480-89453-2), A-01-040215-1505 (480-89453-3), A-01-050815-1600 (480-89453-4), (480-89453-A-4-D MS ^), (480-89453-A-4-E MSD), (480-89453-A-4-C PDS) and (480-89453-A-4-C SD ^). Elevated reporting limits (RLs) are provided.

Method(s) 6010C: The following samples were received outside the holding time for method 6010C: A-01-020415-1600 (480-89453-1), A-01-031915-1600 (480-89453-2) and A-01-040215-1505 (480-89453-3).

Method(s) 7471B: The following samples were received outside the method holding time for 7471B: A-01-020415-1600 (480-89453-1), A-01-031915-1600 (480-89453-2), A-01-040215-1505 (480-89453-3), A-01-050815-1600 (480-89453-4), (480-89453-A-1-C MS), (480-89453-A-1-D MSD) and (480-89453-A-1-B SD ^).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

**General Chemistry**
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

**Organic Prep**
Method(s) 1311: Due to the sample matrix and associated reaction to the extraction fluid, the laboratory was unable to perform the leaching procedure with the required 100g for the following samples: A-01-020415-1600 (480-89453-1), A-01-031915-1600 (480-89453-2), A-01-040215-1505 (480-89453-3) and A-01-050815-1600 (480-89453-4). The volume of leaching fluid was adjusted proportionally to maintain a 20:1 ratio of leaching fluid to weight of sample. Reporting limits (RLs) are not affected.

Method(s) 1311: The following samples were prepared outside of preparation holding time.: A-01-020415-1600 (480-89453-1), A-01-031915-1600 (480-89453-2), A-01-040215-1505 (480-89453-3) and A-01-050815-1600 (480-89453-4).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

## SAMPLE SUMMARY

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

| Lab Sample ID | Client Sample ID | Client Matrix | Date/Time Sampled | Date/Time Received |
|---|---|---|---|---|
| 480-89453-1 | A-01-020415-1600 | Solid | 02/04/2015 1600 | 10/20/2015 0920 |
| 480-89453-2 | A-01-031915-1600 | Solid | 03/19/2015 1600 | 10/20/2015 0920 |
| 480-89453-3 | A-01-040215-1505 | Solid | 04/02/2015 1505 | 10/20/2015 0920 |
| 480-89453-4 | A-01-050815-1600 | Solid | 05/08/2015 1600 | 10/20/2015 0920 |

## EXECUTIVE SUMMARY - Detections

Client: U.S. Army Construction Engineering Resea  Job Number: 480-89453-1

| Lab Sample ID<br>Analyte | Client Sample ID | Result | Qualifier | Reporting Limit | Units | Method |
|---|---|---|---|---|---|---|
| **480-89453-1** | **A-01-020415-1600** | | | | | |
| Arsenic | | 3.6 | | 0.54 | mg/Kg | 6020A |
| Barium | | 382 | | 5.4 | mg/Kg | 6020A |
| Cadmium | | 0.065 | J | 0.54 | mg/Kg | 6020A |
| Chromium | | 663 | B | 1.1 | mg/Kg | 6020A |
| Silver | | 0.21 | J | 0.54 | mg/Kg | 6020A |
| Lead | | 0.70 | | 0.54 | mg/Kg | 6020A |
| Percent Moisture | | 11 | | 0.10 | % | 2540G |
| Percent Solids | | 89 | | 0.10 | % | 2540G |
| *TCLP* | | | | | | |
| Barium | | 3.2 | H | 1.0 | mg/L | 6010C |
| Lead | | 0.0040 | J H | 0.020 | mg/L | 6010C |
| **480-89453-2** | **A-01-031915-1600** | | | | | |
| Arsenic | | 3.3 | | 0.48 | mg/Kg | 6020A |
| Barium | | 350 | | 4.8 | mg/Kg | 6020A |
| Chromium | | 636 | B | 0.95 | mg/Kg | 6020A |
| Silver | | 0.15 | J | 0.48 | mg/Kg | 6020A |
| Lead | | 0.76 | | 0.48 | mg/Kg | 6020A |
| Selenium | | 0.44 | J | 2.4 | mg/Kg | 6020A |
| Percent Moisture | | 0.00 | | 0.10 | % | 2540G |
| Percent Solids | | 100 | | 0.10 | % | 2540G |
| *TCLP* | | | | | | |
| Barium | | 1.9 | H | 1.0 | mg/L | 6010C |
| Chromium | | 0.029 | H | 0.020 | mg/L | 6010C |
| **480-89453-3** | **A-01-040215-1505** | | | | | |
| Arsenic | | 3.3 | | 0.50 | mg/Kg | 6020A |
| Barium | | 517 | | 5.0 | mg/Kg | 6020A |
| Cadmium | | 0.042 | J | 0.50 | mg/Kg | 6020A |
| Chromium | | 337 | B | 0.99 | mg/Kg | 6020A |
| Silver | | 0.12 | J | 0.50 | mg/Kg | 6020A |
| Lead | | 1.0 | | 0.50 | mg/Kg | 6020A |
| Percent Moisture | | 0.00 | | 0.10 | % | 2540G |
| Percent Solids | | 100 | | 0.10 | % | 2540G |
| *TCLP* | | | | | | |
| Barium | | 3.7 | H | 1.0 | mg/L | 6010C |
| Chromium | | 0.015 | J H | 0.020 | mg/L | 6010C |
| Lead | | 0.0040 | J H | 0.020 | mg/L | 6010C |

## EXECUTIVE SUMMARY - Detections

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

| Lab Sample ID<br>Analyte | Client Sample ID | Result | Qualifier | Reporting Limit | Units | Method |
|---|---|---|---|---|---|---|
| **480-89453-4** | **A-01-050815-1600** | | | | | |
| Arsenic | | 1.9 | | 0.48 | mg/Kg | 6020A |
| Barium | | 351 | | 4.8 | mg/Kg | 6020A |
| Chromium | | 197 | B | 0.97 | mg/Kg | 6020A |
| Silver | | 0.11 | J | 0.48 | mg/Kg | 6020A |
| Lead | | 2.5 | | 0.48 | mg/Kg | 6020A |
| Mercury | | 0.011 | J H | 0.021 | mg/Kg | 7471B |
| Percent Moisture | | 0.79 | | 0.10 | % | 2540G |
| Percent Solids | | 99 | | 0.10 | % | 2540G |
| *TCLP* | | | | | | |
| Barium | | 3.8 | F1 | 1.0 | mg/L | 6010C |
| Lead | | 0.0074 | J | 0.020 | mg/L | 6010C |

## METHOD SUMMARY

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89453-1

| Description | Lab Location | Method | Preparation Method |
|---|---|---|---|
| **Matrix: Solid** | | | |
| Metals (ICP) | TAL BUF | SW846 6010C | |
| TCLP Extraction | TAL BUF | | SW846 1311 |
| Preparation, Total Metals | TAL BUF | | SW846 3010A |
| TCLP Mercury | TAL BUF | SW846 7470A | |
| TCLP Extraction | TAL BUF | | SW846 1311 |
| Preparation, Mercury | TAL BUF | | SW846 7470A |
| Mercury (CVAA) | TAL BUF | SW846 7471B | |
| Preparation, Mercury | TAL BUF | | SW846 7471B |
| Metals (ICP/MS) | TAL PIT | SW846 6020A | |
| Preparation, Metals | TAL PIT | | SW846 3050B |
| SM 2540G | TAL PIT | SM22 2540G | |

**Lab References:**

TAL BUF = TestAmerica Buffalo

TAL PIT = TestAmerica Pittsburgh

**Method References:**

SM22 = Standard Methods For The Examination Of Water And Wastewater, 22nd Edition

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates

## METHOD / ANALYST SUMMARY

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

| Method | Analyst | Analyst ID |
|---|---|---|
| SW846 6010C | Hawrysiak, Allison M | AMH |
| SW846 6020A | Reinheimer, Bill | WTR |
| SW846 7470A | Seger, Tiffany A | TAS |
| SW846 7471B | Seger, Tiffany A | TAS |
| SM22 2540G | Loheyde, Cheryl | CLL |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89453-1

**Client Sample ID:** **A-01-020415-1600**

Lab Sample ID: 480-89453-1 | Date Sampled: 02/04/2015 1600
Client Matrix: Solid | Date Received: 10/20/2015 0920

**6010C Metals (ICP)-TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 6010C | Analysis Batch: | 480-270880 | Instrument ID: | ICAP2 |
| Prep Method: | 3010A | Prep Batch: | 480-270374 | Lab File ID: | I2102315B-4.asc |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/23/2015 2020 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 941 | | | | |

| Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Arsenic | | ND | H | 0.0056 | 0.015 |
| Barium | | 3.2 | H | 0.10 | 1.0 |
| Cadmium | | ND | H | 0.00050 | 0.0020 |
| Chromium | | ND | H | 0.010 | 0.020 |
| Lead | | 0.0040 | J H | 0.0030 | 0.020 |
| Silver | | ND | H | 0.0017 | 0.0060 |

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 6010C | Analysis Batch: | 480-271006 | Instrument ID: | ICAP2 |
| Prep Method: | 3010A | Prep Batch: | 480-270374 | Lab File ID: | I2102415A-2.asc |
| Dilution: | 5.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/24/2015 1053 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 941 | | | | |

| Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Selenium | | ND | H | 0.044 | 0.13 |

**6020A Metals (ICP/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 6020A | Analysis Batch: | 180-159963 | Instrument ID: | X |
| Prep Method: | 3050B | Prep Batch: | 180-159790 | Lab File ID: | X51109A.xml |
| Dilution: | 5.0 | | | Initial Weight/Volume: | 00001.04 g |
| Analysis Date: | 11/09/2015 2001 | | | Final Weight/Volume: | 100 mL |
| Prep Date: | 11/09/2015 1244 | | | | |

| Analyte | DryWt Corrected: Y | Result (mg/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Arsenic | | 3.6 | | 0.097 | 0.54 |
| Barium | | 382 | | 0.058 | 5.4 |
| Cadmium | | 0.065 | J | 0.038 | 0.54 |
| Chromium | | 663 | B | 0.033 | 1.1 |
| Silver | | 0.21 | J | 0.021 | 0.54 |
| Lead | | 0.70 | | 0.020 | 0.54 |
| Selenium | | ND | | 0.27 | 2.7 |

**7470A TCLP Mercury-TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 7470A | Analysis Batch | 480-270525 | Instrument ID: | LEEMAN2 |
| Prep Method: | 7470A | Prep Batch: | 480-270385 | Lab File ID: | H10225TC.PRN |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 30 mL |
| Analysis Date: | 10/22/2015 1702 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1215 | | | | |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89453-1

**Client Sample ID:** **A-01-020415-1600**

Lab Sample ID: 480-89453-1 | Date Sampled: 02/04/2015 1600
Client Matrix: Solid | Date Received: 10/20/2015 0920

**7470A TCLP Mercury-TCLP**

Leach Date: 10/21/2015 941

| Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Mercury | | ND | H | 0.00012 | 0.00020 |

**7471B Mercury (CVAA)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 7471B | Analysis Batch: | 480-270289 | Instrument ID: | LEEMAN2 |
| Prep Method: | 7471B | Prep Batch: | 480-270135 | Lab File ID: | H10215S1.PRN |
| Dilution: | 1.0 | | | Initial Weight/Volume: | +0.5970 g |
| Analysis Date: | 10/21/2015 1720 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/21/2015 1500 | | | | |

| Analyte | DryWt Corrected: Y | Result (mg/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Mercury | | ND | H | 0.0091 | 0.022 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89453-1

**Client Sample ID:** **A-01-031915-1600**

Lab Sample ID: 480-89453-2 | Date Sampled: 03/19/2015 1600
Client Matrix: Solid | Date Received: 10/20/2015 0920

**6010C Metals (ICP)-TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 6010C | Analysis Batch: | 480-270880 | Instrument ID: | ICAP2 |
| Prep Method: | 3010A | Prep Batch: | 480-270374 | Lab File ID: | I2102315B-4.asc |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/23/2015 2023 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 941 | | | | |

| Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Arsenic | | ND | H | 0.0056 | 0.015 |
| Barium | | 1.9 | H | 0.10 | 1.0 |
| Cadmium | | ND | H | 0.00050 | 0.0020 |
| Chromium | | 0.029 | H | 0.010 | 0.020 |
| Lead | | ND | H | 0.0030 | 0.020 |
| Silver | | ND | H | 0.0017 | 0.0060 |

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 6010C | Analysis Batch: | 480-271006 | Instrument ID: | ICAP2 |
| Prep Method: | 3010A | Prep Batch: | 480-270374 | Lab File ID: | I2102415A-2.asc |
| Dilution: | 5.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/24/2015 1106 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 941 | | | | |

| Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Selenium | | ND | H | 0.044 | 0.13 |

**6020A Metals (ICP/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 6020A | Analysis Batch: | 180-159963 | Instrument ID: | X |
| Prep Method: | 3050B | Prep Batch: | 180-159790 | Lab File ID: | X51109A.xml |
| Dilution: | 5.0 | | | Initial Weight/Volume: | 00001.05 g |
| Analysis Date: | 11/09/2015 2006 | | | Final Weight/Volume: | 100 mL |
| Prep Date: | 11/09/2015 1244 | | | | |

| Analyte | DryWt Corrected: Y | Result (mg/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Arsenic | | 3.3 | | 0.086 | 0.48 |
| Barium | | 350 | | 0.051 | 4.8 |
| Cadmium | | ND | | 0.033 | 0.48 |
| Chromium | | 636 | B | 0.029 | 0.95 |
| Silver | | 0.15 | J | 0.019 | 0.48 |
| Lead | | 0.76 | | 0.018 | 0.48 |
| Selenium | | 0.44 | J | 0.24 | 2.4 |

**7470A TCLP Mercury-TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 7470A | Analysis Batch | 480-270525 | Instrument ID: | LEEMAN2 |
| Prep Method: | 7470A | Prep Batch: | 480-270385 | Lab File ID: | H10225TC.PRN |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 30 mL |
| Analysis Date: | 10/22/2015 1704 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1215 | | | | |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89453-1

**Client Sample ID:** **A-01-031915-1600**

Lab Sample ID: 480-89453-2 | Date Sampled: 03/19/2015 1600
Client Matrix: Solid | Date Received: 10/20/2015 0920

**7470A TCLP Mercury-TCLP**

Leach Date: 10/21/2015 941

| Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Mercury | | ND | H | 0.00012 | 0.00020 |

**7471B Mercury (CVAA)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 7471B | Analysis Batch: | 480-270289 | Instrument ID: | LEEMAN2 |
| Prep Method: | 7471B | Prep Batch: | 480-270135 | Lab File ID: | H10215S1.PRN |
| Dilution: | 1.0 | | | Initial Weight/Volume: | +0.5845 g |
| Analysis Date: | 10/21/2015 1726 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/21/2015 1500 | | | | |

| Analyte | DryWt Corrected: Y | Result (mg/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Mercury | | ND | H | 0.0083 | 0.021 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89453-1

**Client Sample ID:** **A-01-040215-1505**

Lab Sample ID: 480-89453-3 | Date Sampled: 04/02/2015 1505
Client Matrix: Solid | Date Received: 10/20/2015 0920

## 6010C Metals (ICP)-TCLP

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 6010C | Analysis Batch: | 480-270880 | Instrument ID: | ICAP2 |
| Prep Method: | 3010A | Prep Batch: | 480-270374 | Lab File ID: | I2102315B-4.asc |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/23/2015 2027 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 941 | | | | |

| Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Arsenic | | ND | H | 0.0056 | 0.015 |
| Barium | | 3.7 | H | 0.10 | 1.0 |
| Cadmium | | ND | H | 0.00050 | 0.0020 |
| Chromium | | 0.015 | J H | 0.010 | 0.020 |
| Lead | | 0.0040 | J H | 0.0030 | 0.020 |
| Silver | | ND | H | 0.0017 | 0.0060 |

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 6010C | Analysis Batch: | 480-271006 | Instrument ID: | ICAP2 |
| Prep Method: | 3010A | Prep Batch: | 480-270374 | Lab File ID: | I2102415A-2.asc |
| Dilution: | 5.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/24/2015 1109 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 941 | | | | |

| Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Selenium | | ND | H | 0.044 | 0.13 |

## 6020A Metals (ICP/MS)

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 6020A | Analysis Batch: | 180-159963 | Instrument ID: | X |
| Prep Method: | 3050B | Prep Batch: | 180-159790 | Lab File ID: | X51109A.xml |
| Dilution: | 5.0 | | | Initial Weight/Volume: | 00001.01 g |
| Analysis Date: | 11/09/2015 2011 | | | Final Weight/Volume: | 100 mL |
| Prep Date: | 11/09/2015 1244 | | | | |

| Analyte | DryWt Corrected: Y | Result (mg/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Arsenic | | 3.3 | | 0.090 | 0.50 |
| Barium | | 517 | | 0.053 | 5.0 |
| Cadmium | | 0.042 | J | 0.035 | 0.50 |
| Chromium | | 337 | B | 0.030 | 0.99 |
| Silver | | 0.12 | J | 0.019 | 0.50 |
| Lead | | 1.0 | | 0.019 | 0.50 |
| Selenium | | ND | | 0.25 | 2.5 |

## 7470A TCLP Mercury-TCLP

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 7470A | Analysis Batch | 480-270525 | Instrument ID: | LEEMAN2 |
| Prep Method: | 7470A | Prep Batch: | 480-270385 | Lab File ID: | H10225TC.PRN |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 30 mL |
| Analysis Date: | 10/22/2015 1705 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1215 | | | | |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89453-1

**Client Sample ID:** **A-01-040215-1505**

Lab Sample ID: 480-89453-3 | Date Sampled: 04/02/2015 1505
Client Matrix: Solid | Date Received: 10/20/2015 0920

**7470A TCLP Mercury-TCLP**

Leach Date: 10/21/2015 941

| Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Mercury | | ND | H | 0.00012 | 0.00020 |

**7471B Mercury (CVAA)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 7471B | Analysis Batch: | 480-270289 | Instrument ID: | LEEMAN2 |
| Prep Method: | 7471B | Prep Batch: | 480-270135 | Lab File ID: | H10215S1.PRN |
| Dilution: | 1.0 | | | Initial Weight/Volume: | +0.5921 g |
| Analysis Date: | 10/21/2015 1729 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/21/2015 1500 | | | | |

| Analyte | DryWt Corrected: Y | Result (mg/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Mercury | | ND | H | 0.0082 | 0.020 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89453-1

**Client Sample ID:** **A-01-050815-1600**

Lab Sample ID: 480-89453-4 | Date Sampled: 05/08/2015 1600
Client Matrix: Solid | Date Received: 10/20/2015 0920

**6010C Metals (ICP)-TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 6010C | Analysis Batch: | 480-270880 | Instrument ID: | ICAP2 |
| Prep Method: | 3010A | Prep Batch: | 480-270374 | Lab File ID: | I2102315B-4.asc |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/23/2015 2040 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 941 | | | | |

| Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Arsenic | | ND | | 0.0056 | 0.015 |
| Barium | | 3.8 | F1 | 0.10 | 1.0 |
| Cadmium | | ND | | 0.00050 | 0.0020 |
| Chromium | | ND | | 0.010 | 0.020 |
| Lead | | 0.0074 | J | 0.0030 | 0.020 |
| Silver | | ND | | 0.0017 | 0.0060 |

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 6010C | Analysis Batch: | 480-271006 | Instrument ID: | ICAP2 |
| Prep Method: | 3010A | Prep Batch: | 480-270374 | Lab File ID: | I2102415A-2.asc |
| Dilution: | 5.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/24/2015 1113 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 941 | | | | |

| Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Selenium | | ND | | 0.044 | 0.13 |

**6020A Metals (ICP/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 6020A | Analysis Batch: | 180-159963 | Instrument ID: | X |
| Prep Method: | 3050B | Prep Batch: | 180-159790 | Lab File ID: | X51109A.xml |
| Dilution: | 5.0 | | | Initial Weight/Volume: | 00001.04 g |
| Analysis Date: | 11/09/2015 2016 | | | Final Weight/Volume: | 100 mL |
| Prep Date: | 11/09/2015 1244 | | | | |

| Analyte | DryWt Corrected: Y | Result (mg/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Arsenic | | 1.9 | | 0.088 | 0.48 |
| Barium | | 351 | | 0.052 | 4.8 |
| Cadmium | | ND | | 0.034 | 0.48 |
| Chromium | | 197 | B | 0.030 | 0.97 |
| Silver | | 0.11 | J | 0.019 | 0.48 |
| Lead | | 2.5 | | 0.018 | 0.48 |
| Selenium | | ND | | 0.24 | 2.4 |

**7470A TCLP Mercury-TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 7470A | Analysis Batch | 480-270525 | Instrument ID: | LEEMAN2 |
| Prep Method: | 7470A | Prep Batch: | 480-270385 | Lab File ID: | H10225TC.PRN |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 30 mL |
| Analysis Date: | 10/22/2015 1708 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1215 | | | | |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89453-1

**Client Sample ID:** **A-01-050815-1600**

Lab Sample ID: 480-89453-4 | Date Sampled: 05/08/2015 1600
Client Matrix: Solid | Date Received: 10/20/2015 0920

**7470A TCLP Mercury-TCLP**

Leach Date: 10/21/2015 941

| Analyte | DryWt Corrected: N | Result (mg/L) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Mercury | | ND | H | 0.00012 | 0.00020 |

**7471B Mercury (CVAA)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 7471B | Analysis Batch: | 480-270289 | Instrument ID: | LEEMAN2 |
| Prep Method: | 7471B | Prep Batch: | 480-270135 | Lab File ID: | H10215S1.PRN |
| Dilution: | 1.0 | | | Initial Weight/Volume: | +0.5874 g |
| Analysis Date: | 10/21/2015 1730 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/21/2015 1500 | | | | |

| Analyte | DryWt Corrected: Y | Result (mg/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Mercury | | 0.011 | J H | 0.0083 | 0.021 |

**General Chemistry**

**Client Sample ID:** **A-01-020415-1600**

Lab Sample ID: 480-89453-1 Date Sampled: 02/04/2015 1600
Client Matrix: Solid Date Received: 10/20/2015 0920

| Analyte | Result | Qual | Units | RL | RL | Dil | Method |
|---|---|---|---|---|---|---|---|
| Percent Moisture | 11 | | % | 0.10 | 0.10 | 1.0 | 2540G |
| Analysis Batch: 180-158347 | Analysis Date: 10/27/2015 0835 | | | | | | DryWt Corrected: N |
| Percent Solids | 89 | | % | 0.10 | 0.10 | 1.0 | 2540G |
| Analysis Batch: 180-158347 | Analysis Date: 10/27/2015 0835 | | | | | | DryWt Corrected: N |

**General Chemistry**

**Client Sample ID:** **A-01-031915-1600**

Lab Sample ID: 480-89453-2 Date Sampled: 03/19/2015 1600
Client Matrix: Solid Date Received: 10/20/2015 0920

| Analyte | Result | Qual | Units | RL | RL | Dil | Method |
|---|---|---|---|---|---|---|---|
| Percent Moisture | 0.00 | | % | 0.10 | 0.10 | 1.0 | 2540G |
| Analysis Batch: 180-158347 | Analysis Date: 10/27/2015 0835 | | | | | | DryWt Corrected: N |
| Percent Solids | 100 | | % | 0.10 | 0.10 | 1.0 | 2540G |
| Analysis Batch: 180-158347 | Analysis Date: 10/27/2015 0835 | | | | | | DryWt Corrected: N |

**General Chemistry**

**Client Sample ID:** **A-01-040215-1505**

Lab Sample ID: 480-89453-3 Date Sampled: 04/02/2015 1505
Client Matrix: Solid Date Received: 10/20/2015 0920

| Analyte | Result | Qual | Units | RL | RL | Dil | Method |
|---|---|---|---|---|---|---|---|
| Percent Moisture | 0.00 | | % | 0.10 | 0.10 | 1.0 | 2540G |
| Analysis Batch: 180-158347 | Analysis Date: 10/27/2015 0835 | | | | | | DryWt Corrected: N |
| Percent Solids | 100 | | % | 0.10 | 0.10 | 1.0 | 2540G |
| Analysis Batch: 180-158347 | Analysis Date: 10/27/2015 0835 | | | | | | DryWt Corrected: N |

**General Chemistry**

**Client Sample ID:** **A-01-050815-1600**

Lab Sample ID: 480-89453-4 Date Sampled: 05/08/2015 1600
Client Matrix: Solid Date Received: 10/20/2015 0920

| Analyte | Result | Qual | Units | RL | RL | Dil | Method |
|---|---|---|---|---|---|---|---|
| Percent Moisture | 0.79 | | % | 0.10 | 0.10 | 1.0 | 2540G |
| Analysis Batch: 180-158347 | Analysis Date: 10/27/2015 0835 | | | | | | DryWt Corrected: N |
| Percent Solids | 99 | | % | 0.10 | 0.10 | 1.0 | 2540G |
| Analysis Batch: 180-158347 | Analysis Date: 10/27/2015 0835 | | | | | | DryWt Corrected: N |

**TCLP SPLPW Leachate Blank - Batch: 480-270374**

**Method: 6010C**
**Preparation: 3010A**
**TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | LB2 480-270052/1-C | Analysis Batch: | 480-270880 | Instrument ID: | ICAP2 |
| Client Matrix: | Solid | Prep Batch: | 480-270374 | Lab File ID: | I2102315B-4.asc |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/23/2015 2010 | Units: | mg/L | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| Analyte | Result | Qual | MDL | RL |
|---|---|---|---|---|
| Arsenic | ND | | 0.0056 | 0.015 |
| Barium | ND | | 0.10 | 1.0 |
| Cadmium | ND | | 0.00050 | 0.0020 |
| Chromium | ND | | 0.010 | 0.020 |
| Lead | ND | | 0.0030 | 0.020 |
| Selenium | ND | | 0.0087 | 0.025 |
| Silver | ND | | 0.0017 | 0.0060 |

**Method Blank - Batch: 480-270374**

**Method: 6010C**
**Preparation: 3010A**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | MB 480-270374/2-A | Analysis Batch: | 480-270880 | Instrument ID: | ICAP2 |
| Client Matrix: | Water | Prep Batch: | 480-270374 | Lab File ID: | I2102315B-4.asc |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/23/2015 2014 | Units: | mg/L | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | N/A | | | | |

| Analyte | Result | Qual | MDL | RL |
|---|---|---|---|---|
| Arsenic | ND | | 0.0056 | 0.015 |
| Barium | ND | | 0.10 | 1.0 |
| Cadmium | ND | | 0.00050 | 0.0020 |
| Chromium | ND | | 0.010 | 0.020 |
| Lead | ND | | 0.0030 | 0.020 |
| Selenium | ND | | 0.0087 | 0.025 |
| Silver | ND | | 0.0017 | 0.0060 |

**Lab Control Sample - Batch: 480-270374**

**Method: 6010C**
**Preparation: 3010A**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | LCS 480-270374/3-A | Analysis Batch: | 480-270880 | Instrument ID: | ICAP2 |
| Client Matrix: | Water | Prep Batch: | 480-270374 | Lab File ID: | I2102315B-4.asc |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/23/2015 2017 | Units: | mg/L | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | N/A | | | | |

| Analyte | Spike Amount | Result | % Rec. | Limit | Qual |
|---|---|---|---|---|---|
| Arsenic | 1.00 | 1.07 | 107 | 80 - 120 | |
| Barium | 1.00 | 0.973 | 97 | 80 - 120 | J |
| Cadmium | 1.00 | 1.02 | 102 | 80 - 120 | |
| Chromium | 1.00 | 0.982 | 98 | 80 - 120 | |
| Lead | 1.00 | 0.980 | 98 | 80 - 120 | |
| Selenium | 1.00 | 1.09 | 109 | 80 - 120 | |
| Silver | 1.00 | 1.04 | 104 | 80 - 120 | |

**Post Digestion Spike - Batch: 480-270374**

**Method: 6010C**
**Preparation: 3010A**
**TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | 480-89453-4 | Analysis Batch: | 480-270880 | Instrument ID: | ICAP2 |
| Client Matrix: | Solid | Prep Batch: | 480-270374 | Lab File ID: | I2102315B-4.asc |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/23/2015 2047 | Units: | mg/L | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| Analyte | Sample Result/Qual | Spike Amount | Result | % Rec. | Limit | Qual |
|---|---|---|---|---|---|---|
| Arsenic | ND | 1.00 | 1.18 | 118 | 80 - 120 | |
| Barium | 3.8 | 1.00 | 4.74 | 96 | 80 - 120 | |
| Cadmium | ND | 1.00 | 1.13 | 113 | 80 - 120 | |
| Chromium | ND | 1.00 | 0.989 | 99 | 80 - 120 | |
| Lead | 0.0074 J | 1.00 | 1.03 | 102 | 80 - 120 | |
| Silver | ND | 1.00 | 1.17 | 117 | 80 - 120 | |

**Post Digestion Spike - Batch: 480-270374**

**Method: 6010C**
**Preparation: 3010A**
**TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | 480-89453-4 | Analysis Batch: | 480-271006 | Instrument ID: | ICAP2 |
| Client Matrix: | Solid | Prep Batch: | 480-270374 | Lab File ID: | I2102415A-2.asc |
| Dilution: | 5.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/24/2015 1119 | Units: | mg/L | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| Analyte | Sample Result/Qual | Spike Amount | Result | % Rec. | Limit | Qual |
|---|---|---|---|---|---|---|
| Selenium | ND | 5.00 | 5.10 | 102 | 80 - 120 | |

**Matrix Spike/**
**Matrix Spike Duplicate Recovery Report - Batch: 480-270374**

**Method: 6010C**
**Preparation: 3010A**
**TCLP**

| | | | | | |
|---|---|---|---|---|---|
| MS Lab Sample ID: | 480-89453-4 | Analysis Batch: | 480-270880 | Instrument ID: | ICAP2 |
| Client Matrix: | Solid | Prep Batch: | 480-270374 | Lab File ID: | I2102315B-4.asc |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/23/2015 2050 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| MSD Lab Sample ID: | 480-89453-4 | Analysis Batch: | 480-270880 | Instrument ID: | ICAP2 |
| Client Matrix: | Solid | Prep Batch: | 480-270374 | Lab File ID: | I2102315B-4.asc |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/23/2015 2053 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| | % Rec. | | | | | | |
|---|---|---|---|---|---|---|---|
| Analyte | MS | MSD | Limit | RPD | RPD Limit | MS Qual | MSD Qual |
| Arsenic | 119 | 112 | 75 - 125 | 6 | 20 | | |
| Barium | 100 | 71 | 75 - 125 | 6 | 20 | | F1 |
| Cadmium | 113 | 107 | 75 - 125 | 6 | 20 | | |
| Chromium | 100 | 94 | 75 - 125 | 6 | 20 | | |
| Lead | 103 | 97 | 75 - 125 | 6 | 20 | | |
| Silver | 117 | 110 | 75 - 125 | 6 | 20 | | |

**Matrix Spike/**
**Matrix Spike Duplicate Recovery Report - Batch: 480-270374**

**Method: 6010C**
**Preparation: 3010A**
**TCLP**

| | | | | | |
|---|---|---|---|---|---|
| MS Lab Sample ID: | 480-89453-4 | Analysis Batch: | 480-271006 | Instrument ID: | ICAP2 |
| Client Matrix: | Solid | Prep Batch: | 480-270374 | Lab File ID: | I2102415A-2.asc |
| Dilution: | 5.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/24/2015 1123 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| MSD Lab Sample ID: | 480-89453-4 | Analysis Batch: | 480-271006 | Instrument ID: | ICAP2 |
| Client Matrix: | Solid | Prep Batch: | 480-270374 | Lab File ID: | I2102415A-2.asc |
| Dilution: | 5.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/24/2015 1126 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| | % Rec. | | | | | | |
|---|---|---|---|---|---|---|---|
| Analyte | MS | MSD | Limit | RPD | RPD Limit | MS Qual | MSD Qual |
| Selenium | 97 | 107 | 75 - 125 | 10 | 20 | | |

**Matrix Spike/**
**Matrix Spike Duplicate Recovery Report - Batch: 480-270374**

**Method: 6010C**
**Preparation: 3010A**
**TCLP**

| | | | |
|---|---|---|---|
| MS Lab Sample ID: | 480-89453-4 | Units: mg/L | |
| Client Matrix: | Solid | | |
| Dilution: | 1.0 | | |
| Analysis Date: | 10/23/2015 2050 | | |
| Prep Date: | 10/22/2015 1130 | | |
| Leach Date: | 10/21/2015 0941 | | |

| | |
|---|---|
| MSD Lab Sample ID: | 480-89453-4 |
| Client Matrix: | Solid |
| Dilution: | 1.0 |
| Analysis Date: | 10/23/2015 2053 |
| Prep Date: | 10/22/2015 1130 |
| Leach Date: | 10/21/2015 0941 |

| Analyte | Sample Result/Qual | | MS Spike Amount | MSD Spike Amount | MS Result/Qual | MSD Result/Qual | |
|---|---|---|---|---|---|---|---|
| Arsenic | ND | | 1.00 | 1.00 | 1.19 | 1.12 | |
| Barium | 3.8 | | 1.00 | 1.00 | 4.78 | 4.48 | F1 |
| Cadmium | ND | | 1.00 | 1.00 | 1.13 | 1.07 | |
| Chromium | ND | | 1.00 | 1.00 | 0.999 | 0.942 | |
| Lead | 0.0074 | J | 1.00 | 1.00 | 1.04 | 0.982 | |
| Silver | ND | | 1.00 | 1.00 | 1.17 | 1.10 | |

**Matrix Spike/**
**Matrix Spike Duplicate Recovery Report - Batch: 480-270374**

**Method: 6010C**
**Preparation: 3010A**
**TCLP**

| | | | |
|---|---|---|---|
| MS Lab Sample ID: | 480-89453-4 | Units: mg/L | |
| Client Matrix: | Solid | | |
| Dilution: | 5.0 | | |
| Analysis Date: | 10/24/2015 1123 | | |
| Prep Date: | 10/22/2015 1130 | | |
| Leach Date: | 10/21/2015 0941 | | |

| | |
|---|---|
| MSD Lab Sample ID: | 480-89453-4 |
| Client Matrix: | Solid |
| Dilution: | 5.0 |
| Analysis Date: | 10/24/2015 1126 |
| Prep Date: | 10/22/2015 1130 |
| Leach Date: | 10/21/2015 0941 |

| Analyte | Sample Result/Qual | MS Spike Amount | MSD Spike Amount | MS Result/Qual | MSD Result/Qual |
|---|---|---|---|---|---|
| Selenium | ND | 1.00 | 1.00 | 0.970 | 1.07 |

**Serial Dilution - Batch: 480-270374**

**Method: 6010C**
**Preparation: 3010A**
**TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | 480-89453-4 | Analysis Batch: | 480-270880 | Instrument ID: | ICAP2 |
| Client Matrix: | Solid | Prep Batch: | 480-270374 | Lab File ID: | I2102315B-4.asc |
| Dilution: | 5.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/23/2015 2043 | Units: | mg/L | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| Analyte | Sample Result/Qual | | Result | %Diff | Limit | Qual |
|---|---|---|---|---|---|---|
| Arsenic | ND | | ND | NC | 10 | |
| Barium | 3.8 | | 3.74 | 1.0 | 10 | J |
| Cadmium | ND | | ND | NC | 10 | |
| Chromium | ND | | ND | NC | 10 | |
| Lead | 0.0074 | J | ND | NC | 10 | |
| Silver | ND | | ND | NC | 10 | |

**Serial Dilution - Batch: 480-270374**

**Method: 6010C**
**Preparation: 3010A**
**TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | 480-89453-4 | Analysis Batch: | 480-271006 | Instrument ID: | ICAP2 |
| Client Matrix: | Solid | Prep Batch: | 480-270374 | Lab File ID: | I2102415A-2.asc |
| Dilution: | 25 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 50 mL |
| Analysis Date: | 10/24/2015 1116 | Units: | mg/L | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1130 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| Analyte | Sample Result/Qual | Result | %Diff | Limit | Qual |
|---|---|---|---|---|---|
| Selenium | ND | ND | NC | 10 | |

**Method Blank - Batch: 180-159790**

**Method: 6020A**
**Preparation: 3050B**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | MB 180-159790/1-A | Analysis Batch: | 180-159963 | Instrument ID: | X |
| Client Matrix: | Solid | Prep Batch: | 180-159790 | Lab File ID: | X51109A.xml |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 00001.04 g |
| Analysis Date: | 11/09/2015 1846 | Units: | mg/Kg | Final Weight/Volume: | 100 mL |
| Prep Date: | 11/09/2015 1244 | | | | |
| Leach Date: | N/A | | | | |

| Analyte | Result | Qual | MDL | RL |
|---|---|---|---|---|
| Arsenic | ND | | 0.017 | 0.096 |
| Barium | ND | | 0.010 | 0.96 |
| Cadmium | ND | | 0.0067 | 0.096 |
| Chromium | 0.00942 | J | 0.0059 | 0.19 |
| Silver | ND | | 0.0038 | 0.096 |
| Lead | ND | | 0.0037 | 0.096 |
| Selenium | ND | | 0.048 | 0.48 |

**Lab Control Sample/**
**Lab Control Sample Duplicate Recovery Report - Batch: 180-159790**

**Method: 6020A**
**Preparation: 3050B**

| | | | | | |
|---|---|---|---|---|---|
| LCS Lab Sample ID: | LCS 180-159790/2-A | Analysis Batch: | 180-159963 | Instrument ID: | X |
| Client Matrix: | Solid | Prep Batch: | 180-159790 | Lab File ID: | X51109A.xml |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 00001.02 g |
| Analysis Date: | 11/09/2015 1851 | Units: | mg/Kg | Final Weight/Volume: | 100 mL |
| Prep Date: | 11/09/2015 1244 | | | | |
| Leach Date: | N/A | | | | |

| | | | | | |
|---|---|---|---|---|---|
| LCSD Lab Sample ID: | LCSD 180-159790/3-A | Analysis Batch: | 180-159963 | Instrument ID: | X |
| Client Matrix: | Solid | Prep Batch: | 180-159790 | Lab File ID: | X51109A.xml |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 00001.04 g |
| Analysis Date: | 11/09/2015 1856 | Units: | mg/Kg | Final Weight/Volume: | 100 mL |
| Prep Date: | 11/09/2015 1244 | | | | |
| Leach Date: | N/A | | | | |

| | % Rec. | | | | | | |
|---|---|---|---|---|---|---|---|
| Analyte | LCS | LCSD | Limit | RPD | RPD Limit | LCS Qual | LCSD Qual |
| Arsenic | 93 | 93 | 80 - 120 | 2 | 20 | | |
| Barium | 90 | 90 | 80 - 120 | 2 | 20 | | |
| Cadmium | 95 | 94 | 80 - 120 | 3 | 20 | | |
| Chromium | 105 | 104 | 80 - 120 | 3 | 20 | | |
| Silver | 96 | 97 | 80 - 120 | 1 | 20 | | |
| Lead | 100 | 101 | 80 - 120 | 1 | 20 | | |
| Selenium | 93 | 91 | 80 - 120 | 4 | 20 | | |

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

**Laboratory Control/**
**Laboratory Duplicate Data Report - Batch: 180-159790**

**Method: 6020A**
**Preparation: 3050B**

| | | | | | |
|---|---|---|---|---|---|
| LCS Lab Sample ID: | LCS 180-159790/2-A | Units: mg/Kg | LCSD Lab Sample ID: | LCSD 180-159790/3-A | |
| Client Matrix: | Solid | | Client Matrix: | Solid | |
| Dilution: | 1.0 | | Dilution: | 1.0 | |
| Analysis Date: | 11/09/2015 1851 | | Analysis Date: | 11/09/2015 1856 | |
| Prep Date: | 11/09/2015 1244 | | Prep Date: | 11/09/2015 1244 | |
| Leach Date: | N/A | | Leach Date: | N/A | |

| Analyte | LCS Spike Amount | LCSD Spike Amount | LCS Result/Qual | LCSD Result/Qual |
|---|---|---|---|---|
| Arsenic | 3.92 | 3.85 | 3.65 | 3.59 |
| Barium | 196 | 192 | 176.9 | 173.0 |
| Cadmium | 4.90 | 4.81 | 4.65 | 4.51 |
| Chromium | 19.6 | 19.2 | 20.66 | 20.06 |
| Silver | 4.90 | 4.81 | 4.72 | 4.67 |
| Lead | 1.96 | 1.92 | 1.97 | 1.94 |
| Selenium | 0.980 | 0.962 | 0.911 | 0.878 |

**TCLP SPLPW Leachate Blank - Batch: 480-270385**

**Method: 7470A**
**Preparation: 7470A**
**TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | LB2 480-270052/1-E | Analysis Batch: | 480-270525 | Instrument ID: | LEEMAN2 |
| Client Matrix: | Solid | Prep Batch: | 480-270385 | Lab File ID: | H10225TC.PRN |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 30 mL |
| Analysis Date: | 10/22/2015 1653 | Units: | mg/L | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1215 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| Analyte | Result | Qual | MDL | RL |
|---|---|---|---|---|
| Mercury | ND | | 0.00012 | 0.00020 |

**Method Blank - Batch: 480-270385**

**Method: 7470A**
**Preparation: 7470A**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | MB 480-270385/2-A | Analysis Batch: | 480-270525 | Instrument ID: | LEEMAN2 |
| Client Matrix: | Water | Prep Batch: | 480-270385 | Lab File ID: | H10225TC.PRN |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 30 mL |
| Analysis Date: | 10/22/2015 1656 | Units: | mg/L | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1215 | | | | |
| Leach Date: | N/A | | | | |

| Analyte | Result | Qual | MDL | RL |
|---|---|---|---|---|
| Mercury | ND | | 0.00012 | 0.00020 |

**Lab Control Sample - Batch: 480-270385**

**Method: 7470A**
**Preparation: 7470A**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | LCS 480-270385/3-A | Analysis Batch: | 480-270525 | Instrument ID: | LEEMAN2 |
| Client Matrix: | Water | Prep Batch: | 480-270385 | Lab File ID: | H10225TC.PRN |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 30 mL |
| Analysis Date: | 10/22/2015 1657 | Units: | mg/L | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1215 | | | | |
| Leach Date: | N/A | | | | |

| Analyte | Spike Amount | Result | % Rec. | Limit | Qual |
|---|---|---|---|---|---|
| Mercury | 0.00668 | 0.00645 | 97 | 80 - 120 | |

**Matrix Spike/**
**Matrix Spike Duplicate Recovery Report - Batch: 480-270385**

**Method: 7470A**
**Preparation: 7470A**
**TCLP**

| | | | | | |
|---|---|---|---|---|---|
| MS Lab Sample ID: | 480-89453-4 | Analysis Batch: | 480-270525 | Instrument ID: | LEEMAN2 |
| Client Matrix: | Solid | Prep Batch: | 480-270385 | Lab File ID: | H10225TC.PRN |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 30 mL |
| Analysis Date: | 10/22/2015 1711 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1215 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| MSD Lab Sample ID: | 480-89453-4 | Analysis Batch: | 480-270525 | Instrument ID: | LEEMAN2 |
| Client Matrix: | Solid | Prep Batch: | 480-270385 | Lab File ID: | H10225TC.PRN |
| Dilution: | 1.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 30 mL |
| Analysis Date: | 10/22/2015 1714 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1215 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| | % Rec. | | | | | | |
|---|---|---|---|---|---|---|---|
| Analyte | MS | MSD | Limit | RPD | RPD Limit | MS Qual | MSD Qual |
| Mercury | 94 | 94 | 80 - 120 | 0 | 20 | | |

**Matrix Spike/**
**Matrix Spike Duplicate Recovery Report - Batch: 480-270385**

**Method: 7470A**
**Preparation: 7470A**
**TCLP**

| | | | |
|---|---|---|---|
| MS Lab Sample ID: | 480-89453-4 | Units: | mg/L |
| Client Matrix: | Solid | | |
| Dilution: | 1.0 | | |
| Analysis Date: | 10/22/2015 1711 | | |
| Prep Date: | 10/22/2015 1215 | | |
| Leach Date: | 10/21/2015 0941 | | |

| | |
|---|---|
| MSD Lab Sample ID: | 480-89453-4 |
| Client Matrix: | Solid |
| Dilution: | 1.0 |
| Analysis Date: | 10/22/2015 1714 |
| Prep Date: | 10/22/2015 1215 |
| Leach Date: | 10/21/2015 0941 |

| Analyte | Sample Result/Qual | MS Spike Amount | MSD Spike Amount | MS Result/Qual | MSD Result/Qual |
|---|---|---|---|---|---|
| Mercury | ND | 0.00668 | 0.00668 | 0.00627 | 0.00627 |

**Serial Dilution - Batch: 480-270385**

**Method: 7470A**
**Preparation: 7470A**
**TCLP**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | 480-89453-4 | Analysis Batch: | 480-270525 | Instrument ID: | LEEMAN2 |
| Client Matrix: | Solid | Prep Batch: | 480-270385 | Lab File ID: | H10225TC.PRN |
| Dilution: | 5.0 | Leach Batch: | 480-270052 | Initial Weight/Volume: | 30 mL |
| Analysis Date: | 10/22/2015 1710 | Units: | mg/L | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/22/2015 1215 | | | | |
| Leach Date: | 10/21/2015 0941 | | | | |

| Analyte | Sample Result/Qual | Result | %Diff | Limit | Qual |
|---|---|---|---|---|---|
| Mercury | ND | ND | NC | 10 | |

**Method Blank - Batch: 480-270135**

**Method: 7471B**
**Preparation: 7471B**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | MB 480-270135/1-A | Analysis Batch: | 480-270289 | Instrument ID: | LEEMAN2 |
| Client Matrix: | Solid | Prep Batch: | 480-270135 | Lab File ID: | H10215S1.PRN |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | +0.5937 g |
| Analysis Date: | 10/21/2015 1714 | Units: | mg/Kg | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/21/2015 1500 | | | | |
| Leach Date: | N/A | | | | |

| Analyte | Result | Qual | MDL | RL |
|---|---|---|---|---|
| Mercury | ND | | 0.0082 | 0.020 |

**LCS-Certified Reference Material - Batch: 480-270135**

**Method: 7471B**
**Preparation: 7471B**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | LCSSRM 480-270135/2-A | Analysis Batch: | 480-270289 | Instrument ID: | LEEMAN2 |
| Client Matrix: | Solid | Prep Batch: | 480-270135 | Lab File ID: | H10215S1.PRN |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | +0.0239 g |
| Analysis Date: | 10/21/2015 1718 | Units: | mg/Kg | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/21/2015 1500 | | | | |
| Leach Date: | N/A | | | | |

| Analyte | Spike Amount | Result | % Rec. | Limit | Qual |
|---|---|---|---|---|---|
| Mercury | 8.37 | 9.27 | 110.7 | 51.3 - 148.1 | |

**Matrix Spike/**
**Matrix Spike Duplicate Recovery Report - Batch: 480-270135**

**Method: 7471B**
**Preparation: 7471B**

| | | | | | |
|---|---|---|---|---|---|
| MS Lab Sample ID: | 480-89453-1 | Analysis Batch: | 480-270289 | Instrument ID: | LEEMAN2 |
| Client Matrix: | Solid | Prep Batch: | 480-270135 | Lab File ID: | H10215S1.PRN |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | +0.5942 g |
| Analysis Date: | 10/21/2015 1723 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/21/2015 1500 | | | | |
| Leach Date: | N/A | | | | |

| | | | | | |
|---|---|---|---|---|---|
| MSD Lab Sample ID: | 480-89453-1 | Analysis Batch: | 480-270289 | Instrument ID: | LEEMAN2 |
| Client Matrix: | Solid | Prep Batch: | 480-270135 | Lab File ID: | H10215S1.PRN |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | +0.5954 g |
| Analysis Date: | 10/21/2015 1725 | | | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/21/2015 1500 | | | | |
| Leach Date: | N/A | | | | |

| | % Rec. | | | | | | |
|---|---|---|---|---|---|---|---|
| Analyte | MS | MSD | Limit | RPD | RPD Limit | MS Qual | MSD Qual |
| Mercury | 100 | 101 | 80 - 120 | 0 | 20 | | |

**Matrix Spike/**
**Matrix Spike Duplicate Recovery Report - Batch: 480-270135**

**Method: 7471B**
**Preparation: 7471B**

| | | | |
|---|---|---|---|
| MS Lab Sample ID: | 480-89453-1 | Units: mg/Kg | |
| Client Matrix: | Solid | | |
| Dilution: | 1.0 | | |
| Analysis Date: | 10/21/2015 1723 | | |
| Prep Date: | 10/21/2015 1500 | | |
| Leach Date: | N/A | | |

| | |
|---|---|
| MSD Lab Sample ID: | 480-89453-1 |
| Client Matrix: | Solid |
| Dilution: | 1.0 |
| Analysis Date: | 10/21/2015 1725 |
| Prep Date: | 10/21/2015 1500 |
| Leach Date: | N/A |

| Analyte | Sample Result/Qual | MS Spike Amount | MSD Spike Amount | MS Result/Qual | MSD Result/Qual |
|---|---|---|---|---|---|
| Mercury | ND | 0.376 | 0.376 | 0.378 | 0.378 |

**Serial Dilution - Batch: 480-270135**

**Method: 7471B**
**Preparation: 7471B**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | 480-89453-1 | Analysis Batch: | 480-270289 | Instrument ID: | LEEMAN2 |
| Client Matrix: | Solid | Prep Batch: | 480-270135 | Lab File ID: | H10215S1.PRN |
| Dilution: | 5.0 | Leach Batch: | N/A | Initial Weight/Volume: | +0.5970 g |
| Analysis Date: | 10/21/2015 1721 | Units: | mg/Kg | Final Weight/Volume: | 50 mL |
| Prep Date: | 10/21/2015 1500 | | | | |
| Leach Date: | N/A | | | | |

| Analyte | Sample Result/Qual | Result | %Diff | Limit | Qual |
|---|---|---|---|---|---|
| Mercury | ND | ND | NC | 10 | |

## DATA REPORTING QUALIFIERS

Client: U.S. Army Construction Engineering Resea Job Number: 480-89453-1

| Lab Section | Qualifier | Description |
|---|---|---|
| Metals | | |
| | B | Compound was found in the blank and sample. |
| | F1 | MS and/or MSD Recovery is outside acceptance limits. |
| | J | Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value. |
| | H | Sample was prepped or analyzed beyond the specified holding time |

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

## QC Association Summary

| Lab Sample ID | Client Sample ID | Report Basis | Client Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| **Prep Batch: 180-159790** | | | | | |
| LCS 180-159790/2-A | Lab Control Sample | T | Solid | 3050B | |
| LCSD 180-159790/3-A | Lab Control Sample Duplicate | T | Solid | 3050B | |
| MB 180-159790/1-A | Method Blank | T | Solid | 3050B | |
| 480-89453-1 | A-01-020415-1600 | T | Solid | 3050B | |
| 480-89453-2 | A-01-031915-1600 | T | Solid | 3050B | |
| 480-89453-3 | A-01-040215-1505 | T | Solid | 3050B | |
| 480-89453-4 | A-01-050815-1600 | T | Solid | 3050B | |
| **Analysis Batch:180-159963** | | | | | |
| LCS 180-159790/2-A | Lab Control Sample | T | Solid | 6020A | 180-159790 |
| LCSD 180-159790/3-A | Lab Control Sample Duplicate | T | Solid | 6020A | 180-159790 |
| MB 180-159790/1-A | Method Blank | T | Solid | 6020A | 180-159790 |
| 480-89453-1 | A-01-020415-1600 | T | Solid | 6020A | 180-159790 |
| 480-89453-2 | A-01-031915-1600 | T | Solid | 6020A | 180-159790 |
| 480-89453-3 | A-01-040215-1505 | T | Solid | 6020A | 180-159790 |
| 480-89453-4 | A-01-050815-1600 | T | Solid | 6020A | 180-159790 |
| **Prep Batch: 480-270052** | | | | | |
| LB2 480-270052/1-C | TCLP SPLPW Leachate Blank | P | Solid | 1311 | |
| LB2 480-270052/1-E | TCLP SPLPW Leachate Blank | P | Solid | 1311 | |
| 480-89453-1 | A-01-020415-1600 | P | Solid | 1311 | |
| 480-89453-2 | A-01-031915-1600 | P | Solid | 1311 | |
| 480-89453-3 | A-01-040215-1505 | P | Solid | 1311 | |
| 480-89453-4 | A-01-050815-1600 | P | Solid | 1311 | |
| 480-89453-4MS | Matrix Spike | P | Solid | 1311 | |
| 480-89453-4MSD | Matrix Spike Duplicate | P | Solid | 1311 | |
| **Prep Batch: 480-270135** | | | | | |
| LCSSRM 480-270135/2-A | LCS-Certified Reference Material | T | Solid | 7471B | |
| MB 480-270135/1-A | Method Blank | T | Solid | 7471B | |
| 480-89453-1 | A-01-020415-1600 | T | Solid | 7471B | |
| 480-89453-1MS | Matrix Spike | T | Solid | 7471B | |
| 480-89453-1MSD | Matrix Spike Duplicate | T | Solid | 7471B | |
| 480-89453-2 | A-01-031915-1600 | T | Solid | 7471B | |
| 480-89453-3 | A-01-040215-1505 | T | Solid | 7471B | |
| 480-89453-4 | A-01-050815-1600 | T | Solid | 7471B | |

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

## QC Association Summary

| Lab Sample ID | Client Sample ID | Report Basis | Client Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| **Analysis Batch:480-270289** | | | | | |
| LCSSRM 480-270135/2-A | LCS-Certified Reference Material | T | Solid | 7471B | 480-270135 |
| MB 480-270135/1-A | Method Blank | T | Solid | 7471B | 480-270135 |
| 480-89453-1 | A-01-020415-1600 | T | Solid | 7471B | 480-270135 |
| 480-89453-1MS | Matrix Spike | T | Solid | 7471B | 480-270135 |
| 480-89453-1MSD | Matrix Spike Duplicate | T | Solid | 7471B | 480-270135 |
| 480-89453-2 | A-01-031915-1600 | T | Solid | 7471B | 480-270135 |
| 480-89453-3 | A-01-040215-1505 | T | Solid | 7471B | 480-270135 |
| 480-89453-4 | A-01-050815-1600 | T | Solid | 7471B | 480-270135 |
| **Prep Batch: 480-270374** | | | | | |
| LCS 480-270374/3-A | Lab Control Sample | T | Water | 3010A | |
| MB 480-270374/2-A | Method Blank | T | Water | 3010A | |
| LB2 480-270052/1-C | TCLP SPLPW Leachate Blank | P | Solid | 3010A | 480-270052 |
| 480-89453-1 | A-01-020415-1600 | P | Solid | 3010A | 480-270052 |
| 480-89453-2 | A-01-031915-1600 | P | Solid | 3010A | 480-270052 |
| 480-89453-3 | A-01-040215-1505 | P | Solid | 3010A | 480-270052 |
| 480-89453-4 | A-01-050815-1600 | P | Solid | 3010A | 480-270052 |
| 480-89453-4MS | Matrix Spike | P | Solid | 3010A | 480-270052 |
| 480-89453-4MSD | Matrix Spike Duplicate | P | Solid | 3010A | 480-270052 |
| **Prep Batch: 480-270385** | | | | | |
| LCS 480-270385/3-A | Lab Control Sample | T | Water | 7470A | |
| MB 480-270385/2-A | Method Blank | T | Water | 7470A | |
| LB2 480-270052/1-E | TCLP SPLPW Leachate Blank | P | Solid | 7470A | 480-270052 |
| 480-89453-1 | A-01-020415-1600 | P | Solid | 7470A | 480-270052 |
| 480-89453-2 | A-01-031915-1600 | P | Solid | 7470A | 480-270052 |
| 480-89453-3 | A-01-040215-1505 | P | Solid | 7470A | 480-270052 |
| 480-89453-4 | A-01-050815-1600 | P | Solid | 7470A | 480-270052 |
| 480-89453-4MS | Matrix Spike | P | Solid | 7470A | 480-270052 |
| 480-89453-4MSD | Matrix Spike Duplicate | P | Solid | 7470A | 480-270052 |
| **Analysis Batch:480-270525** | | | | | |
| LB2 480-270052/1-E | TCLP SPLPW Leachate Blank | P | Solid | 7470A | 480-270385 |
| LCS 480-270385/3-A | Lab Control Sample | T | Water | 7470A | 480-270385 |
| MB 480-270385/2-A | Method Blank | T | Water | 7470A | 480-270385 |
| 480-89453-1 | A-01-020415-1600 | P | Solid | 7470A | 480-270385 |
| 480-89453-2 | A-01-031915-1600 | P | Solid | 7470A | 480-270385 |
| 480-89453-3 | A-01-040215-1505 | P | Solid | 7470A | 480-270385 |
| 480-89453-4 | A-01-050815-1600 | P | Solid | 7470A | 480-270385 |
| 480-89453-4MS | Matrix Spike | P | Solid | 7470A | 480-270385 |
| 480-89453-4MSD | Matrix Spike Duplicate | P | Solid | 7470A | 480-270385 |

## QC Association Summary

| Lab Sample ID | Client Sample ID | Report Basis | Client Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| **Metals** | | | | | |
| **Analysis Batch:480-270880** | | | | | |
| LB2 480-270052/1-C | TCLP SPLPW Leachate Blank | P | Solid | 6010C | 480-270374 |
| LCS 480-270374/3-A | Lab Control Sample | T | Water | 6010C | 480-270374 |
| MB 480-270374/2-A | Method Blank | T | Water | 6010C | 480-270374 |
| 480-89453-1 | A-01-020415-1600 | P | Solid | 6010C | 480-270374 |
| 480-89453-2 | A-01-031915-1600 | P | Solid | 6010C | 480-270374 |
| 480-89453-3 | A-01-040215-1505 | P | Solid | 6010C | 480-270374 |
| 480-89453-4 | A-01-050815-1600 | P | Solid | 6010C | 480-270374 |
| 480-89453-4MS | Matrix Spike | P | Solid | 6010C | 480-270374 |
| 480-89453-4MSD | Matrix Spike Duplicate | P | Solid | 6010C | 480-270374 |
| **Analysis Batch:480-271006** | | | | | |
| 480-89453-1 | A-01-020415-1600 | P | Solid | 6010C | 480-270374 |
| 480-89453-2 | A-01-031915-1600 | P | Solid | 6010C | 480-270374 |
| 480-89453-3 | A-01-040215-1505 | P | Solid | 6010C | 480-270374 |
| 480-89453-4 | A-01-050815-1600 | P | Solid | 6010C | 480-270374 |
| 480-89453-4MS | Matrix Spike | P | Solid | 6010C | 480-270374 |
| 480-89453-4MSD | Matrix Spike Duplicate | P | Solid | 6010C | 480-270374 |

**Report Basis**
P = TCLP
T = Total

**General Chemistry**

| | | | | | |
|---|---|---|---|---|---|
| **Analysis Batch:180-158347** | | | | | |
| 480-89453-1 | A-01-020415-1600 | T | Solid | 2540G | |
| 480-89453-2 | A-01-031915-1600 | T | Solid | 2540G | |
| 480-89453-3 | A-01-040215-1505 | T | Solid | 2540G | |
| 480-89453-4 | A-01-050815-1600 | T | Solid | 2540G | |

**Report Basis**
T = Total

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

## Laboratory Chronicle

**Lab ID: 480-89453-1** **Client ID: A-01-020415-1600**

Sample Date/Time: 02/04/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3010A | 480-89453-A-1-E | | 480-270880 | 480-270374 | 10/22/2015 11:30 | 1 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-1-E | | 480-270880 | 480-270374 | 10/23/2015 20:20 | 1 | TAL BUF | AMH |
| P:3010A | 480-89453-A-1-E ^5 | | 480-271006 | 480-270374 | 10/22/2015 11:30 | 5 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-1-E ^5 | | 480-271006 | 480-270374 | 10/24/2015 10:53 | 5 | TAL BUF | AMH |
| P:3050B | 480-89453-A-1-H ^5 | | 180-159963 | 180-159790 | 11/09/2015 12:44 | 5 | TAL PIT | BMH |
| A:6020A | 480-89453-A-1-H ^5 | | 180-159963 | 180-159790 | 11/09/2015 20:01 | 5 | TAL PIT | WTR |
| P:7470A | 480-89453-A-1-F | | 480-270525 | 480-270385 | 10/22/2015 12:15 | 1 | TAL BUF | TAS |
| A:7470A | 480-89453-A-1-F | | 480-270525 | 480-270385 | 10/22/2015 17:02 | 1 | TAL BUF | TAS |
| P:7471B | 480-89453-A-1-B | | 480-270289 | 480-270135 | 10/21/2015 15:00 | 1 | TAL BUF | TAS |
| A:7471B | 480-89453-A-1-B | | 480-270289 | 480-270135 | 10/21/2015 17:20 | 1 | TAL BUF | TAS |
| A:2540G | 480-89453-A-1 | | 180-158347 | | 10/27/2015 08:35 | 1 | TAL PIT | CLL |

**Lab ID: 480-89453-1 MS** **Client ID: A-01-020415-1600**

Sample Date/Time: 02/04/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:7471B | 480-89453-A-1-C MS | | 480-270289 | 480-270135 | 10/21/2015 15:00 | 1 | TAL BUF | TAS |
| A:7471B | 480-89453-A-1-C MS | | 480-270289 | 480-270135 | 10/21/2015 17:23 | 1 | TAL BUF | TAS |

**Lab ID: 480-89453-1 MSD** **Client ID: A-01-020415-1600**

Sample Date/Time: 02/04/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:7471B | 480-89453-A-1-D MSD | | 480-270289 | 480-270135 | 10/21/2015 15:00 | 1 | TAL BUF | TAS |
| A:7471B | 480-89453-A-1-D MSD | | 480-270289 | 480-270135 | 10/21/2015 17:25 | 1 | TAL BUF | TAS |

**Lab ID: 480-89453-1 SD** **Client ID: A-01-020415-1600**

Sample Date/Time: 02/04/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:7471B | 480-89453-A-1-B SD ^5 | | 480-270289 | 480-270135 | 10/21/2015 15:00 | 5 | TAL BUF | TAS |
| A:7471B | 480-89453-A-1-B SD ^5 | | 480-270289 | 480-270135 | 10/21/2015 17:21 | 5 | TAL BUF | TAS |

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

## Laboratory Chronicle

**Lab ID: 480-89453-2** **Client ID: A-01-031915-1600**

Sample Date/Time: 03/19/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3010A | 480-89453-A-2-C | | 480-270880 | 480-270374 | 10/22/2015 11:30 | 1 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-2-C | | 480-270880 | 480-270374 | 10/23/2015 20:23 | 1 | TAL BUF | AMH |
| P:3010A | 480-89453-A-2-C ^5 | | 480-271006 | 480-270374 | 10/22/2015 11:30 | 5 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-2-C ^5 | | 480-271006 | 480-270374 | 10/24/2015 11:06 | 5 | TAL BUF | AMH |
| P:3050B | 480-89453-A-2-F ^5 | | 180-159963 | 180-159790 | 11/09/2015 12:44 | 5 | TAL PIT | BMH |
| A:6020A | 480-89453-A-2-F ^5 | | 180-159963 | 180-159790 | 11/09/2015 20:06 | 5 | TAL PIT | WTR |
| P:7470A | 480-89453-A-2-D | | 480-270525 | 480-270385 | 10/22/2015 12:15 | 1 | TAL BUF | TAS |
| A:7470A | 480-89453-A-2-D | | 480-270525 | 480-270385 | 10/22/2015 17:04 | 1 | TAL BUF | TAS |
| P:7471B | 480-89453-A-2-B | | 480-270289 | 480-270135 | 10/21/2015 15:00 | 1 | TAL BUF | TAS |
| A:7471B | 480-89453-A-2-B | | 480-270289 | 480-270135 | 10/21/2015 17:26 | 1 | TAL BUF | TAS |
| A:2540G | 480-89453-A-2 | | 180-158347 | | 10/27/2015 08:35 | 1 | TAL PIT | CLL |

**Lab ID: 480-89453-3** **Client ID: A-01-040215-1505**

Sample Date/Time: 04/02/2015 15:05 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3010A | 480-89453-A-3-C | | 480-270880 | 480-270374 | 10/22/2015 11:30 | 1 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-3-C | | 480-270880 | 480-270374 | 10/23/2015 20:27 | 1 | TAL BUF | AMH |
| P:3010A | 480-89453-A-3-C ^5 | | 480-271006 | 480-270374 | 10/22/2015 11:30 | 5 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-3-C ^5 | | 480-271006 | 480-270374 | 10/24/2015 11:09 | 5 | TAL BUF | AMH |
| P:3050B | 480-89453-A-3-F ^5 | | 180-159963 | 180-159790 | 11/09/2015 12:44 | 5 | TAL PIT | BMH |
| A:6020A | 480-89453-A-3-F ^5 | | 180-159963 | 180-159790 | 11/09/2015 20:11 | 5 | TAL PIT | WTR |
| P:7470A | 480-89453-A-3-D | | 480-270525 | 480-270385 | 10/22/2015 12:15 | 1 | TAL BUF | TAS |
| A:7470A | 480-89453-A-3-D | | 480-270525 | 480-270385 | 10/22/2015 17:05 | 1 | TAL BUF | TAS |
| P:7471B | 480-89453-A-3-B | | 480-270289 | 480-270135 | 10/21/2015 15:00 | 1 | TAL BUF | TAS |
| A:7471B | 480-89453-A-3-B | | 480-270289 | 480-270135 | 10/21/2015 17:29 | 1 | TAL BUF | TAS |
| A:2540G | 480-89453-A-3 | | 180-158347 | | 10/27/2015 08:35 | 1 | TAL PIT | CLL |

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

## Laboratory Chronicle

**Lab ID: 480-89453-4** **Client ID: A-01-050815-1600**

Sample Date/Time: 05/08/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3010A | 480-89453-A-4-C | | 480-270880 | 480-270374 | 10/22/2015 11:30 | 1 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-4-C | | 480-270880 | 480-270374 | 10/23/2015 20:40 | 1 | TAL BUF | AMH |
| P:3010A | 480-89453-A-4-C ^5 | | 480-271006 | 480-270374 | 10/22/2015 11:30 | 5 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-4-C ^5 | | 480-271006 | 480-270374 | 10/24/2015 11:13 | 5 | TAL BUF | AMH |
| P:3050B | 480-89453-A-4-J ^5 | | 180-159963 | 180-159790 | 11/09/2015 12:44 | 5 | TAL PIT | BMH |
| A:6020A | 480-89453-A-4-J ^5 | | 180-159963 | 180-159790 | 11/09/2015 20:16 | 5 | TAL PIT | WTR |
| P:7470A | 480-89453-A-4-F | | 480-270525 | 480-270385 | 10/22/2015 12:15 | 1 | TAL BUF | TAS |
| A:7470A | 480-89453-A-4-F | | 480-270525 | 480-270385 | 10/22/2015 17:08 | 1 | TAL BUF | TAS |
| P:7471B | 480-89453-A-4-B | | 480-270289 | 480-270135 | 10/21/2015 15:00 | 1 | TAL BUF | TAS |
| A:7471B | 480-89453-A-4-B | | 480-270289 | 480-270135 | 10/21/2015 17:30 | 1 | TAL BUF | TAS |
| A:2540G | 480-89453-A-4 | | 180-158347 | | 10/27/2015 08:35 | 1 | TAL PIT | CLL |

**Lab ID: 480-89453-4 MS** **Client ID: A-01-050815-1600**

Sample Date/Time: 05/08/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3010A | 480-89453-A-4-D MS | | 480-270880 | 480-270374 | 10/22/2015 11:30 | 1 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-4-D MS | | 480-270880 | 480-270374 | 10/23/2015 20:50 | 1 | TAL BUF | AMH |
| P:3010A | 480-89453-A-4-D MS ^5 | | 480-271006 | 480-270374 | 10/22/2015 11:30 | 5 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-4-D MS ^5 | | 480-271006 | 480-270374 | 10/24/2015 11:23 | 5 | TAL BUF | AMH |
| P:7470A | 480-89453-A-4-G MS | | 480-270525 | 480-270385 | 10/22/2015 12:15 | 1 | TAL BUF | TAS |
| A:7470A | 480-89453-A-4-G MS | | 480-270525 | 480-270385 | 10/22/2015 17:11 | 1 | TAL BUF | TAS |

**Lab ID: 480-89453-4 MSD** **Client ID: A-01-050815-1600**

Sample Date/Time: 05/08/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3010A | 480-89453-A-4-E MSD | | 480-270880 | 480-270374 | 10/22/2015 11:30 | 1 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-4-E MSD | | 480-270880 | 480-270374 | 10/23/2015 20:53 | 1 | TAL BUF | AMH |
| P:3010A | 480-89453-A-4-E MSD ^5 | | 480-271006 | 480-270374 | 10/22/2015 11:30 | 5 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-4-E MSD ^5 | | 480-271006 | 480-270374 | 10/24/2015 11:26 | 5 | TAL BUF | AMH |
| P:7470A | 480-89453-A-4-H MSD | | 480-270525 | 480-270385 | 10/22/2015 12:15 | 1 | TAL BUF | TAS |
| A:7470A | 480-89453-A-4-H MSD | | 480-270525 | 480-270385 | 10/22/2015 17:14 | 1 | TAL BUF | TAS |

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

## Laboratory Chronicle

**Lab ID: 480-89453-4 SD** **Client ID: A-01-050815-1600**

Sample Date/Time: 05/08/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3010A | 480-89453-A-4-C SD ^5 | | 480-270880 | 480-270374 | 10/22/2015 11:30 | 5 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-4-C SD ^5 | | 480-270880 | 480-270374 | 10/23/2015 20:43 | 5 | TAL BUF | AMH |
| P:3010A | 480-89453-A-4-C PDS | | 480-270880 | 480-270374 | 10/22/2015 11:30 | 1 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-4-C PDS | | 480-270880 | 480-270374 | 10/23/2015 20:47 | 1 | TAL BUF | AMH |
| P:3010A | 480-89453-A-4-C SD ^25 | | 480-271006 | 480-270374 | 10/22/2015 11:30 | 25 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-4-C SD ^25 | | 480-271006 | 480-270374 | 10/24/2015 11:16 | 25 | TAL BUF | AMH |
| P:3010A | 480-89453-A-4-C PDS ^5 | | 480-271006 | 480-270374 | 10/22/2015 11:30 | 5 | TAL BUF | KJ1 |
| A:6010C | 480-89453-A-4-C PDS ^5 | | 480-271006 | 480-270374 | 10/24/2015 11:19 | 5 | TAL BUF | AMH |
| P:7470A | 480-89453-A-4-F SD ^5 | | 480-270525 | 480-270385 | 10/22/2015 12:15 | 5 | TAL BUF | TAS |
| A:7470A | 480-89453-A-4-F SD ^5 | | 480-270525 | 480-270385 | 10/22/2015 17:10 | 5 | TAL BUF | TAS |

**Lab ID: MB** **Client ID: N/A**

Sample Date/Time: N/A Received Date/Time: N/A

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3010A | MB 480-270374/2-A | | 480-270880 | 480-270374 | 10/22/2015 11:30 | 1 | TAL BUF | KJ1 |
| A:6010C | MB 480-270374/2-A | | 480-270880 | 480-270374 | 10/23/2015 20:14 | 1 | TAL BUF | AMH |
| P:3050B | MB 180-159790/1-A | | 180-159963 | 180-159790 | 11/09/2015 12:44 | 1 | TAL PIT | BMH |
| A:6020A | MB 180-159790/1-A | | 180-159963 | 180-159790 | 11/09/2015 18:46 | 1 | TAL PIT | WTR |
| P:7470A | MB 480-270385/2-A | | 480-270525 | 480-270385 | 10/22/2015 12:15 | 1 | TAL BUF | TAS |
| A:7470A | MB 480-270385/2-A | | 480-270525 | 480-270385 | 10/22/2015 16:56 | 1 | TAL BUF | TAS |
| P:7471B | MB 480-270135/1-A | | 480-270289 | 480-270135 | 10/21/2015 15:00 | 1 | TAL BUF | TAS |
| A:7471B | MB 480-270135/1-A | | 480-270289 | 480-270135 | 10/21/2015 17:14 | 1 | TAL BUF | TAS |

**Lab ID: LB2** **Client ID: N/A**

Sample Date/Time: N/A Received Date/Time: N/A

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3010A | LB2 480-270052/1-C | | 480-270880 | 480-270374 | 10/22/2015 11:30 | 1 | TAL BUF | KJ1 |
| A:6010C | LB2 480-270052/1-C | | 480-270880 | 480-270374 | 10/23/2015 20:10 | 1 | TAL BUF | AMH |
| P:7470A | LB2 480-270052/1-E | | 480-270525 | 480-270385 | 10/22/2015 12:15 | 1 | TAL BUF | TAS |
| A:7470A | LB2 480-270052/1-E | | 480-270525 | 480-270385 | 10/22/2015 16:53 | 1 | TAL BUF | TAS |

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

## Laboratory Chronicle

**Lab ID: LCS** **Client ID: N/A**

Sample Date/Time: N/A Received Date/Time: N/A

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3010A | LCS 480-270374/3-A | | 480-270880 | 480-270374 | 10/22/2015 11:30 | 1 | TAL BUF | KJ1 |
| A:6010C | LCS 480-270374/3-A | | 480-270880 | 480-270374 | 10/23/2015 20:17 | 1 | TAL BUF | AMH |
| P:3050B | LCS 180-159790/2-A | | 180-159963 | 180-159790 | 11/09/2015 12:44 | 1 | TAL PIT | BMH |
| A:6020A | LCS 180-159790/2-A | | 180-159963 | 180-159790 | 11/09/2015 18:51 | 1 | TAL PIT | WTR |
| P:7470A | LCS 480-270385/3-A | | 480-270525 | 480-270385 | 10/22/2015 12:15 | 1 | TAL BUF | TAS |
| A:7470A | LCS 480-270385/3-A | | 480-270525 | 480-270385 | 10/22/2015 16:57 | 1 | TAL BUF | TAS |

**Lab ID: LCSD** **Client ID: N/A**

Sample Date/Time: N/A Received Date/Time: N/A

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3050B | LCSD 180-159790/3-A | | 180-159963 | 180-159790 | 11/09/2015 12:44 | 1 | TAL PIT | BMH |
| A:6020A | LCSD 180-159790/3-A | | 180-159963 | 180-159790 | 11/09/2015 18:56 | 1 | TAL PIT | WTR |

**Lab ID: LCSSRM** **Client ID: N/A**

Sample Date/Time: N/A Received Date/Time: N/A

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:7471B | LCSSRM 480-270135/2-A | | 480-270289 | 480-270135 | 10/21/2015 15:00 | 1 | TAL BUF | TAS |
| A:7471B | LCSSRM 480-270135/2-A | | 480-270289 | 480-270135 | 10/21/2015 17:18 | 1 | TAL BUF | TAS |

**Lab References:**
TAL BUF = TestAmerica Buffalo
TAL PIT = TestAmerica Pittsburgh

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| **MED_SRM_D085_00002** | 10/31/17 | | ERA, Lot D085-540 | | (Purchased Reagent) | | Al | 8060 mg/Kg |
| | | | | | | | Arsenic | 113 mg/Kg |
| | | | | | | | B | 99.1 mg/Kg |
| | | | | | | | Barium | 155 mg/Kg |
| | | | | | | | Be | 109 mg/Kg |
| | | | | | | | Ca | 5850 mg/Kg |
| | | | | | | | Cadmium | 67.5 mg/Kg |
| | | | | | | | Chromium | 164 mg/Kg |
| | | | | | | | Co | 100 mg/Kg |
| | | | | | | | Cu | 100 mg/Kg |
| | | | | | | | Fe | 15200 mg/Kg |
| | | | | | | | K | 2770 mg/Kg |
| | | | | | | | Lead | 90.1 mg/Kg |
| | | | | | | | Mercury | 8.37 mg/Kg |
| | | | | | | | Mg | 2790 mg/Kg |
| | | | | | | | Mn | 363 mg/Kg |
| | | | | | | | Mo | 73.8 mg/Kg |
| | | | | | | | Na | 686 mg/Kg |
| | | | | | | | Ni | 89.3 mg/Kg |
| | | | | | | | Sb | 94 mg/Kg |
| | | | | | | | Selenium | 156 mg/Kg |
| | | | | | | | Silver | 52.6 mg/Kg |
| | | | | | | | Sn | 100 mg/Kg |
| | | | | | | | Sr | 86.3 mg/Kg |
| | | | | | | | Ti | 304 mg/Kg |
| | | | | | | | Tl | 116 mg/Kg |
| | | | | | | | V | 73 mg/Kg |
| | | | | | | | Zn | 168 mg/Kg |
| **MED_TCLP_00013** | 07/31/16 | | Ultra Scientific, Lot CM-3291 | | (Purchased Reagent) | | Arsenic | 200 ug/mL |
| | | | | | | | Barium | 200 ug/mL |
| | | | | | | | Be | 200 ug/mL |
| | | | | | | | Cadmium | 200 ug/mL |
| | | | | | | | Chromium | 200 ug/mL |
| | | | | | | | Co | 200 ug/mL |
| | | | | | | | Cu | 200 ug/mL |
| | | | | | | | Lead | 200 ug/mL |
| | | | | | | | Mn | 200 ug/mL |
| | | | | | | | Mo | 200 ug/mL |
| | | | | | | | Ni | 200 ug/mL |
| | | | | | | | Sb | 200 ug/mL |
| | | | | | | | Selenium | 200 ug/mL |
| | | | | | | | Silver | 200 ug/mL |
| | | | | | | | Tl | 200 ug/mL |
| | | | | | | | V | 200 ug/mL |
| | | | | | | | Zn | 200 ug/mL |
| **MEH_HG_TCLP_W_00073** | 04/07/16 | 10/07/15 | Di Water, Lot Di H2O | 100 mL | MEA_Sr_STK_00003 | 2 mL | Sr | 200000 ng/mL |
| | | | | | MEH_HG3_STK_00006 | 1.335 mL | Mercury | 1335 ng/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| .MEA_Sr_STK_00003 | 05/17/16 | | Ultra Scientific, Lot L00106 | | (Purchased Reagent) | | Sr | 10000 ug/mL |
| .MEH_HG3_STK_00006 | 08/30/16 | | Aqua Solutions, Lot 5073168 | | (Purchased Reagent) | | Mercury | 100 mg/L |
| **MEH_HG2_WKG_01023** | 10/22/15 | 10/21/15 | 1% HNO3, Lot 3021848 | 50 mL | MEH_HG2_INT_00029 | 0.5 mL | Mercury | 100 ng/mL |
| .MEH_HG2_INT_00029 | 04/05/16 | 10/05/15 | 1% HNO3, Lot 2930814 | 50 mL | MEH_HG3_STK_00006 | 5 mL | Mercury | 10000 ng/mL |
| ..MEH_HG3_STK_00006 | 08/30/16 | | Aqua Solutions, Lot 5073168 | | (Purchased Reagent) | | Mercury | 100 mg/L |
| **MEH_HG2_WKG_01024** | 10/23/15 | 10/22/15 | 1% HNO3, Lot 3021848 | 50 mL | MEH_HG2_INT_00029 | 0.5 mL | Mercury | 100 ng/mL |
| .MEH_HG2_INT_00029 | 04/05/16 | 10/05/15 | 1% HNO3, Lot 2930814 | 50 mL | MEH_HG3_STK_00006 | 5 mL | Mercury | 10000 ng/mL |
| ..MEH_HG3_STK_00006 | 08/30/16 | | Aqua Solutions, Lot 5073168 | | (Purchased Reagent) | | Mercury | 100 mg/L |
| **MEI_04_ICV_00286** | 01/08/16 | 10/12/15 | 1% HNO3, Lot 2993303 | 100 mL | MEI_09_CCV_00200 | 75 mL | Arsenic | 0.375 mg/L |
| | | | | | | | Barium | 0.375 mg/L |
| | | | | | | | Cadmium | 0.375 mg/L |
| | | | | | | | Chromium | 0.375 mg/L |
| | | | | | | | Lead | 0.375 mg/L |
| | | | | | | | Selenium | 0.375 mg/L |
| | | | | | | | Silver | 0.375 mg/L |
| .MEI_09_CCV_00200 | 01/08/16 | 10/05/15 | 1% HNO3, Lot 2993303 | 2000 mL | MEI_CCV_A_STK_00009 | 10 mL | Arsenic | 0.5 ug/mL |
| | | | | | | | Barium | 0.5 ug/mL |
| | | | | | | | Cadmium | 0.5 ug/mL |
| | | | | | | | Chromium | 0.5 ug/mL |
| | | | | | | | Lead | 0.5 ug/mL |
| | | | | | | | Selenium | 0.5 ug/mL |
| | | | | | MEI_CCV_Ag_00008 | 1 mL | Silver | 0.5 ug/mL |
| ..MEI_CCV_A_STK_00009 | 01/08/16 | | High-Purity, Lot 1500517 | | (Purchased Reagent) | | Arsenic | 100 ug/mL |
| | | | | | | | Barium | 100 ug/mL |
| | | | | | | | Cadmium | 100 ug/mL |
| | | | | | | | Chromium | 100 ug/mL |
| | | | | | | | Lead | 100 ug/mL |
| | | | | | | | Selenium | 100 ug/mL |
| ..MEI_CCV_Ag_00008 | 09/17/17 | | High-Purity, Lot 1420628 | | (Purchased Reagent) | | Silver | 1000 ug/mL |
| **MEI_07_ICSA_00080** | 07/08/17 | 10/02/15 | 1% HNO3, Lot 2993303 | 500 mL | MEA_Al_STK_00006 | 25 mL | Al | 500 ug/mL |
| | | | | | MEA_Ca_STK_00009 | 25 mL | Ca | 500 ug/mL |
| | | | | | MEA_Fe_STK_00008 | 10 mL | Fe | 200 ug/mL |
| | | | | | MEA_MG_STK_00007 | 25 mL | Mg | 500 ug/mL |
| .MEA_Al_STK_00006 | 07/08/17 | | Ultra Scientific, Lot M002668 | | (Purchased Reagent) | | Al | 10000 ug/mL |
| .MEA_Ca_STK_00009 | 08/17/18 | | Ultra Scientific, Lot T00315 | | (Purchased Reagent) | | Ca | 10000 ug/mL |
| .MEA_Fe_STK_00008 | 08/17/18 | | Ultra Scientific, Lot CM-3098 | | (Purchased Reagent) | | Fe | 10000 ug/mL |
| .MEA_MG_STK_00007 | 08/17/18 | | Ultra Scientific, Lot CM-0429 | | (Purchased Reagent) | | Mg | 10000 ug/mL |
| **MEI_08_ICSAB_00096** | 12/23/15 | 07/08/15 | 1% HNO3, Lot 2833593 | 500 mL | MEA_Ag_STK_00003 | 0.1 mL | Silver | 0.2 ug/mL |
| | | | | | MEA_S_STK_00019 | 0.05 mL | Sulfur | 1 ug/mL |
| | | | | | MEI_ICSAB_STK_00019 | 50 mL | Al | 500.5 ug/mL |
| | | | | | | | Arsenic | 0.1 ug/mL |
| | | | | | | | Barium | 0.5 ug/mL |
| | | | | | | | Be | 0.5 ug/mL |
| | | | | | | | Ca | 500.5 ug/mL |
| | | | | | | | Cadmium | 1 ug/mL |
| | | | | | | | Chromium | 0.5 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Co | 0.5 ug/mL |
| | | | | | | | Cu | 0.5 ug/mL |
| | | | | | | | Fe | 100 ug/mL |
| | | | | | | | Lead | 0.05 ug/mL |
| | | | | | | | Li | 0.5 ug/mL |
| | | | | | | | Mg | 500.6 ug/mL |
| | | | | | | | Mn | 0.5 ug/mL |
| | | | | | | | Ni | 1 ug/mL |
| | | | | | | | Sb | 0.6 ug/mL |
| | | | | | | | Selenium | 0.05 ug/mL |
| | | | | | | | Si | 1 ug/mL |
| | | | | | | | Sr | 0.5 ug/mL |
| | | | | | | | Tl | 0.1 ug/mL |
| | | | | | | | V | 0.5 ug/mL |
| | | | | | | | Zn | 1 ug/mL |
| .MEA_Ag_STK_00003 | 05/31/16 | Ultra Scientific, Lot K00335 | | | (Purchased Reagent) | | Silver | 1000 ug/mL |
| .MEA_S_STK_00019 | 12/23/15 | High Purity, Lot 1326810 | | | (Purchased Reagent) | | Sulfur | 10000 ug/mL |
| .MEI_ICSAB_STK_00019 | 01/31/16 | Ultra Scientific, Lot CL-5319 | | | (Purchased Reagent) | | Al | 5006 ug/mL |
| | | | | | | | Arsenic | 1 ug/mL |
| | | | | | | | Barium | 5 ug/mL |
| | | | | | | | Be | 5 ug/mL |
| | | | | | | | Ca | 5005 ug/mL |
| | | | | | | | Cadmium | 10 ug/mL |
| | | | | | | | Chromium | 5 ug/mL |
| | | | | | | | Co | 5 ug/mL |
| | | | | | | | Cu | 5 ug/mL |
| | | | | | | | Fe | 1000 ug/mL |
| | | | | | | | Lead | 0.5 ug/mL |
| | | | | | | | Li | 5 ug/mL |
| | | | | | | | Mg | 5006 ug/mL |
| | | | | | | | Mn | 5 ug/mL |
| | | | | | | | Ni | 10 ug/mL |
| | | | | | | | Sb | 6 ug/mL |
| | | | | | | | Selenium | 0.5 ug/mL |
| | | | | | | | Si | 10 ug/mL |
| | | | | | | | Sr | 5 ug/mL |
| | | | | | | | Tl | 1 ug/mL |
| | | | | | | | V | 5 ug/mL |
| | | | | | | | Zn | 10 ug/mL |
| **MEI_09_CCV_00200** | 01/08/16 | 10/05/15 | 1% HNO3, Lot 2393303 | 2000 mL | MEI_CCV_A_STK_00009 | 10 mL | Arsenic | 0.5 ug/mL |
| | | | | | | | Barium | 0.5 ug/mL |
| | | | | | | | Cadmium | 0.5 ug/mL |
| | | | | | | | Chromium | 0.5 ug/mL |
| | | | | | | | Lead | 0.5 ug/mL |
| | | | | | | | Selenium | 0.5 ug/mL |
| | | | | | MEI_CCV_Ag_00008 | 1 mL | Silver | 0.5 ug/mL |
| .MEI_CCV_A_STK_00009 | 01/08/16 | High-Purity, Lot 1500517 | | | (Purchased Reagent) | | Arsenic | 100 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Barium | 100 ug/mL |
| | | | | | | | Cadmium | 100 ug/mL |
| | | | | | | | Chromium | 100 ug/mL |
| | | | | | | | Lead | 100 ug/mL |
| | | | | | | | Selenium | 100 ug/mL |
| .MEI_CCV_Ag_00008 | 09/17/17 | | High-Purity, Lot 1420628 | | (Purchased Reagent) | | Silver | 1000 ug/mL |
| **MEI_10_CCVL_00082** | 01/24/16 | 10/20/15 | 1% HNO3, Lot 3083467 | 2000 mL | MEI_CRI_STK2_00007 | 20 mL | Arsenic | 0.015 mg/L |
| | | | | | | | Cadmium | 0.002 mg/L |
| | | | | | | | Lead | 0.01 mg/L |
| | | | | | | | Selenium | 0.025 mg/L |
| | | | | | | | Silver | 0.006 mg/L |
| | | | | | MEI_CRI_STOCK_00019 | 20 mL | Arsenic | 0.015 mg/L |
| | | | | | | | Barium | 0.002 mg/L |
| | | | | | | | Cadmium | 0.002 mg/L |
| | | | | | | | Chromium | 0.004 mg/L |
| | | | | | | | Lead | 0.01 mg/L |
| | | | | | | | Selenium | 0.025 mg/L |
| | | | | | | | Silver | 0.006 mg/L |
| .MEI_CRI_STK2_00007 | 01/24/16 | 09/21/15 | 6%HNO3 5%HCL, Lot 2487631 | 1000 mL | MEA_As_STK_00003 | 0.05 mL | Arsenic | 0.5 ug/mL |
| | | | | | MEA_Cd_STK_00003 | 0.01 mL | Cadmium | 0.1 ug/mL |
| | | | | | MEA_PB_STK_00006 | 0.05 mL | Lead | 0.5 ug/mL |
| | | | | | MEA_Se_STK_00004 | 0.1 mL | Selenium | 1 ug/mL |
| | | | | | MEI_CCV_Ag_00007 | 0.3 mL | Silver | 0.3 ug/mL |
| ..MEA_As_STK_00003 | 05/25/18 | | Ultra Scientific, Lot T00590 | | (Purchased Reagent) | | Arsenic | 10000 ug/mL |
| ..MEA_Cd_STK_00003 | 01/24/16 | | Ultra Scientific, Lot L00406 | | (Purchased Reagent) | | Cadmium | 10000 ug/mL |
| ..MEA_PB_STK_00006 | 06/25/17 | | Ultra Scientific, Lot M00611 | | (Purchased Reagent) | | Lead | 10000 ug/mL |
| ..MEA_Se_STK_00004 | 11/01/16 | | Ultra Scientific, Lot P01005 | | (Purchased Reagent) | | Selenium | 10000 ug/mL |
| ..MEI_CCV_Ag_00007 | 03/25/18 | | Ultra, Lot M00474 | | (Purchased Reagent) | | Silver | 1000 ug/mL |
| .MEI_CRI_STOCK_00019 | 01/24/16 | 09/22/15 | 6%HNO3 5%HCL, Lot 222 | 1000 mL | MEA_As_STK_00003 | 0.1 mL | Arsenic | 1 ug/mL |
| | | | | | MEA_Ba_STK_00004 | 0.02 mL | Barium | 0.2 ug/mL |
| | | | | | MEA_Cd_STK_00003 | 0.01 mL | Cadmium | 0.1 ug/mL |
| | | | | | MEA_Cr_STK_00003 | 0.04 mL | Chromium | 0.4 ug/mL |
| | | | | | MEA_PB_STK_00006 | 0.05 mL | Lead | 0.5 ug/mL |
| | | | | | MEA_Se_STK_00004 | 0.15 mL | Selenium | 1.5 ug/mL |
| | | | | | MEI_CCV_Ag_00007 | 0.3 mL | Silver | 0.3 ug/mL |
| ..MEA_As_STK_00003 | 05/25/18 | | Ultra Scientific, Lot T00590 | | (Purchased Reagent) | | Arsenic | 10000 ug/mL |
| ..MEA_Ba_STK_00004 | 07/10/17 | | Ultra Scientific, Lot L01142 | | (Purchased Reagent) | | Barium | 10000 ug/mL |
| ..MEA_Cd_STK_00003 | 01/24/16 | | Ultra Scientific, Lot L00406 | | (Purchased Reagent) | | Cadmium | 10000 ug/mL |
| ..MEA_Cr_STK_00003 | 05/25/18 | | Ultra Scientific, Lot cl-4304 | | (Purchased Reagent) | | Chromium | 10000 ug/mL |
| ..MEA_PB_STK_00006 | 06/25/17 | | Ultra Scientific, Lot M00611 | | (Purchased Reagent) | | Lead | 10000 ug/mL |
| ..MEA_Se_STK_00004 | 11/01/16 | | Ultra Scientific, Lot P01005 | | (Purchased Reagent) | | Selenium | 10000 ug/mL |
| ..MEI_CCV_Ag_00007 | 03/25/18 | | Ultra, Lot M00474 | | (Purchased Reagent) | | Silver | 1000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Pittsburgh  Job No.: 480-89453-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| **MCCV1X_00082** | 12/31/15 | 11/09/15 | 2% Nitric Acid, Lot 1241747 | 500 mL | MCALSPECAREV_00006 | 10 mL | Arsenic | 0.1 ppm |
| | | | | | | | Barium | 0.1 ppm |
| | | | | | | | Cadmium | 0.1 ppm |
| | | | | | | | Chromium | 0.1 ppm |
| | | | | | | | Lead | 0.1 ppm |
| | | | | | | | Mg | 50 ppm |
| | | | | | | | Selenium | 0.1 ppm |
| | | | | | | | Silver | 0.1 ppm |
| .MCALSPECAREV_00006 | 06/01/16 | Inorganic Ventures, Lot J2-MEB575123 | | | (Purchased Reagent) | | Arsenic | 5 ppm |
| | | | | | | | Barium | 5 ppm |
| | | | | | | | Cadmium | 5 ppm |
| | | | | | | | Chromium | 5 ppm |
| | | | | | | | Lead | 5 ppm |
| | | | | | | | Mg | 2500 ppm |
| | | | | | | | Selenium | 5 ppm |
| | | | | | | | Silver | 5 ppm |
| **MCRIX_00075** | 12/30/15 | 11/06/15 | HNO3, Lot 1191081 | 250 mL | MMSCRI-1B_00005 | 1 mL | Arsenic | 0.001 ppm |
| | | | | | | | Barium | 0.01 ppm |
| | | | | | | | Cadmium | 0.001 ppm |
| | | | | | | | Chromium | 0.002 ppm |
| | | | | | | | Lead | 0.001 ppm |
| | | | | | | | Selenium | 0.005 ppm |
| | | | | | | | Silver | 0.001 ppm |
| .MMSCRI-1B_00005 | 04/01/16 | Inorganic Ventures, Lot J2-MEB572092 | | | (Purchased Reagent) | | Arsenic | 0.25 ppm |
| | | | | | | | Barium | 2.5 ppm |
| | | | | | | | Cadmium | 0.25 ppm |
| | | | | | | | Chromium | 0.5 ppm |
| | | | | | | | Lead | 0.25 ppm |
| | | | | | | | Selenium | 1.25 ppm |
| | | | | | | | Silver | 0.25 ppm |
| **MICSABX_00078** | 12/31/15 | 11/09/15 | 2% Nitric Acid, Lot J38N82 | 100 mL | M6020ICS-0A_00006 | 10 mL | Al | 100 ppm |
| | | | | | | | Ca | 100 ppm |
| | | | | | | | Fe | 100 ppm |
| | | | | | | | K | 100 ppm |
| | | | | | | | Mg | 100 ppm |
| | | | | | | | Mo | 2 ppm |
| | | | | | | | Na | 100 ppm |
| | | | | | | | Ti | 2 ppm |
| | | | | | M6020ICS-0B_00007 | 1 mL | Arsenic | 0.02 ppm |
| | | | | | | | Cadmium | 0.02 ppm |
| | | | | | | | Chromium | 0.02 ppm |
| | | | | | | | Co | 0.02 ppm |
| | | | | | | | Cu | 0.02 ppm |
| | | | | | | | Mn | 0.022 ppm |
| | | | | | | | Ni | 0.02 ppm |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Pittsburgh  Job No.: 480-89453-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Silver | 0.02 ppm |
| | | | | | | | Zn | 0.025 ppm |
| | | | | | MMSICSAB-1_00008 | 0.2 mL | Barium | 0.02 ppm |
| | | | | | | | Be | 0.02 ppm |
| | | | | | | | Lead | 0.02 ppm |
| | | | | | | | Sr | 0.025 ppm |
| | | | | | | | Tl | 0.02 ppm |
| | | | | | | | V | 0.02 ppm |
| | | | | | MMSICSAB-2_00007 | 0.2 mL | B | 0.05 ppm |
| | | | | | | | Sb | 0.02 ppm |
| | | | | | | | Selenium | 0.05 ppm |
| | | | | | | | Si | 0.5 ppm |
| | | | | | | | Sn | 0.1 ppm |
| .M6020ICS-0A_00006 | 01/26/18 | Inorganic Ventures, Lot J2-MEB533111 | | | (Purchased Reagent) | | Al | 1000 ppm |
| | | | | | | | Ca | 1000 ppm |
| | | | | | | | Fe | 1000 ppm |
| | | | | | | | K | 1000 ppm |
| | | | | | | | Mg | 1000 ppm |
| | | | | | | | Mo | 20 ppm |
| | | | | | | | Na | 1000 ppm |
| | | | | | | | Tl | 20 ppm |
| .M6020ICS-0B_00007 | 01/26/18 | Inorganic Ventures, Lot J2-MEB589107 | | | (Purchased Reagent) | | Arsenic | 2 ppm |
| | | | | | | | Cadmium | 2 ppm |
| | | | | | | | Chromium | 2 ppm |
| | | | | | | | Co | 2 ppm |
| | | | | | | | Cu | 2 ppm |
| | | | | | | | Mn | 2.2 ppm |
| | | | | | | | Ni | 2 ppm |
| | | | | | | | Silver | 2 ppm |
| | | | | | | | Zn | 2.5 ppm |
| .MMSICSAB-1_00008 | 06/01/16 | Inorganic Ventures, Lot J2-MEB575125 | | | (Purchased Reagent) | | Barium | 10 ppm |
| | | | | | | | Be | 10 ppm |
| | | | | | | | Lead | 10 ppm |
| | | | | | | | Sr | 12.5 ppm |
| | | | | | | | Tl | 10 ppm |
| | | | | | | | V | 10 ppm |
| .MMSICSAB-2_00007 | 06/01/16 | Inorganic Ventures, Lot J2-MEB575126 | | | (Purchased Reagent) | | B | 25 ppm |
| | | | | | | | Sb | 10 ppm |
| | | | | | | | Selenium | 25 ppm |
| | | | | | | | Si | 250 ppm |
| | | | | | | | Sn | 50 ppm |
| **MICSAX_00074** | 12/31/15 | 11/09/15 | DI Water, Lot J38N82 | 100 mL | M6020ICS-0A_00006 | 10 mL | Al | 100 ppm |
| | | | | | | | Ca | 100 ppm |
| | | | | | | | Fe | 100 ppm |
| | | | | | | | K | 100 ppm |
| | | | | | | | Mg | 100 ppm |
| | | | | | | | Mo | 2 ppm |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Pittsburgh  Job No.: 480-89453-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Na | 100 ppm |
| | | | | | | | Ti | 2 ppm |
| .M6020ICS-0A_00006 | 01/26/18 | Inorganic Ventures, Lot J2-MEB533111 | | | (Purchased Reagent) | | Al | 1000 ppm |
| | | | | | | | Ca | 1000 ppm |
| | | | | | | | Fe | 1000 ppm |
| | | | | | | | K | 1000 ppm |
| | | | | | | | Mg | 1000 ppm |
| | | | | | | | Mo | 20 ppm |
| | | | | | | | Na | 1000 ppm |
| | | | | | | | Ti | 20 ppm |
| **MICVX_00038** | 11/30/15 | 10/23/15 | 2% Nitric Acid, Lot 28106 | 250 mg/L | MICPMSICV_00018 | 10 mg/L | Arsenic | 0.08 mg/L |
| | | | | | | | Barium | 0.08 mg/L |
| | | | | | | | Cadmium | 0.08 mg/L |
| | | | | | | | Chromium | 0.08 mg/L |
| | | | | | | | Lead | 0.08 mg/L |
| | | | | | | | Mg | 40 mg/L |
| | | | | | | | Selenium | 0.08 mg/L |
| | | | | | | | Silver | 0.08 mg/L |
| .MICPMSICV_00018 | 11/30/15 | SPEX CertiPrep, Lot 7-230WL | | | (Purchased Reagent) | | Arsenic | 2 ppm |
| | | | | | | | Barium | 2 ppm |
| | | | | | | | Cadmium | 2 ppm |
| | | | | | | | Chromium | 2 ppm |
| | | | | | | | Lead | 2 ppm |
| | | | | | | | Mg | 1000 ppm |
| | | | | | | | Selenium | 2 ppm |
| | | | | | | | Silver | 2 ppm |
| **MSTD2X_00053** | 12/31/15 | 11/09/15 | DI Water, Lot 1241717 | 250 mL | MCALSPECAREV_00006 | 10 mg/L | Arsenic | 0.2 ppm |
| | | | | | | | Barium | 0.2 ppm |
| | | | | | | | Cadmium | 0.2 ppm |
| | | | | | | | Chromium | 0.2 ppm |
| | | | | | | | Lead | 0.2 ppm |
| | | | | | | | Selenium | 0.2 ppm |
| | | | | | | | Silver | 0.2 ppm |
| .MCALSPECAREV_00006 | 06/01/16 | Inorganic Ventures, Lot J2-MEB575123 | | | (Purchased Reagent) | | Arsenic | 5 ppm |
| | | | | | | | Barium | 5 ppm |
| | | | | | | | Cadmium | 5 ppm |
| | | | | | | | Chromium | 5 ppm |
| | | | | | | | Lead | 5 ppm |
| | | | | | | | Selenium | 5 ppm |
| | | | | | | | Silver | 5 ppm |
| **MTAPITTICPMS_00022** | 05/01/16 | INORGANIC VENTURES, Lot G2-MEB506053 | | | (Purchased Reagent) | | Al | 200 ug/mL |
| | | | | | | | Arsenic | 4 ug/mL |
| | | | | | | | B | 100 ug/mL |
| | | | | | | | Barium | 200 ug/mL |
| | | | | | | | Be | 5 ug/mL |
| | | | | | | | Cadmium | 5 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Chromium | 20 ug/mL |
| | | | | | | | Co | 50 ug/mL |
| | | | | | | | Cu | 25 ug/mL |
| | | | | | | | Fe | 100 ug/mL |
| | | | | | | | Lead | 2 ug/mL |
| | | | | | | | Mn | 50 ug/mL |
| | | | | | | | Ni | 50 ug/mL |
| | | | | | | | Selenium | 1 ug/mL |
| | | | | | | | Silver | 5 ug/mL |
| | | | | | | | Sr | 100 ug/mL |
| | | | | | | | Tl | 5 ug/mL |
| | | | | | | | V | 50 ug/mL |
| | | | | | | | Zn | 50 ug/mL |
| MTAPITTMSA_00027 | 11/01/16 | | INORGANIC VENTURES, Lot J2-MEB584008 | | (Purchased Reagent) | | Ca | 5000 ug/mL |
| | | | | | | | K | 5000 ug/mL |
| | | | | | | | Mg | 5000 ug/mL |
| | | | | | | | Na | 5000 ug/mL |
| MTAPITTMSC_00033 | 11/01/16 | | Inorganic Ventures, Lot J2-MEB584009 | | (Purchased Reagent) | | Mo | 100 ug/mL |
| | | | | | | | Sb | 50 ug/mL |
| | | | | | | | Si | 1000 ug/mL |
| | | | | | | | SiO2 | 2140 ug/mL |
| | | | | | | | Sn | 200 ug/mL |
| | | | | | | | Ti | 100 ug/mL |

# Certification Summary

Client: U.S. Army Construction Engineering Resea
Project/Site: Cerl Gasifier - Research Project

TestAmerica Job ID: 480-89453-1

| Laboratory | Authority | Program | EPA Region | Certification ID |
|---|---|---|---|---|
| TestAmerica Buffalo | California | State Program | 9 | 1169CA |
| TestAmerica Buffalo | Connecticut | State Program | 1 | PH-0568 |
| TestAmerica Buffalo | Florida | NELAP | 4 | E87672 |
| TestAmerica Buffalo | Georgia | State Program | 4 | 956 |
| TestAmerica Buffalo | Georgia | State Program | 4 | N/A |
| TestAmerica Buffalo | Illinois | NELAP | 5 | 200003 |
| TestAmerica Buffalo | Iowa | State Program | 7 | 374 |
| TestAmerica Buffalo | Kansas | NELAP | 7 | E-10187 |
| TestAmerica Buffalo | Kentucky (DW) | State Program | 4 | 90029 |
| TestAmerica Buffalo | Kentucky (UST) | State Program | 4 | 30 |
| TestAmerica Buffalo | Kentucky (WW) | State Program | 4 | 90029 |
| TestAmerica Buffalo | Louisiana | NELAP | 6 | 02031 |
| TestAmerica Buffalo | Maine | State Program | 1 | NY00044 |
| TestAmerica Buffalo | Maryland | State Program | 3 | 294 |
| TestAmerica Buffalo | Massachusetts | State Program | 1 | M-NY044 |
| TestAmerica Buffalo | Michigan | State Program | 5 | 9937 |
| TestAmerica Buffalo | Minnesota | NELAP | 5 | 036-999-337 |
| TestAmerica Buffalo | New Hampshire | NELAP Primary AB | 1 | 2973 |
| TestAmerica Buffalo | New Hampshire | NELAP Secondary AB | 1 | 2337 |
| TestAmerica Buffalo | New Jersey | NELAP | 2 | NY455 |
| TestAmerica Buffalo | New York | NELAP | 2 | 10026 |
| TestAmerica Buffalo | North Dakota | State Program | 8 | R-176 |
| TestAmerica Buffalo | Oklahoma | State Program | 6 | 9421 |
| TestAmerica Buffalo | Oregon | NELAP | 10 | NY200003 |
| TestAmerica Buffalo | Pennsylvania | NELAP | 3 | 68-00281 |
| TestAmerica Buffalo | Rhode Island | State Program | 1 | LAO00328 |
| TestAmerica Buffalo | Tennessee | State Program | 4 | TN02970 |
| TestAmerica Buffalo | Texas | NELAP | 6 | T104704412-15-6 |
| TestAmerica Buffalo | USDA | Federal | | P330-11-00386 |
| TestAmerica Buffalo | Virginia | NELAP | 3 | 460185 |
| TestAmerica Buffalo | Washington | State Program | 10 | C784 |
| TestAmerica Buffalo | West Virginia DEP | State Program | 3 | 252 |
| TestAmerica Buffalo | Wisconsin | State Program | 5 | 998310390 |
| TestAmerica Pittsburgh | Arkansas DEQ | State Program | 6 | 88-0690 |
| TestAmerica Pittsburgh | California | State Program | 9 | 2891 |
| TestAmerica Pittsburgh | Connecticut | State Program | 1 | PH-0688 |
| TestAmerica Pittsburgh | Florida | NELAP | 4 | E871008 |
| TestAmerica Pittsburgh | Illinois | NELAP | 5 | 200005 |
| TestAmerica Pittsburgh | Kansas | NELAP | 7 | E-10350 |
| TestAmerica Pittsburgh | Louisiana | NELAP | 6 | 04041 |
| TestAmerica Pittsburgh | New Hampshire | NELAP | 1 | 2030 |
| TestAmerica Pittsburgh | New Jersey | NELAP | 2 | PA005 |
| TestAmerica Pittsburgh | New York | NELAP | 2 | 11182 |
| TestAmerica Pittsburgh | North Carolina (WW/SW) | State Program | 4 | 434 |
| TestAmerica Pittsburgh | Pennsylvania | NELAP | 3 | 02-00416 |
| TestAmerica Pittsburgh | South Carolina | State Program | 4 | 89014 |
| TestAmerica Pittsburgh | Texas | NELAP | 6 | T104704528-15-2 |
| TestAmerica Pittsburgh | US Fish & Wildlife | Federal | | LE94312A-1 |
| TestAmerica Pittsburgh | USDA | Federal | | P330-10-00139 |
| TestAmerica Pittsburgh | USDA | Federal | | P-Soil-01 |
| TestAmerica Pittsburgh | Utah | NELAP | 8 | PA001462015-4 |
| TestAmerica Pittsburgh | Virginia | NELAP | 3 | 460189 |
| TestAmerica Pittsburgh | West Virginia DEP | State Program | 3 | 142 |
| TestAmerica Pittsburgh | Wisconsin | State Program | 5 | 998027800 |

# Certification Summary

Client: U.S. Army Construction Engineering Resea
Project/Site: Cerl Gasifier - Research Project

TestAmerica Job ID: 480-89453-1

| Laboratory | Authority | Program | EPA Region | Certification ID |
|---|---|---|---|---|

Accreditation may not be offered or required for all methods and analytes reported in this package. Please contact your project manager for the laboratory's current list of certified methods and analytes.

# METALS

COVER PAGE
METALS

Lab Name: TestAmerica Buffalo Job Number: 480-89453-1

SDG No.:

Project: Cerl Gasifier - Research Project

| Client Sample ID | Lab Sample ID |
|---|---|
| A-01-020415-1600 | 480-89453-1 |
| A-01-031915-1600 | 480-89453-2 |
| A-01-040215-1505 | 480-89453-3 |
| A-01-050815-1600 | 480-89453-4 |

Comments:

COVER PAGE
METALS

Lab Name: TestAmerica Pittsburgh Job Number: 480-89453-1

SDG No.:

Project: Cerl Gasifier - Research Project

| Client Sample ID | Lab Sample ID |
|---|---|
| A-01-020415-1600 | 480-89453-1 |
| A-01-031915-1600 | 480-89453-2 |
| A-01-040215-1505 | 480-89453-3 |
| A-01-050815-1600 | 480-89453-4 |

Comments:

1A-IN
INORGANIC ANALYSIS DATA SHEET
METALS

Client Sample ID: A-01-020415-1600 Lab Sample ID: 480-89453-1

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG ID.:

Matrix: Solid Date Sampled: 02/04/2015 16:00

Reporting Basis: DRY Date Received: 10/20/2015 09:20

% Solids: 89.4

| CAS No. | Analyte | Result | RL | MDL | Units | C | Q | DIL | Method |
|---|---|---|---|---|---|---|---|---|---|
| 7439-97-6 | Mercury | ND | 0.022 | 0.0091 | mg/Kg | | H | 1 | 7471B |

1A-IN
INORGANIC ANALYSIS DATA SHEET
METALS - TCLP

Client Sample ID: A-01-020415-1600 | Lab Sample ID: 480-89453-1

Lab Name: TestAmerica Buffalo | Job No.: 480-89453-1

SDG ID.:

Matrix: Solid | Date Sampled: 02/04/2015 16:00

Reporting Basis: WET | Date Received: 10/20/2015 09:20

| CAS No. | Analyte | Result | RL | MDL | Units | C | Q | DIL | Method |
|---|---|---|---|---|---|---|---|---|---|
| 7440-38-2 | Arsenic | ND | 0.015 | 0.0056 | mg/L | | H | 1 | 6010C |
| 7440-39-3 | Barium | 3.2 | 1.0 | 0.10 | mg/L | | H | 1 | 6010C |
| 7440-43-9 | Cadmium | ND | 0.0020 | 0.00050 | mg/L | | H | 1 | 6010C |
| 7440-47-3 | Chromium | ND | 0.020 | 0.010 | mg/L | | H | 1 | 6010C |
| 7439-92-1 | Lead | 0.0040 | 0.020 | 0.0030 | mg/L | J | H | 1 | 6010C |
| 7782-49-2 | Selenium | ND | 0.13 | 0.044 | mg/L | | H | 5 | 6010C |
| 7440-22-4 | Silver | ND | 0.0060 | 0.0017 | mg/L | | H | 1 | 6010C |
| 7439-97-6 | Mercury | ND | 0.00020 | 0.00012 | mg/L | | H | 1 | 7470A |

1A-IN
INORGANIC ANALYSIS DATA SHEET
METALS

Client Sample ID: A-01-031915-1600
Lab Sample ID: 480-89453-2
Lab Name: TestAmerica Buffalo
Job No.: 480-89453-1
SDG ID.:
Matrix: Solid
Date Sampled: 03/19/2015 16:00
Reporting Basis: DRY
Date Received: 10/20/2015 09:20
% Solids: 100.0

| CAS No. | Analyte | Result | RL | MDL | Units | C | Q | DIL | Method |
|---|---|---|---|---|---|---|---|---|---|
| 7439-97-6 | Mercury | ND | 0.021 | 0.0083 | mg/Kg | | H | 1 | 7471B |

1A-IN
INORGANIC ANALYSIS DATA SHEET
METALS - TCLP

Client Sample ID: A-01-031915-1600 | Lab Sample ID: 480-89453-2
Lab Name: TestAmerica Buffalo | Job No.: 480-89453-1
SDG ID.:
Matrix: Solid | Date Sampled: 03/19/2015 16:00
Reporting Basis: WET | Date Received: 10/20/2015 09:20

| CAS No. | Analyte | Result | RL | MDL | Units | C | Q | DIL | Method |
|---|---|---|---|---|---|---|---|---|---|
| 7440-38-2 | Arsenic | ND | 0.015 | 0.0056 | mg/L | | H | 1 | 6010C |
| 7440-39-3 | Barium | 1.9 | 1.0 | 0.10 | mg/L | | H | 1 | 6010C |
| 7440-43-9 | Cadmium | ND | 0.0020 | 0.00050 | mg/L | | H | 1 | 6010C |
| 7440-47-3 | Chromium | 0.029 | 0.020 | 0.010 | mg/L | | H | 1 | 6010C |
| 7439-92-1 | Lead | ND | 0.020 | 0.0030 | mg/L | | H | 1 | 6010C |
| 7782-49-2 | Selenium | ND | 0.13 | 0.044 | mg/L | | H | 5 | 6010C |
| 7440-22-4 | Silver | ND | 0.0060 | 0.0017 | mg/L | | H | 1 | 6010C |
| 7439-97-6 | Mercury | ND | 0.00020 | 0.00012 | mg/L | | H | 1 | 7470A |

1A-IN
INORGANIC ANALYSIS DATA SHEET
METALS

Client Sample ID: A-01-040215-1505 Lab Sample ID: 480-89453-3

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG ID.:

Matrix: Solid Date Sampled: 04/02/2015 15:05

Reporting Basis: DRY Date Received: 10/20/2015 09:20

% Solids: 100.0

| CAS No. | Analyte | Result | RL | MDL | Units | C | Q | DIL | Method |
|---|---|---|---|---|---|---|---|---|---|
| 7439-97-6 | Mercury | ND | 0.020 | 0.0082 | mg/Kg | | H | 1 | 7471B |

1A-IN
INORGANIC ANALYSIS DATA SHEET
METALS - TCLP

Client Sample ID: A-01-040215-1505 | Lab Sample ID: 480-89453-3
Lab Name: TestAmerica Buffalo | Job No.: 480-89453-1
SDG ID.:
Matrix: Solid | Date Sampled: 04/02/2015 15:05
Reporting Basis: WET | Date Received: 10/20/2015 09:20

| CAS No. | Analyte | Result | RL | MDL | Units | C | Q | DIL | Method |
|---|---|---|---|---|---|---|---|---|---|
| 7440-38-2 | Arsenic | ND | 0.015 | 0.0056 | mg/L | | H | 1 | 6010C |
| 7440-39-3 | Barium | 3.7 | 1.0 | 0.10 | mg/L | | H | 1 | 6010C |
| 7440-43-9 | Cadmium | ND | 0.0020 | 0.00050 | mg/L | | H | 1 | 6010C |
| 7440-47-3 | Chromium | 0.015 | 0.020 | 0.010 | mg/L | J | H | 1 | 6010C |
| 7439-92-1 | Lead | 0.0040 | 0.020 | 0.0030 | mg/L | J | H | 1 | 6010C |
| 7782-49-2 | Selenium | ND | 0.13 | 0.044 | mg/L | | H | 5 | 6010C |
| 7440-22-4 | Silver | ND | 0.0060 | 0.0017 | mg/L | | H | 1 | 6010C |
| 7439-97-6 | Mercury | ND | 0.00020 | 0.00012 | mg/L | | H | 1 | 7470A |

1A-IN
INORGANIC ANALYSIS DATA SHEET
METALS

Client Sample ID: A-01-050815-1600
Lab Sample ID: 480-89453-4
Lab Name: TestAmerica Buffalo
Job No.: 480-89453-1
SDG ID.:
Matrix: Solid
Date Sampled: 05/08/2015 16:00
Reporting Basis: DRY
Date Received: 10/20/2015 09:20
% Solids: 99.2

| CAS No. | Analyte | Result | RL | MDL | Units | C | Q | DIL | Method |
|---|---|---|---|---|---|---|---|---|---|
| 7439-97-6 | Mercury | 0.011 | 0.021 | 0.0083 | mg/Kg | J | H | 1 | 7471B |

1A-IN
INORGANIC ANALYSIS DATA SHEET
METALS - TCLP

Client Sample ID: A-01-050815-1600 | Lab Sample ID: 480-89453-4
Lab Name: TestAmerica Buffalo | Job No.: 480-89453-1
SDG ID.:
Matrix: Solid | Date Sampled: 05/08/2015 16:00
Reporting Basis: WET | Date Received: 10/20/2015 09:20

| CAS No. | Analyte | Result | RL | MDL | Units | C | Q | DIL | Method |
|---|---|---|---|---|---|---|---|---|---|
| 7440-38-2 | Arsenic | ND | 0.015 | 0.0056 | mg/L | | | 1 | 6010C |
| 7440-39-3 | Barium | 3.8 | 1.0 | 0.10 | mg/L | | F1 | 1 | 6010C |
| 7440-43-9 | Cadmium | ND | 0.0020 | 0.00050 | mg/L | | | 1 | 6010C |
| 7440-47-3 | Chromium | ND | 0.020 | 0.010 | mg/L | | | 1 | 6010C |
| 7439-92-1 | Lead | 0.0074 | 0.020 | 0.0030 | mg/L | J | | 1 | 6010C |
| 7782-49-2 | Selenium | ND | 0.13 | 0.044 | mg/L | | | 5 | 6010C |
| 7440-22-4 | Silver | ND | 0.0060 | 0.0017 | mg/L | | | 1 | 6010C |
| 7439-97-6 | Mercury | ND | 0.00020 | 0.00012 | mg/L | | H | 1 | 7470A |

1A-IN
INORGANIC ANALYSIS DATA SHEET
METALS

Client Sample ID: A-01-020415-1600
Lab Sample ID: 480-89453-1
Lab Name: TestAmerica Pittsburgh
Job No.: 480-89453-1
SDG ID.:
Matrix: Solid
Date Sampled: 02/04/2015 16:00
Reporting Basis: DRY
Date Received: 10/20/2015 09:20
% Solids: 89.4

| CAS No. | Analyte | Result | RL | MDL | Units | C | Q | DIL | Method |
|---|---|---|---|---|---|---|---|---|---|
| 7440-38-2 | Arsenic | 3.6 | 0.54 | 0.097 | mg/Kg | | | 5 | 6020A |
| 7440-39-3 | Barium | 382 | 5.4 | 0.058 | mg/Kg | | | 5 | 6020A |
| 7440-43-9 | Cadmium | 0.065 | 0.54 | 0.038 | mg/Kg | J | | 5 | 6020A |
| 7440-47-3 | Chromium | 663 | 1.1 | 0.033 | mg/Kg | | B | 5 | 6020A |
| 7440-22-4 | Silver | 0.21 | 0.54 | 0.021 | mg/Kg | J | | 5 | 6020A |
| 7439-92-1 | Lead | 0.70 | 0.54 | 0.020 | mg/Kg | | | 5 | 6020A |
| 7782-49-2 | Selenium | ND | 2.7 | 0.27 | mg/Kg | | | 5 | 6020A |

1A-IN
INORGANIC ANALYSIS DATA SHEET
METALS

Client Sample ID: A-01-031915-1600
Lab Sample ID: 480-89453-2
Lab Name: TestAmerica Pittsburgh
Job No.: 480-89453-1
SDG ID.:
Matrix: Solid
Date Sampled: 03/19/2015 16:00
Reporting Basis: DRY
Date Received: 10/20/2015 09:20
% Solids: 100.0

| CAS No. | Analyte | Result | RL | MDL | Units | C | Q | DIL | Method |
|---|---|---|---|---|---|---|---|---|---|
| 7440-38-2 | Arsenic | 3.3 | 0.48 | 0.086 | mg/Kg | | | 5 | 6020A |
| 7440-39-3 | Barium | 350 | 4.8 | 0.051 | mg/Kg | | | 5 | 6020A |
| 7440-43-9 | Cadmium | ND | 0.48 | 0.033 | mg/Kg | | | 5 | 6020A |
| 7440-47-3 | Chromium | 636 | 0.95 | 0.029 | mg/Kg | | B | 5 | 6020A |
| 7440-22-4 | Silver | 0.15 | 0.48 | 0.019 | mg/Kg | J | | 5 | 6020A |
| 7439-92-1 | Lead | 0.76 | 0.48 | 0.018 | mg/Kg | | | 5 | 6020A |
| 7782-49-2 | Selenium | 0.44 | 2.4 | 0.24 | mg/Kg | J | | 5 | 6020A |

1A-IN
INORGANIC ANALYSIS DATA SHEET
METALS

Client Sample ID: A-01-040215-1505 Lab Sample ID: 480-89453-3

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG ID.:

Matrix: Solid Date Sampled: 04/02/2015 15:05

Reporting Basis: DRY Date Received: 10/20/2015 09:20

% Solids: 100.0

| CAS No. | Analyte | Result | RL | MDL | Units | C | Q | DIL | Method |
|---|---|---|---|---|---|---|---|---|---|
| 7440-38-2 | Arsenic | 3.3 | 0.50 | 0.090 | mg/Kg | | | 5 | 6020A |
| 7440-39-3 | Barium | 517 | 5.0 | 0.053 | mg/Kg | | | 5 | 6020A |
| 7440-43-9 | Cadmium | 0.042 | 0.50 | 0.035 | mg/Kg | J | | 5 | 6020A |
| 7440-47-3 | Chromium | 357 | 0.99 | 0.030 | mg/Kg | | B | 5 | 6020A |
| 7440-22-4 | Silver | 0.12 | 0.50 | 0.019 | mg/Kg | J | | 5 | 6020A |
| 7439-92-1 | Lead | 1.0 | 0.50 | 0.019 | mg/Kg | | | 5 | 6020A |
| 7782-49-2 | Selenium | ND | 2.5 | 0.25 | mg/Kg | | | 5 | 6020A |

1A-IN
INORGANIC ANALYSIS DATA SHEET
METALS

Client Sample ID: A-01-050815-1600
Lab Sample ID: 480-89453-4
Lab Name: TestAmerica Pittsburgh
Job No.: 480-89453-1
SDG ID.:
Matrix: Solid
Date Sampled: 05/08/2015 16:00
Reporting Basis: DRY
Date Received: 10/20/2015 09:20
% Solids: 99.2

| CAS No. | Analyte | Result | RL | MDL | Units | C | Q | DIL | Method |
|---|---|---|---|---|---|---|---|---|---|
| 7440-38-2 | Arsenic | 1.9 | 0.48 | 0.088 | mg/Kg | | | 5 | 6020A |
| 7440-39-3 | Barium | 351 | 4.8 | 0.052 | mg/Kg | | | 5 | 6020A |
| 7440-43-9 | Cadmium | ND | 0.48 | 0.034 | mg/Kg | | | 5 | 6020A |
| 7440-47-3 | Chromium | 197 | 0.97 | 0.030 | mg/Kg | | B | 5 | 6020A |
| 7440-22-4 | Silver | 0.11 | 0.48 | 0.019 | mg/Kg | J | | 5 | 6020A |
| 7439-92-1 | Lead | 2.5 | 0.48 | 0.018 | mg/Kg | | | 5 | 6020A |
| 7782-49-2 | Selenium | ND | 2.4 | 0.24 | mg/Kg | | | 5 | 6020A |

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

ICV Source: MEI_04_ICV_00286 Concentration Units: mg/L

CCV Source: MEI_09_CCV_00200

| Analyte | ICV 480-270880/5 10/23/2015 16:08 | | | | CCV 480-270880/14 10/23/2015 19:51 | | | | CCV 480-270880/23 10/23/2015 20:30 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Arsenic** | 0.362 | | 0.375 | 96 | 0.511 | | 0.500 | 102 | 0.517 | | 0.500 | 103 |
| **Barium** | 0.374 | | 0.375 | 100 | 0.518 | | 0.500 | 104 | 0.519 | | 0.500 | 104 |
| **Cadmium** | 0.366 | | 0.375 | 98 | 0.515 | | 0.500 | 103 | 0.517 | | 0.500 | 103 |
| **Chromium** | 0.369 | | 0.375 | 98 | 0.511 | | 0.500 | 102 | 0.519 | | 0.500 | 104 |
| **Lead** | 0.364 | | 0.375 | 97 | 0.510 | | 0.500 | 102 | 0.516 | | 0.500 | 103 |
| **Selenium** | 0.367 | | 0.375 | 98 | 0.510 | | 0.500 | 102 | 0.520 | | 0.500 | 104 |
| **Silver** | 0.371 | | 0.375 | 99 | 0.518 | | 0.500 | 104 | 0.524 | | 0.500 | 105 |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

ICV Source: MEI_04_ICV_00286 Concentration Units: mg/L

CCV Source: MEI_09_CCV_00200

| Analyte | CCV 480-270880/31 10/23/2015 21:09 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Arsenic** | 0.507 | | 0.500 | 101 | | | | | | | | |
| **Barium** | 0.510 | | 0.500 | 102 | | | | | | | | |
| **Cadmium** | 0.511 | | 0.500 | 102 | | | | | | | | |
| **Chromium** | 0.516 | | 0.500 | 103 | | | | | | | | |
| **Lead** | 0.516 | | 0.500 | 103 | | | | | | | | |
| **Selenium** | 0.507 | | 0.500 | 101 | | | | | | | | |
| **Silver** | 0.522 | | 0.500 | 104 | | | | | | | | |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

ICV Source: MEI_10_CCVL_00082 Concentration Units: mg/L

CCV Source: MEI_10_CCVL_00082

| Analyte | ICVL 480-270880/7 10/23/2015 16:14 | | | | CCVL 480-270880/16 10/23/2015 19:57 | | | | CCVL 480-270880/25 10/23/2015 20:37 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Arsenic** | 0.0151 | | 0.0150 | 101 | 0.0139 | J | 0.0150 | 92 | 0.0136 | J | 0.0150 | 91 |
| **Barium** | 0.00213 | | 0.00200 | 107 | 0.00200 | | 0.00200 | 100 | 0.00218 | | 0.00200 | 109 |
| **Cadmium** | 0.00203 | | 0.00200 | 102 | 0.00193 | J | 0.00200 | 97 | 0.00209 | | 0.00200 | 105 |
| **Chromium** | 0.00404 | | 0.00400 | 101 | 0.00356 | J | 0.00400 | 89 | 0.00399 | J | 0.00400 | 100 |
| **Lead** | 0.00818 | J | 0.0100 | 82 | 0.00914 | J | 0.0100 | 91 | 0.00945 | J | 0.0100 | 95 |
| **Selenium** | 0.0238 | J | 0.0250 | 95 | 0.0231 | J | 0.0250 | 92 | 0.0228 | J | 0.0250 | 91 |
| **Silver** | 0.00620 | | 0.00600 | 103 | 0.00668 | | 0.00600 | 111 | 0.00587 | J | 0.00600 | 98 |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

ICV Source: MEI_10_CCVL_00082  Concentration Units: mg/L

CCV Source: MEI_10_CCVL_00082

| Analyte | CCVL 480-270880/33 10/23/2015 21:15 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Arsenic** | 0.0157 | | 0.0150 | 105 | | | | | | | | |
| **Barium** | 0.00251 | | 0.00200 | 126 | | | | | | | | |
| **Cadmium** | 0.00214 | | 0.00200 | 107 | | | | | | | | |
| **Chromium** | 0.00420 | | 0.00400 | 105 | | | | | | | | |
| **Lead** | 0.00976 | J | 0.0100 | 98 | | | | | | | | |
| **Selenium** | 0.0270 | | 0.0250 | 108 | | | | | | | | |
| **Silver** | 0.00647 | | 0.00600 | 108 | | | | | | | | |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

ICV Source: MEI_04_ICV_00286  Concentration Units: mg/L

CCV Source: MEI_09_CCV_00200

| Analyte | ICV 480-271006/5 10/24/2015 09:45 | | | | CCV 480-271006/14 10/24/2015 10:18 | | | | CCV 480-271006/18 10/24/2015 10:56 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Selenium** | 0.365 | | 0.375 | 97 | 0.490 | | 0.500 | 98 | 0.483 | | 0.500 | 97 |
| *Arsenic* | 0.362 | | 0.375 | 96 | 0.488 | | 0.500 | 98 | 0.480 | | 0.500 | 96 |
| *Barium* | 0.372 | | 0.375 | 99 | 0.497 | | 0.500 | 99 | 0.490 | | 0.500 | 98 |
| *Cadmium* | 0.364 | | 0.375 | 97 | 0.493 | | 0.500 | 99 | 0.487 | | 0.500 | 97 |
| *Chromium* | 0.366 | | 0.375 | 98 | 0.493 | | 0.500 | 99 | 0.486 | | 0.500 | 97 |
| *Lead* | 0.363 | | 0.375 | 97 | 0.492 | | 0.500 | 98 | 0.485 | | 0.500 | 97 |
| *Silver* | 0.369 | | 0.375 | 98 | 0.495 | | 0.500 | 99 | 0.490 | | 0.500 | 98 |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

ICV Source: MEI_04_ICV_00286  Concentration Units: mg/L

CCV Source: MEI_09_CCV_00200

| Analyte | CCV 480-271006/28 10/24/2015 11:36 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Selenium** | 0.495 | | 0.500 | 99 | | | | | | | | |
| *Arsenic* | 0.497 | | 0.500 | 99 | | | | | | | | |
| *Barium* | 0.504 | | 0.500 | 101 | | | | | | | | |
| *Cadmium* | 0.505 | | 0.500 | 101 | | | | | | | | |
| *Chromium* | 0.503 | | 0.500 | 101 | | | | | | | | |
| *Lead* | 0.506 | | 0.500 | 101 | | | | | | | | |
| *Silver* | 0.506 | | 0.500 | 101 | | | | | | | | |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

ICV Source: MEI_10_CCVL_00082 Concentration Units: mg/L

CCV Source: MEI_10_CCVL_00082

| Analyte | ICVL 480-271006/7 10/24/2015 09:52 | | | | CCVL 480-271006/16 10/24/2015 10:25 | | | | CCVL 480-271006/20 10/24/2015 11:03 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Selenium** | 0.0216 | J | 0.0250 | 86 | 0.0192 | J | 0.0250 | 77 | 0.0204 | J | 0.0250 | 81 |
| *Arsenic* | 0.0119 | J | 0.0150 | 79 | 0.0143 | J | 0.0150 | 95 | 0.0137 | J | 0.0150 | 92 |
| *Barium* | 0.00194 | J | 0.00200 | 97 | 0.00196 | J | 0.00200 | 98 | 0.00197 | J | 0.00200 | 99 |
| *Cadmium* | 0.00200 | | 0.00200 | 100 | 0.00229 | | 0.00200 | 115 | 0.00214 | | 0.00200 | 107 |
| *Chromium* | 0.00415 | | 0.00400 | 104 | 0.00419 | | 0.00400 | 105 | 0.00379 | J | 0.00400 | 95 |
| *Lead* | 0.00938 | J | 0.0100 | 94 | 0.00914 | J | 0.0100 | 91 | 0.00956 | J | 0.0100 | 96 |
| *Silver* | 0.00604 | | 0.00600 | 101 | 0.00583 | J | 0.00600 | 97 | 0.00616 | | 0.00600 | 103 |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

ICV Source: MEI_10_CCVL_00082 Concentration Units: mg/L

CCV Source: MEI_10_CCVL_00082

| Analyte | CCVL 480-271006/30 10/24/2015 11:42 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Selenium** | 0.0210 | J | 0.0250 | 84 | | | | | | | | |
| *Arsenic* | 0.0151 | | 0.0150 | 101 | | | | | | | | |
| *Barium* | 0.00205 | | 0.00200 | 103 | | | | | | | | |
| *Cadmium* | 0.00217 | | 0.00200 | 109 | | | | | | | | |
| *Chromium* | 0.00381 | J | 0.00400 | 95 | | | | | | | | |
| *Lead* | 0.0102 | | 0.0100 | 102 | | | | | | | | |
| *Silver* | 0.00623 | | 0.00600 | 104 | | | | | | | | |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

ICV Source: MEH_HG2_WKG_01023 Concentration Units: mg/L

CCV Source: MEH_HG2_WKG_01023

| Analyte | ICV 480-270289/1 10/21/2015 16:34 | | | | ICVL 480-270289/3 10/21/2015 16:38 | | | | CCV 480-270289/16 10/21/2015 16:58 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Mercury** | 0.00317 | | 0.00300 | 106 | 0.000218 | | 0.000200 | 109 | 0.00213 | | 0.00200 | 107 |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

ICV Source: MEH_HG2_WKG_01023 Concentration Units: mg/L

CCV Source: MEH_HG2_WKG_01023

| Analyte | CCV 480-270289/28 10/21/2015 17:16 | | | | CCV 480-270289/38 10/21/2015 17:32 | | | | CCVL 480-270289/40 10/21/2015 17:35 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Mercury** | 0.00209 | | 0.00200 | 105 | 0.00212 | | 0.00200 | 106 | 0.000187 | J | 0.000200 | 94 |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

ICV Source: MEH_HG2_WKG_01024 Concentration Units: mg/L

CCV Source: MEH_HG2_WKG_01024

| Analyte | ICV 480-270525/1 10/22/2015 15:26 | | | | ICVL 480-270525/3 10/22/2015 15:29 | | | | CCV 480-270525/40 10/22/2015 16:36 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Mercury** | 0.00315 | | 0.00300 | 105 | 0.000242 | | 0.000200 | 121 | 0.00207 | | 0.00200 | 104 |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

ICV Source: MEH_HG2_WKG_01024 Concentration Units: mg/L

CCV Source: MEH_HG2_WKG_01024

| Analyte | CCV 480-270525/52 10/22/2015 16:59 | | | | CCV 480-270525/62 10/22/2015 17:17 | | | | CCVL 480-270525/64 10/22/2015 17:20 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Mercury** | 0.00205 | | 0.00200 | 103 | 0.00199 | | 0.00200 | 100 | 0.000232 | | 0.000200 | 116 |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Pittsburgh  Job No.: 480-89453-1

SDG No.:

ICV Source: MICVX_00038  Concentration Units: ug/L

CCV Source: MCCV1X_00082

| Analyte | ICV 180-159963/5 11/09/2015 16:39 | | | | CCV 180-159963/10 11/09/2015 17:09 | | | | CCV 180-159963/22 11/09/2015 18:13 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Arsenic** | 77.58 | | 80.0 | 97 | 98.45 | | 100 | 98 | 95.85 | | 100 | 96 |
| **Barium** | 80.95 | | 80.0 | 101 | 100.7 | | 100 | 101 | 96.99 | | 100 | 97 |
| **Cadmium** | 79.98 | | 80.0 | 100 | 102.5 | | 100 | 103 | 95.89 | | 100 | 96 |
| **Chromium** | 79.71 | | 80.0 | 100 | 102.4 | | 100 | 102 | 99.07 | | 100 | 99 |
| **Lead** | 80.82 | | 80.0 | 101 | 104.3 | | 100 | 104 | 97.93 | | 100 | 98 |
| **Selenium** | 75.98 | | 80.0 | 95 | 98.11 | | 100 | 98 | 95.91 | | 100 | 96 |
| **Silver** | 80.14 | | 80.0 | 100 | 101.3 | | 100 | 101 | 96.99 | | 100 | 97 |
| *Magnesium* | 39520 | | 40000 | 99 | 48800 | | 50000 | 98 | 47590 | | 50000 | 95 |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2A-IN
CALIBRATION VERIFICATIONS
METALS

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

ICV Source: MICVX_00038 Concentration Units: ug/L

CCV Source: MCCV1X_00082

| Analyte | CCV 180-159963/34 11/09/2015 19:26 | | | | CCV 180-159963/46 11/09/2015 20:35 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Found | C | True | %R | Found | C | True | %R | Found | C | True | %R |
| **Arsenic** | 97.98 | | 100 | 98 | 98.94 | | 100 | 99 | | | | |
| **Barium** | 98.79 | | 100 | 99 | 99.21 | | 100 | 99 | | | | |
| **Cadmium** | 98.20 | | 100 | 98 | 99.61 | | 100 | 100 | | | | |
| **Chromium** | 99.88 | | 100 | 100 | 102.0 | | 100 | 102 | | | | |
| **Lead** | 104.8 | | 100 | 105 | 105.3 | | 100 | 105 | | | | |
| **Selenium** | 98.02 | | 100 | 98 | 99.95 | | 100 | 100 | | | | |
| **Silver** | 99.96 | | 100 | 100 | 101.0 | | 100 | 101 | | | | |
| *Magnesium* | 47620 | | 50000 | 95 | 47890 | | 50000 | 96 | | | | |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.
Italicized analytes were not requested for this sequence.

2B-IN
CRQL CHECK STANDARD
METALS

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

Method: 6020A Instrument ID: X

Lab Sample ID: CRI 180-159963/7 Concentration Units: ug/L

CRQL Check Standard Source: MCRIX_00075

| Analyte | CRQL Check Standard | | | | |
|---|---|---|---|---|---|
| | True | Found | Qualifiers | %R(1) | Limits |
| Arsenic | 1.00 | 0.845 | J | 84 | 70-130 |
| Barium | 10.0 | 9.50 | J | 95 | 70-130 |
| Cadmium | 1.00 | 0.975 | J | 98 | 70-130 |
| Chromium | 2.00 | 1.86 | J | 93 | 70-130 |
| Silver | 1.00 | 1.04 | | 104 | 70-130 |
| Lead | 1.00 | 1.03 | | 103 | 70-130 |
| Selenium | 5.00 | 4.38 | J | 88 | 70-130 |

Lab Sample ID: CRI 180-159963/84 Concentration Units: ug/L

CRQL Check Standard Source: MCRIX_00075

| Analyte | CRQL Check Standard | | | | |
|---|---|---|---|---|---|
| | True | Found | Qualifiers | %R(1) | Limits |
| Arsenic | 1.00 | 0.923 | J | 92 | 70-130 |
| Barium | 10.0 | 9.41 | J | 94 | 70-130 |
| Cadmium | 1.00 | 0.858 | J | 86 | 70-130 |
| Chromium | 2.00 | 2.01 | | 100 | 70-130 |
| Silver | 1.00 | 0.968 | J | 97 | 70-130 |
| Lead | 1.00 | 0.969 | J | 97 | 70-130 |
| Selenium | 5.00 | 4.95 | J | 99 | 70-130 |

Note: Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM IIB-IN

3-IN
INSTRUMENT BLANKS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Concentration Units: mg/L

| Analyte | RL | ICB 480-270880/6 10/23/2015 16:11 | | CCB 480-270880/15 10/23/2015 19:54 | | CCB 480-270880/24 10/23/2015 20:33 | | CCB 480-270880/32 10/23/2015 21:12 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Found | C | Found | C | Found | C | Found | C |
| **Arsenic** | 0.015 | ND | | ND | | ND | | ND | |
| **Barium** | 0.0020 | ND | | ND | | ND | | ND | |
| **Cadmium** | 0.0020 | ND | | ND | | ND | | ND | |
| **Chromium** | 0.0040 | ND | | ND | | ND | | ND | |
| **Lead** | 0.010 | ND | | ND | | ND | | ND | |
| **Selenium** | 0.025 | ND | | ND | | ND | | ND | |
| **Silver** | 0.0060 | ND | | ND | | ND | | ND | |

Italicized analytes were not requested for this sequence.

3-IN
INSTRUMENT BLANKS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Concentration Units: mg/L

| Analyte | RL | ICB 480-271006/6 10/24/2015 09:48 | | CCB 480-271006/15 10/24/2015 10:21 | | CCB 480-271006/19 10/24/2015 11:00 | | CCB 480-271006/29 10/24/2015 11:39 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Found | C | Found | C | Found | C | Found | C |
| **Selenium** | 0.025 | ND | | ND | | ND | | ND | |
| *Arsenic* | 0.015 | ND | | ND | | ND | | ND | |
| *Barium* | 0.0020 | ND | | ND | | ND | | ND | |
| *Cadmium* | 0.0020 | ND | | ND | | ND | | ND | |
| *Chromium* | 0.0040 | ND | | ND | | ND | | ND | |
| *Lead* | 0.010 | ND | | ND | | ND | | ND | |
| *Silver* | 0.0060 | ND | | ND | | ND | | ND | |

Italicized analytes were not requested for this sequence.

3-IN
INSTRUMENT BLANKS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Concentration Units: mg/L

| Analyte | RL | ICB 480-270289/2 10/21/2015 16:36 | | CCB 480-270289/17 10/21/2015 16:59 | | CCB 480-270289/29 10/21/2015 17:17 | | CCB 480-270289/39 10/21/2015 17:34 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Found | C | Found | C | Found | C | Found | C |
| **Mercury** | 0.00020 | ND | | ND | | ND | | ND | |

Italicized analytes were not requested for this sequence.

3-IN
INSTRUMENT BLANKS
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Concentration Units: mg/L

| Analyte | RL | ICB 480-270525/2 10/22/2015 15:28 | | CCB 480-270525/41 10/22/2015 16:38 | | CCB 480-270525/53 10/22/2015 17:01 | | CCB 480-270525/63 10/22/2015 17:18 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Found | C | Found | C | Found | C | Found | C |
| **Mercury** | 0.00020 | ND | | ND | | ND | | ND | |

Italicized analytes were not requested for this sequence.

3-IN
INSTRUMENT BLANKS
METALS

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

Concentration Units: ug/L

| Analyte | RL | ICB 180-159963/6 11/09/2015 16:48 | | CCB1 180-159963/11 11/09/2015 17:17 | | CCB2 180-159963/23 11/09/2015 18:22 | | CCB3 180-159963/35 11/09/2015 19:35 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Found | C | Found | C | Found | C | Found | C |
| **Arsenic** | 1.0 | ND | | ND | | ND | | ND | |
| **Barium** | 10.0 | ND | | ND | | ND | | ND | |
| **Cadmium** | 1.0 | ND | | ND | | ND | | ND | |
| **Chromium** | 2.0 | ND | | ND | | ND | | ND | |
| **Lead** | 1.0 | ND | | ND | | ND | | ND | |
| **Selenium** | 5.0 | ND | | ND | | ND | | ND | |
| **Silver** | 1.0 | ND | | ND | | ND | | ND | |
| *Magnesium* | 500 | ND | | ND | | ND | | ND | |

Italicized analytes were not requested for this sequence.

3-IN
INSTRUMENT BLANKS
METALS

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

Concentration Units: ug/L

| Analyte | RL | CCB4 180-159963/47 11/09/2015 20:04 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Found | C | Found | C | Found | C | Found | C |
| **Arsenic** | 1.0 | ND | | | | | | | |
| **Barium** | 10.0 | ND | | | | | | | |
| **Cadmium** | 1.0 | ND | | | | | | | |
| **Chromium** | 2.0 | ND | | | | | | | |
| **Lead** | 1.0 | ND | | | | | | | |
| **Selenium** | 5.0 | ND | | | | | | | |
| **Silver** | 1.0 | ND | | | | | | | |
| *Magnesium* | 500 | ND | | | | | | | |

Italicized analytes were not requested for this sequence.

3-IN
METHOD BLANK
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Concentration Units: mg/L Lab Sample ID: MB 480-270374/2-A

Instrument Code: ICAP2 Batch No.: 270880

| CAS No. | Analyte | Concentration | C | Q | Method |
|---|---|---|---|---|---|
| 7440-38-2 | Arsenic | ND | | | 6010C |
| 7440-39-3 | Barium | ND | | | 6010C |
| 7440-43-9 | Cadmium | ND | | | 6010C |
| 7440-47-3 | Chromium | ND | | | 6010C |
| 7439-92-1 | Lead | ND | | | 6010C |
| 7782-49-2 | Selenium | ND | | | 6010C |
| 7440-22-4 | Silver | ND | | | 6010C |

3-IN
METHOD BLANK
METALS - TCLP

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Concentration Units: mg/L Lab Sample ID: LB2 480-270052/1-C

Instrument Code: ICAP2 Batch No.: 270880

| CAS No. | Analyte | Concentration | C | Q | Method |
|---|---|---|---|---|---|
| 7440-38-2 | Arsenic | ND | | | 6010C |
| 7440-39-3 | Barium | ND | | | 6010C |
| 7440-43-9 | Cadmium | ND | | | 6010C |
| 7440-47-3 | Chromium | ND | | | 6010C |
| 7439-92-1 | Lead | ND | | | 6010C |
| 7782-49-2 | Selenium | ND | | | 6010C |
| 7440-22-4 | Silver | ND | | | 6010C |

3-IN
METHOD BLANK
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Concentration Units: mg/L Lab Sample ID: MB 480-270385/2-A

Instrument Code: LEEMAN2 Batch No.: 270525

| CAS No. | Analyte | Concentration | C | Q | Method |
|---|---|---|---|---|---|
| 7439-97-6 | Mercury | ND | | | 7470A |

3-IN
METHOD BLANK
METALS - TCLP

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Concentration Units: mg/L  Lab Sample ID: LB2 480-270052/1-E

Instrument Code: LEEMAN2  Batch No.: 270525

| CAS No. | Analyte | Concentration | C | Q | Method |
|---|---|---|---|---|---|
| 7439-97-6 | Mercury | ND | | | 7470A |

3-IN
METHOD BLANK
METALS

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Concentration Units: mg/Kg  Lab Sample ID: MB 480-270135/1-A

Instrument Code: LEEMAN2  Batch No.: 270289

| CAS No. | Analyte | Concentration | C | Q | Method |
|---|---|---|---|---|---|
| 7439-97-6 | Mercury | ND | | | 7471B |

FORM III-IN

3-IN
METHOD BLANK
METALS

Lab Name: TestAmerica Pittsburgh  Job No.: 480-89453-1

SDG No.:

Concentration Units: mg/Kg  Lab Sample ID: MB 180-159790/1-A

Instrument Code: X  Batch No.: 159963

| CAS No. | Analyte | Concentration | C | Q | Method |
|---|---|---|---|---|---|
| 7440-38-2 | Arsenic | ND | | | 6020A |
| 7440-39-3 | Barium | ND | | | 6020A |
| 7440-43-9 | Cadmium | ND | | | 6020A |
| 7440-47-3 | Chromium | 0.00942 | J | | 6020A |
| 7440-22-4 | Silver | ND | | | 6020A |
| 7439-92-1 | Lead | ND | | | 6020A |
| 7782-49-2 | Selenium | ND | | | 6020A |

4A-IN
INTERFERENCE CHECK STANDARD
METALS

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Lab Sample ID: ICSA 480-270880/9  Instrument ID: ICAP2

Lab File ID: I21023158-4.asc  ICS Source: MEI_07_ICSA_00080

Concentration Units: mg/L

| Analyte | True Solution A | Found Solution A | Percent Recovery |
|---|---|---|---|
| **Arsenic** | | **-0.0098** | |
| **Barium** | | **0.0006** | |
| **Cadmium** | | **0.0011** | |
| **Chromium** | | **0.0023** | |
| **Lead** | | **0.0039** | |
| **Selenium** | | **-0.0003** | |
| **Silver** | | **0.0004** | |
| *Aluminum* | *500* | *525* | *105* |
| *Antimony* | | *0.0045* | |
| *Beryllium* | | *0.0001* | |
| *Boron* | | *-0.0048* | |
| *Calcium* | *500* | *473* | *95* |
| *Cobalt* | | *0.0036* | |
| *Copper* | | *-0.0040* | |
| *Iron* | *200* | *185* | *93* |
| *Lithium* | | *0.0153* | |
| *Magnesium* | *500* | *513* | *103* |
| *Manganese* | | *0.0008* | |
| *Molybdenum* | | *-0.0010* | |
| *Nickel* | | *0.0006* | |
| *Potassium* | | *-0.0148* | |
| *Silicon* | | *-0.0190* | |
| *Sodium* | | *0.0625* | |
| *Strontium* | | *0.0056* | |
| *Sulfur* | | *-0.0225* | |
| *Thallium* | | *-0.0063* | |
| *Tin* | | *-0.0004* | |
| *Titanium* | | *0.0008* | |
| *Vanadium* | | *-0.0021* | |
| *Zinc* | | *0.0115* | |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM IVA-IN

4A-IN
INTERFERENCE CHECK STANDARD
METALS

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Lab Sample ID: ICSAB 480-270880/10  Instrument ID: ICAP2

Lab File ID: I21023158-4.asc  ICS Source: MEI_08_ICSAB_00096

Concentration Units: mg/L

| Analyte | True Solution AB | Found Solution AB | Percent Recovery |
|---|---|---|---|
| **Arsenic** | **0.100** | **0.0902** | **90** |
| **Barium** | **0.500** | **0.486** | **97** |
| **Cadmium** | **1.00** | **1.01** | **101** |
| **Chromium** | **0.500** | **0.484** | **97** |
| **Lead** | **0.0500** | **0.0505** | **101** |
| **Selenium** | **0.0500** | **0.0508** | **102** |
| **Silver** | **0.200** | **0.217** | **109** |
| *Aluminum* | *501* | *500* | *100* |
| *Antimony* | *0.600* | *0.603* | *100* |
| *Beryllium* | *0.500* | *0.485* | *97* |
| *Boron* | | *0.0007* | |
| *Calcium* | *501* | *459* | *92* |
| *Cobalt* | *0.500* | *0.480* | *96* |
| *Copper* | *0.500* | *0.504* | *101* |
| *Iron* | *100* | *92.8* | *93* |
| *Lithium* | *0.500* | *0.536* | *107* |
| *Magnesium* | *501* | *514* | *103* |
| *Manganese* | *0.500* | *0.469* | *94* |
| *Molybdenum* | | *-0.0001* | |
| *Nickel* | *1.00* | *0.985* | *99* |
| *Potassium* | | *0.0292* | |
| *Silicon* | *1.00* | *1.05* | *105* |
| *Sodium* | | *0.105* | |
| *Strontium* | *0.500* | *0.503* | *101* |
| *Sulfur* | *1.00* | *1.08* | *108* |
| *Thallium* | *0.100* | *0.0910* | *91* |
| *Tin* | | *-0.0010* | |
| *Titanium* | | *0.0017* | |
| *Vanadium* | *0.500* | *0.505* | *101* |
| *Zinc* | *1.00* | *0.925* | *92* |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM IVA-IN

4A-IN
INTERFERENCE CHECK STANDARD
METALS

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Lab Sample ID: ICSA 480-271006/9  Instrument ID: ICAP2

Lab File ID: I2102415A-2.asc  ICS Source: MEI_07_ICSA_00080

Concentration Units: mg/L

| Analyte | True Solution A | Found Solution A | Percent Recovery |
|---|---|---|---|
| **Selenium** | | **-0.0019** | |
| *Aluminum* | *500* | *509* | *102* |
| *Antimony* | | *-0.0071* | |
| *Arsenic* | | *-0.0093* | |
| *Barium* | | *0.0006* | |
| *Beryllium* | | *0.0001* | |
| *Boron* | | *-0.0083* | |
| *Cadmium* | | *0.0010* | |
| *Calcium* | *500* | *459* | *92* |
| *Chromium* | | *0.0013* | |
| *Cobalt* | | *0.0039* | |
| *Copper* | | *-0.0040* | |
| *Iron* | *200* | *180* | *90* |
| *Lead* | | *0.0010* | |
| *Lithium* | | *0.0084* | |
| *Magnesium* | *500* | *498* | *100* |
| *Manganese* | | *0.0008* | |
| *Molybdenum* | | *-0.0012* | |
| *Nickel* | | *0.0010* | |
| *Potassium* | | *0.0141* | |
| *Silicon* | | *-0.0089* | |
| *Silver* | | *0.0001* | |
| *Sodium* | | *0.0566* | |
| *Strontium* | | *0.0054* | |
| *Sulfur* | | *-0.0099* | |
| *Thallium* | | *-0.0090* | |
| *Tin* | | *-0.0005* | |
| *Titanium* | | *0.0009* | |
| *Vanadium* | | *-0.0015* | |
| *Zinc* | | *0.0099* | |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM IVA-IN

4A-IN
INTERFERENCE CHECK STANDARD
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Lab Sample ID: ICSAB 480-271006/10 Instrument ID: ICAP2

Lab File ID: I2102415A-2.asc ICS Source: MEI_08_ICSAB_00096

Concentration Units: mg/L

| Analyte | True Solution AB | Found Solution AB | Found Percent Recovery |
|---|---|---|---|
| **Selenium** | **0.0500** | **0.0510** | **102** |
| *Aluminum* | *501* | *488* | *98* |
| *Antimony* | *0.600* | *0.580* | *97* |
| *Arsenic* | *0.100* | *0.0921* | *92* |
| *Barium* | *0.500* | *0.479* | *96* |
| *Beryllium* | *0.500* | *0.474* | *95* |
| *Boron* | | *-0.0036* | |
| *Cadmium* | *1.00* | *0.982* | *98* |
| *Calcium* | *501* | *451* | *90* |
| *Chromium* | *0.500* | *0.475* | *95* |
| *Cobalt* | *0.500* | *0.471* | *94* |
| *Copper* | *0.500* | *0.499* | *100* |
| *Iron* | *100* | *90.4* | *90* |
| *Lead* | *0.0500* | *0.0464* | *93* |
| *Lithium* | *0.500* | *0.525* | *105* |
| *Magnesium* | *501* | *505* | *101* |
| *Manganese* | *0.500* | *0.461* | *92* |
| *Molybdenum* | | *-0.0011* | |
| *Nickel* | *1.00* | *0.966* | *97* |
| *Potassium* | | *0.0198* | |
| *Silicon* | *1.00* | *1.05* | *105* |
| *Silver* | *0.200* | *0.214* | *107* |
| *Sodium* | | *0.0959* | |
| *Strontium* | *0.500* | *0.493* | *99* |
| *Sulfur* | *1.00* | *1.06* | *106* |
| *Thallium* | *0.100* | *0.0878* | *88* |
| *Tin* | | *-0.0016* | |
| *Titanium* | | *0.0016* | |
| *Vanadium* | *0.500* | *0.495* | *99* |
| *Zinc* | *1.00* | *0.984* | *98* |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM IVA-IN

4A-IN
INTERFERENCE CHECK STANDARD
METALS

Lab Name: TestAmerica Pittsburgh  Job No.: 480-89453-1

SDG No.:

Lab Sample ID: ICSA 180-159963/8  Instrument ID: X

Lab File ID: X51109A.xml  ICS Source: MICSAX_00074

Concentration Units: ug/L

| Analyte | True Solution A | Found Solution A | Percent Recovery |
|---|---|---|---|
| **Arsenic** | | **0.256** | |
| **Barium** | | **0.0480** | |
| **Cadmium** | | **0.628** | |
| **Chromium** | | **1.45** | |
| **Lead** | | **0.220** | |
| **Selenium** | | **0.0790** | |
| **Silver** | | **0.0400** | |
| *Aluminum* | *100000* | *100800* | *101* |
| *Antimony* | | *0.0450* | |
| *Beryllium* | | *0.0300* | |
| *Boron* | | *0.297* | |
| *Calcium* | *100000* | *104800* | *105* |
| *Cobalt* | | *0.0850* | |
| *Copper* | | *2.18* | |
| *Iron* | *100000* | *105700* | *106* |
| *Magnesium* | *100000* | *104200* | *104* |
| *Manganese* | | *0.396* | |
| *Molybdenum* | *2000* | *2246* | *112* |
| *Nickel* | | *0.204* | |
| *Potassium* | *100000* | *104000* | *104* |
| *Silicon* | | *29.4* | |
| *Sodium* | *100000* | *102700* | *103* |
| *Strontium* | | *0.763* | |
| *Thallium* | | *0.0000* | |
| *Tin* | | *-0.108* | |
| *Titanium* | *2000* | *2269* | *113* |
| *Vanadium* | | *-0.0100* | |
| *Zinc* | | *3.81* | |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM IVA-IN

4A-IN
INTERFERENCE CHECK STANDARD
METALS

Lab Name: TestAmerica Pittsburgh  Job No.: 480-89453-1

SDG No.:

Lab Sample ID: ICSAB 180-159963/9  Instrument ID: X

Lab File ID: X51109A.xml  ICS Source: MICSABX_00078

Concentration Units: ug/L

| Analyte | True Solution AB | Found Solution AB | Percent Recovery |
|---|---|---|---|
| **Arsenic** | **20.0** | **19.6** | **98** |
| **Barium** | **20.0** | **19.9** | **100** |
| **Cadmium** | **20.0** | **21.0** | **105** |
| **Chromium** | **20.0** | **21.0** | **105** |
| **Lead** | **20.0** | **20.9** | **104** |
| **Selenium** | **50.0** | **49.1** | **98** |
| **Silver** | **20.0** | **19.2** | **96** |
| *Aluminum* | *100000* | *93757* | *94* |
| *Antimony* | *20.0* | *19.9* | *99* |
| *Beryllium* | *20.0* | *20.5* | *103* |
| *Boron* | *50.0* | *54.4* | *109* |
| *Calcium* | *100000* | *98117* | *98* |
| *Cobalt* | *20.0* | *20.0* | *100* |
| *Copper* | *20.0* | *20.6* | *103* |
| *Iron* | *100000* | *99317* | *99* |
| *Magnesium* | *100000* | *96623* | *97* |
| *Manganese* | *22.0* | *19.6* | *89* |
| *Molybdenum* | *2000* | *2096* | *105* |
| *Nickel* | *20.0* | *19.2* | *96* |
| *Potassium* | *100000* | *97567* | *98* |
| *Silicon* | *500* | *538* | *108* |
| *Sodium* | *100000* | *95160* | *95* |
| *Strontium* | *25.0* | *20.5* | *82* |
| *Thallium* | *20.0* | *20.3* | *101* |
| *Tin* | *100* | *101* | *101* |
| *Titanium* | *2000* | *2115* | *106* |
| *Vanadium* | *20.0* | *19.3* | *96* |
| *Zinc* | *25.0* | *22.7* | *91* |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM IVA-IN

5A-IN
MATRIX SPIKE SAMPLE RECOVERY
METALS

Client ID: A-01-020415-1600 MS
Lab ID: 480-89453-1 MS
Lab Name: TestAmerica Buffalo
Job No.: 480-89453-1
SDG No.:
Matrix: Solid
Concentration Units: mg/Kg
% Solids: 89.4

| Analyte | SSR C | Sample Result (SR) C | Spike Added (SA) | %R | Control Limit %R | Q | Method |
|---|---|---|---|---|---|---|---|
| Mercury | 0.378 | ND | 0.376 | 100 | 80-120 | | 7471B |

SSR = Spiked Sample Result

Calculations are performed before rounding to avoid round-off errors in calculated results.
Note - Results and Reporting Limits have been adjusted for dry weight.

FORM VA - IN

5A-IN
MATRIX SPIKE SAMPLE RECOVERY
METALS - TCLP

Client ID: A-01-050815-1600 MS
Lab ID: 480-89453-4 MS
Lab Name: TestAmerica Buffalo
Job No.: 480-89453-1
SDG No.:
Matrix: Solid
Concentration Units: mg/L
% Solids:

| Analyte | SSR | C | Sample Result (SR) | C | Spike Added (SA) | %R | Control Limit %R | Q | Method |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 1.19 | | ND | | 1.00 | 119 | 75-125 | | 6010C |
| Barium | 4.78 | | 3.8 | | 1.00 | 100 | 75-125 | | 6010C |
| Cadmium | 1.13 | | ND | | 1.00 | 113 | 75-125 | | 6010C |
| Chromium | 0.999 | | ND | | 1.00 | 100 | 75-125 | | 6010C |
| Lead | 1.04 | | 0.0074 | J | 1.00 | 103 | 75-125 | | 6010C |
| Selenium | 0.970 | | ND | | 1.00 | 97 | 75-125 | | 6010C |
| Silver | 1.17 | | ND | | 1.00 | 117 | 75-125 | | 6010C |
| Mercury | 0.00627 | | ND | | 0.00668 | 94 | 80-120 | | 7470A |

SSR = Spiked Sample Result

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM VA - IN

5A-IN
MATRIX SPIKE DUPLICATE SAMPLE RECOVERY
METALS

Client ID: A-01-020415-1600 MSD
Lab ID: 480-89453-1 MSD
Lab Name: TestAmerica Buffalo
Job No.: 480-89453-1
SDG No.:
Matrix: Solid
Concentration Units: mg/Kg
% Solids: 89.4

| Analyte | (SDR) C | Spike Added (SA) | %R | Control Limit %R | RPD | RPD Limit | Q | Method |
|---|---|---|---|---|---|---|---|---|
| Mercury | 0.378 | 0.376 | 101 | 80-120 | 0 | 20 | | 7471B |

SDR = Sample Duplicate Result

Calculations are performed before rounding to avoid round-off errors in calculated results.
Note - Results and Reporting Limits have been adjusted for dry weight.

FORM VD - IN

5A-IN
MATRIX SPIKE DUPLICATE SAMPLE RECOVERY
METALS - TCLP

Client ID: A-01-050815-1600 MSD
Lab ID: 480-89453-4 MSD
Lab Name: TestAmerica Buffalo
Job No.: 480-89453-1
SDG No.:
Matrix: Solid
Concentration Units: mg/L
% Solids:

| Analyte | (SDR) | C | Spike Added (SA) | %R | Control Limit %R | RPD | RPD Limit | Q | Method |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 1.12 | | 1.00 | 112 | 75-125 | 6 | 20 | | 6010C |
| Barium | 4.48 | | 1.00 | 71 | 75-125 | 6 | 20 | F1 | 6010C |
| Cadmium | 1.07 | | 1.00 | 107 | 75-125 | 6 | 20 | | 6010C |
| Chromium | 0.942 | | 1.00 | 94 | 75-125 | 6 | 20 | | 6010C |
| Lead | 0.982 | | 1.00 | 97 | 75-125 | 6 | 20 | | 6010C |
| Selenium | 1.07 | | 1.00 | 107 | 75-125 | 10 | 20 | | 6010C |
| Silver | 1.10 | | 1.00 | 110 | 75-125 | 6 | 20 | | 6010C |
| Mercury | 0.00627 | | 0.00668 | 94 | 80-120 | 0 | 20 | | 7470A |

SDR = Sample Duplicate Result

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM VD - IN

5B-IN
POST DIGESTION SPIKE SAMPLE RECOVERY
METALS - TCLP

Client ID: A-01-050815-1600 PDS | Lab ID: 480-89453-4 PDS

Lab Name: TestAmerica Buffalo | Job No.: 480-89453-1

SDG No.:

Matrix: Solid | Concentration Units: mg/L

| Analyte | SSR | C | Sample Result (SR) | C | Spike Added (SA) | %R | Control Limit %R | Q | Method |
|---|---|---|---|---|---|---|---|---|---|
| Arsenic | 1.18 | | ND | | 1.00 | 118 | 80-120 | | 6010C |
| Barium | 4.74 | | 3.8 | | 1.00 | 96 | 80-120 | | 6010C |
| Cadmium | 1.13 | | ND | | 1.00 | 113 | 80-120 | | 6010C |
| Chromium | 0.989 | | ND | | 1.00 | 99 | 80-120 | | 6010C |
| Lead | 1.03 | | 0.0074 | J | 1.00 | 102 | 80-120 | | 6010C |
| Selenium | 5.10 | | ND | | 5.00 | 102 | 80-120 | | 6010C |
| Silver | 1.17 | | ND | | 1.00 | 117 | 80-120 | | 6010C |

SSR = Spiked Sample Result

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM VB - IN

7A-IN
LAB CONTROL SAMPLE
METALS

Lab ID: LCS 480-270374/3-A

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

Sample Matrix: Water  LCS Source: MED_TCLP_00013

| Analyte | Water(mg/L) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | True | Found | C | %R | Limits | | Q | Method |
| Arsenic | 1.00 | 1.07 | | 107 | 80 | 120 | | 6010C |
| Barium | 1.00 | 0.973 | J | 97 | 80 | 120 | | 6010C |
| Cadmium | 1.00 | 1.02 | | 102 | 80 | 120 | | 6010C |
| Chromium | 1.00 | 0.982 | | 98 | 80 | 120 | | 6010C |
| Lead | 1.00 | 0.980 | | 98 | 80 | 120 | | 6010C |
| Selenium | 1.00 | 1.09 | | 109 | 80 | 120 | | 6010C |
| Silver | 1.00 | 1.04 | | 104 | 80 | 120 | | 6010C |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM VIIA - IN

7A-IN
LAB CONTROL SAMPLE
METALS

Lab ID: LCS 480-270385/3-A

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

Sample Matrix: Water  LCS Source: MEH_HG_TCLP_W_00073

| Analyte | Water(mg/L) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | True | Found | C | %R | Limits | | Q | Method |
| Mercury | 0.00668 | 0.00645 | | 97 | 80 | 120 | | 7470A |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM VIIA - IN

7A-IN
LCS-CERTIFIED REFERENCE MATERIAL
METALS

Lab ID: LCSSRM 480-270135/2-A

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

Sample Matrix: Solid  LCS Source: MED_SRM_D085_00002

| Analyte | Solid(mg/Kg) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | True | Found | C | %R | Limits | | Q | Method |
| Mercury | 8.37 | 9.27 | | 110.7 | 51.3 | 148.1 | | 7471B |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM VIIA - IN

7A-IN
LAB CONTROL SAMPLE
METALS

Lab ID: LCS 180-159790/2-A

Lab Name: TestAmerica Pittsburgh | Job No.: 480-89453-1

Sample Matrix: Solid | LCS Source: MTAPITTICPMS_00022

| Analyte | Solid(mg/Kg) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | True | Found | C | %R | Limits | | Q | Method |
| Arsenic | 3.92 | 3.65 | | 93 | 80 | 120 | | 6020A |
| Barium | 196 | 176.9 | | 90 | 80 | 120 | | 6020A |
| Cadmium | 4.90 | 4.65 | | 95 | 80 | 120 | | 6020A |
| Chromium | 19.6 | 20.66 | | 105 | 80 | 120 | | 6020A |
| Silver | 4.90 | 4.72 | | 96 | 80 | 120 | | 6020A |
| Lead | 1.96 | 1.97 | | 100 | 80 | 120 | | 6020A |
| Selenium | 0.980 | 0.911 | | 93 | 80 | 120 | | 6020A |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM VIIA - IN

7D-IN
LAB CONTROL SAMPLE DUPLICATE
METALS

Lab ID: LCSD 180-159790/3-A

Lab Name: TestAmerica Pittsburgh  Job No.: 480-89453-1

Sample Matrix: Solid  LCS Source: MTAPITTICPMS_00022

| Analyte | (SDR) C | Spike Added | %R | Control Limit %R | RPD | RPD Limit | Q | Method |
|---|---|---|---|---|---|---|---|---|
| Arsenic | 3.59 | 3.85 | 93 | 80-120 | 2 | 20 | | 6020A |
| Barium | 173.0 | 192 | 90 | 80-120 | 2 | 20 | | 6020A |
| Cadmium | 4.51 | 4.81 | 94 | 80-120 | 3 | 20 | | 6020A |
| Chromium | 20.06 | 19.2 | 104 | 80-120 | 3 | 20 | | 6020A |
| Silver | 4.67 | 4.81 | 97 | 80-120 | 1 | 20 | | 6020A |
| Lead | 1.94 | 1.92 | 101 | 80-120 | 1 | 20 | | 6020A |
| Selenium | 0.878 | 0.962 | 91 | 80-120 | 4 | 20 | | 6020A |

SDR = Spike Duplicate Results
Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM VIID - IN

8-IN
ICP-AES AND ICP-MS SERIAL DILUTIONS
METALS - TCLP

Lab ID: 480-89453-4

SDG No:

Lab Name: TestAmerica Buffalo  Job No: 480-89453-1

Matrix: Solid  Concentration Units: mg/L

| Analyte | Initial Sample Result (I) | C | Serial Dilution Result (S) | C | % Difference | Q | Method |
|---|---|---|---|---|---|---|---|
| Arsenic | ND | | ND | | NC | | 6010C |
| Barium | 3.8 | | 3.74 | J | 1.0 | | 6010C |
| Cadmium | ND | | ND | | NC | | 6010C |
| Chromium | ND | | ND | | NC | | 6010C |
| Lead | 0.0074 | J | ND | | NC | | 6010C |
| Selenium | ND | | ND | | NC | | 6010C |
| Silver | ND | | ND | | NC | | 6010C |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM VIII-IN

8-IN
ICP-AES AND ICP-MS SERIAL DILUTIONS
METALS

Lab ID: 480-89453-1

SDG No:

Lab Name: TestAmerica Buffalo  Job No: 480-89453-1

Matrix: Solid  Concentration Units: mg/Kg

| Analyte | Initial Sample Result (I) | C | Serial Dilution Result (S) | C | % Difference | Q | Method |
|---|---|---|---|---|---|---|---|
| Mercury | ND | | ND | | NC | | 7471B |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM VIII-IN

8-IN
ICP-AES AND ICP-MS SERIAL DILUTIONS
METALS - TCLP

Lab ID: 480-89453-4

SDG No:

Lab Name: TestAmerica Buffalo Job No: 480-89453-1

Matrix: Solid Concentration Units: mg/L

| Analyte | Initial Sample Result (I) | C | Serial Dilution Result (S) | C | % Difference | Q | Method |
|---|---|---|---|---|---|---|---|
| Mercury | ND | | ND | | NC | | 7470A |

Calculations are performed before rounding to avoid round-off errors in calculated results.

FORM VIII-IN

9-IN
DETECTION LIMITS
METALS - TCLP

Lab Name: TestAmerica Buffalo  Job Number: 480-89453-1

SDG Number:

Matrix: Solid  Instrument ID: ICAP2

Method: 6010C  MDL Date: 04/29/2015 13:01

Prep Method: 3010A

Leach Method: 1311

| Analyte | Wavelength/ Mass | RL (mg/L) | MDL (mg/L) |
|---|---|---|---|
| Arsenic | 189.042 | 0.015 | 0.00555 |
| Barium | 455.403 | 1 | 0.1 |
| Cadmium | 228.802 | 0.002 | 0.0005 |
| Chromium | 267.716 | 0.02 | 0.01 |
| Lead | 220.353 | 0.02 | 0.003 |
| Selenium | 196.090 | 0.025 | 0.0087 |
| Silver | 328.068 | 0.006 | 0.0017 |

9-IN
CALIBRATION BLANK DETECTION LIMITS
METALS - TCLP

Lab Name: TestAmerica Buffalo Job Number: 480-89453-1

SDG Number:

Matrix: Solid Instrument ID: ICAP2

Method: 6010C XMDL Date: 04/29/2015 13:01

| Analyte | Wavelength/ Mass | XRL (mg/L) | XMDL (mg/L) |
|---|---|---|---|
| Arsenic | 189.042 | 0.015 | 0.00555 |
| Barium | 455.403 | 0.002 | 0.0007 |
| Cadmium | 228.802 | 0.002 | 0.0005 |
| Chromium | 267.716 | 0.004 | 0.001 |
| Lead | 220.353 | 0.01 | 0.003 |
| Selenium | 196.090 | 0.025 | 0.0087 |
| Silver | 328.068 | 0.006 | 0.0017 |

9-IN
DETECTION LIMITS
METALS - TCLP

Lab Name: TestAmerica Buffalo  Job Number: 480-89453-1

SDG Number:

Matrix: Solid  Instrument ID: LEEMAN2

Method: 7470A  MDL Date: 01/28/2010 00:00

Prep Method: 7470A

Leach Method: 1311

| Analyte | Wavelength/ Mass | RL (mg/L) | MDL (mg/L) |
|---|---|---|---|
| Mercury | 253.7 | 0.0002 | 0.00012 |

FORM IX - IN

9-IN
CALIBRATION BLANK DETECTION LIMITS
METALS - TCLP

Lab Name: TestAmerica Buffalo Job Number: 480-89453-1

SDG Number:

Matrix: Solid Instrument ID: LEEMAN2

Method: 7470A XMDL Date: 01/28/2010 00:00

| Analyte | Wavelength/ Mass | XRL (mg/L) | XMDL (mg/L) |
|---|---|---|---|
| Mercury | 253.7 | 0.0002 | 0.00012 |

FORM IX - IN

9-IN
DETECTION LIMITS
METALS

Lab Name: TestAmerica Buffalo Job Number: 480-89453-1

SDG Number:

Matrix: Solid Instrument ID: LEEMAN2

Method: 7471B MDL Date: 01/29/2010 00:00

Prep Method: 7471B

| Analyte | Wavelength/ Mass | RL (mg/Kg) | MDL (mg/Kg) |
|---|---|---|---|
| Mercury | 253.7 | 0.02 | 0.0081 |

FORM IX - IN

9-IN
CALIBRATION BLANK DETECTION LIMITS
METALS

Lab Name: TestAmerica Buffalo Job Number: 480-89453-1

SDG Number:

Matrix: Solid Instrument ID: LEEMAN2

Method: 7471B XMDL Date: 01/29/2010 00:00

| Analyte | Wavelength/ Mass | XRL (mg/L) | XMDL (mg/L) |
|---|---|---|---|
| Mercury | 253.7 | 0.0002 | 0.00012 |

9-IN
DETECTION LIMITS
METALS

Lab Name: TestAmerica Pittsburgh  Job Number: 480-89453-1

SDG Number:

Matrix: Solid  Instrument ID: X

Method: 6020A  MDL Date: 01/23/2010 19:04

Prep Method: 3050B

| Analyte | Wavelength/ Mass | RL (mg/Kg) | MDL (mg/Kg) |
|---|---|---|---|
| Arsenic | 75 | 0.1 | 0.0181 |
| Barium | 137 | 1 | 0.0107 |
| Cadmium | 111 | 0.1 | 0.007 |
| Chromium | 52 | 0.2 | 0.0061 |
| Lead | 208 | 0.1 | 0.0038 |
| Selenium | 82 | 0.5 | 0.0502 |
| Silver | 107 | 0.1 | 0.0039 |

9-IN
CALIBRATION BLANK DETECTION LIMITS
METALS

Lab Name: TestAmerica Pittsburgh Job Number: 480-89453-1

SDG Number:

Matrix: Solid Instrument ID: X

Method: 6020A XMDL Date: 01/23/2010 19:04

| Analyte | Wavelength/ Mass | XRL (ug/L) | XMDL (ug/L) |
|---|---|---|---|
| Arsenic | 75 | 1 | 0.2908 |
| Barium | 137 | 10 | 0.098 |
| Cadmium | 111 | 1 | 0.1144 |
| Chromium | 52 | 2 | 0.5433 |
| Lead | 208 | 1 | 0.0192 |
| Selenium | 82 | 5 | 0.4216 |
| Silver | 107 | 1 | 0.0362 |

10-IN
ICP-AES INTERELEMENT CORRECTION FACTORS
METALS

Lab Name: TestAmerica Buffalo Job Number: 480-89453-1

SDG No.:

ICP-AES Instrument ID: ICAP2 Date: 10/13/2015

| Analyte | Wave Length | Al | As | Be | Ca | Cd | Co | Cr | Cu | Fe | Mg | Mn | Mo | Ni | Si |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 308.215 | | | | | | | | | | | | | | |
| Antimony | 206.833 | | | | | | | 0.016886 | | -0.000038 | | | -0.003460 | | |
| Arsenic | 189.042 | | | | | | | -0.016699 | | | | | -0.001439 | | -0.00002242 |
| Barium | 455.403 | | | | | | | | | | | | | | |
| Beryllium | 313.042 | | | | | | | | | | | | | | |
| Boron | 208.959 | | | | | | | | | | | | 0.045987 | | 0.00077341 |
| Cadmium | 228.802 | | 005232 | | | | | | | -0.000007 | | | | -0.000183 | |
| Calcium | 317.933 | | | | | | | | | | | | | | |
| Chromium | 267.716 | | | | | | | | | -0.000009 | | 0.000128 | | | |
| Cobalt | 228.616 | | | | | | | | | | | | -0.001422 | | |
| Copper | 327.396 | | | | 0.000028 | | | | | -0.000012 | | | | | |
| Iron | 259.940 | | | | | | | | | | 0.000214 | -0.000349 | | | |
| Lead | 220.353 | -0.000045 | | | | | -0.000313 | | 0.002016 | 0.000014 | | 0.000089 | -0.001660 | 0.000081 | 0.00011293 |
| Lithium | 670.784 | | | | | | | | | | | | | | |
| Magnesium | 279.079 | | | | | | | | | | | -0.005496 | -0.016782 | | |
| Manganese | 257.610 | 0.00005 | | | | | | | | 0.000013 | | | | | |
| Molybdenum | 202.030 | | | | | | | | | -0.000008 | | -0.000089 | | | |
| Nickel | 231.604 | | | | | | | | | 0.000035 | | | | | |
| Potassium | 766.490 | | | | | | | | | | | | | | |
| Selenium | 196.090 | -0.000116 | | | | | | | | -0.000019 | | 0.000437 | | | |
| Silicon | 288.158 | | | | | | | -0.001254 | | | | | | | |
| Silver | 328.068 | | | | | | | | | -0.000013 | | -0.000015 | | | |
| Sodium | 589.592 | | | | | | | | | | | | | | |
| Strontium | 407.771 | | | | | | | | | | | | | | |
| Sulfur | 182.034 | -0.000111 | | | | | | | | | | | | | |
| Thallium | 190.856 | 0.000021 | | | | | 0.004001 | | | | | | | | |
| Tin | 189.989 | | | | | | | | | | | | | | |
| Titanium | 334.904 | | | | 0.000005 | | | 0.000199 | | | | | 0.000497 | | |
| Vanadium | 292.402 | | | | | | | | | 0.000016 | | | -0.003989 | | |

X-IN

10-IN
ICP-AES INTERELEMENT CORRECTION FACTORS
METALS

Lab Name: TestAmerica Buffalo Job Number: 480-89453-1

SDG No.:

ICP-AES Instrument ID: ICAP2 Date: 10/13/2015

| Analyte | Wave Length | Al | As | Be | Ca | Cd | Co | Cr | Cu | Fe | Mg | Mn | Mo | Ni | Si |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zinc | 206.200 | | | | | | | -0.001712 | | | | | | | |

362

X-IN

10-IN
ICP-AES INTERELEMENT CORRECTION FACTORS
METALS

Lab Name: TestAmerica Buffalo Job Number: 480-89453-1

SDG No.:

ICP-AES Instrument ID: ICAP2 Date: 10/13/2015

| Analyte | Wave Length | Sn | Ti | Tl | V | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 308.215 | | | | 0.007523 | | | | | | | | | | |
| Antimony | 206.833 | | 0.000781 | | | | | | | | | | | | |
| Arsenic | 189.042 | | | | | | | | | | | | | | |
| Barium | 455.403 | | | | | | | | | | | | | | |
| Beryllium | 313.042 | | -0.001012 | | 0.000334 | | | | | | | | | | |
| Boron | 208.959 | | | | | | | | | | | | | | |
| Cadmium | 228.802 | | | | | | | | | | | | | | |
| Calcium | 317.933 | | | | | | | | | | | | | | |
| Chromium | 267.716 | | | | | | | | | | | | | | |
| Cobalt | 228.616 | | 0.001956 | | | | | | | | | | | | |
| Copper | 327.396 | | -0.002019 | | -0.000724 | | | | | | | | | | |
| Iron | 259.940 | | | | | | | | | | | | | | |
| Lead | 220.353 | | -0.00454 | | -0.000044 | | | | | | | | | | |
| Lithium | 670.784 | | | | | | | | | | | | | | |
| Magnesium | 279.079 | | -0.003460 | | | | | | | | | | | | |
| Manganese | 257.610 | | | | -0.000070 | | | | | | | | | | |
| Molybdenum | 202.030 | | | | | | | | | | | | | | |
| Nickel | 231.604 | | | | | | | | | | | | | | |
| Potassium | 766.490 | | | | | | | | | | | | | | |
| Selenium | 196.090 | | | | | | | | | | | | | | |
| Silicon | 288.158 | | -0.022549 | | 0.003607 | | | | | | | | | | |
| Silver | 328.068 | | -0.000143 | | 0.000018 | | | | | | | | | | |
| Sodium | 589.592 | | | | | | | | | | | | | | |
| Strontium | 407.771 | | | | | | | | | | | | | | |
| Sulfur | 182.034 | | | | | | | | | | | | | | |
| Thallium | 190.856 | | -0.000286 | | -0.0006667 | | | | | | | | | | |
| Tin | 189.989 | | -0.000712 | | | | | | | | | | | | |
| Titanium | 334.904 | | | | | | | | | | | | | | |
| Vanadium | 292.402 | | 0.000374 | | | | | | | | | | | | |
| Zinc | 206.200 | | | | | | | | | | | | | | |

X-IN

11-IN
LINEAR RANGES
METALS

Lab Name: TestAmerica Buffalo Job No: 480-89453-1

SDG No.:

Instrument ID: ICAP2 Date: 09/29/2015 14:49

| Analyte | Integ. Time (Sec.) | Concentration (mg/L) | Method |
|---|---|---|---|
| Arsenic | 15 | 30 | 6010C |
| Barium | 15 | 10 | 6010C |
| Cadmium | 15 | 5 | 6010C |
| Chromium | 15 | 50 | 6010C |
| Lead | 15 | 120 | 6010C |
| Selenium | 15 | 60 | 6010C |
| Silver | 15 | 3 | 6010C |

11-IN
LINEAR RANGES
METALS

Lab Name: TestAmerica Buffalo Job No: 480-89453-1

SDG No.:

Instrument ID: LEEMAN2 Date: 10/13/2015 15:08

| Analyte | Integ. Time (Sec.) | Concentration (ug/L) | Method |
|---|---|---|---|
| Mercury | 10 | 10 | 7470A |
| Mercury | 10 | 10 | 7471B |

11-IN
LINEAR RANGES
METALS

Lab Name: TestAmerica Pittsburgh Job No: 480-89453-1

SDG No.:

Instrument ID: X Date: 03/14/2011 22:35

| Analyte | Integ. Time (Sec.) | Concentration (ug/L) | Method |
|---|---|---|---|
| Arsenic | | 4500 | 6020A |
| Barium | | 13500 | 6020A |
| Cadmium | | 13500 | 6020A |
| Chromium | | 13500 | 6020A |
| Silver | | 2500 | 6020A |
| Lead | | 20000 | 6020A |
| Selenium | | 4500 | 6020A |

12-IN
PREPARATION LOG
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Prep Method: 3010A

| Lab Sample ID | Preparation Date | Prep Batch | Initial Weight | Initial Volume (mL) | Final Volume (mL) |
|---|---|---|---|---|---|
| LB2 480-270052/1-C | 10/22/2015 11:30 | 270374 | | 50 | 50 |
| MB 480-270374/2-A | 10/22/2015 11:30 | 270374 | | 50 | 50 |
| LCS 480-270374/3-A | 10/22/2015 11:30 | 270374 | | 50 | 50 |
| 480-89453-1 | 10/22/2015 11:30 | 270374 | | 50 | 50 |
| 480-89453-2 | 10/22/2015 11:30 | 270374 | | 50 | 50 |
| 480-89453-3 | 10/22/2015 11:30 | 270374 | | 50 | 50 |
| 480-89453-4 | 10/22/2015 11:30 | 270374 | | 50 | 50 |
| 480-89453-4 MS | 10/22/2015 11:30 | 270374 | | 50 | 50 |
| 480-89453-4 MSD | 10/22/2015 11:30 | 270374 | | 50 | 50 |

12-IN
PREPARATION LOG
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Prep Method: 7471B

| Lab Sample ID | Preparation Date | Prep Batch | Initial Weight (g) | Initial Volume | Final Volume (mL) |
|---|---|---|---|---|---|
| MB 480-270135/1-A | 10/21/2015 15:00 | 270135 | +0.5937 | | 50 |
| LCSSRM 480-270135/2-A | 10/21/2015 15:00 | 270135 | +0.0239 | | 50 |
| 480-89453-1 | 10/21/2015 15:00 | 270135 | +0.5970 | | 50 |
| 480-89453-1 MS | 10/21/2015 15:00 | 270135 | +0.5942 | | 50 |
| 480-89453-1 MSD | 10/21/2015 15:00 | 270135 | +0.5954 | | 50 |
| 480-89453-2 | 10/21/2015 15:00 | 270135 | +0.5845 | | 50 |
| 480-89453-3 | 10/21/2015 15:00 | 270135 | +0.5921 | | 50 |
| 480-89453-4 | 10/21/2015 15:00 | 270135 | +0.5874 | | 50 |

12-IN
PREPARATION LOG
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Prep Method: 7470A

| Lab Sample ID | Preparation Date | Prep Batch | Initial Weight | Initial Volume (mL) | Final Volume (mL) |
|---|---|---|---|---|---|
| LB2 480-270052/1-E | 10/22/2015 12:15 | 270385 | | 30 | 50 |
| MB 480-270385/2-A | 10/22/2015 12:15 | 270385 | | 30 | 50 |
| LCS 480-270385/3-A | 10/22/2015 12:15 | 270385 | | 30 | 50 |
| 480-89453-1 | 10/22/2015 12:15 | 270385 | | 30 | 50 |
| 480-89453-2 | 10/22/2015 12:15 | 270385 | | 30 | 50 |
| 480-89453-3 | 10/22/2015 12:15 | 270385 | | 30 | 50 |
| 480-89453-4 | 10/22/2015 12:15 | 270385 | | 30 | 50 |
| 480-89453-4 MS | 10/22/2015 12:15 | 270385 | | 30 | 50 |
| 480-89453-4 MSD | 10/22/2015 12:15 | 270385 | | 30 | 50 |

12-IN
PREPARATION LOG
METALS

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

Prep Method: 3050B

| Lab Sample ID | Preparation Date | Prep Batch | Initial Weight (g) | Initial Volume | Final Volume (mL) |
|---|---|---|---|---|---|
| MB 180-159790/1-A | 11/09/2015 12:44 | 159790 | 00001.04 | | 100 |
| LCS 180-159790/2-A | 11/09/2015 12:44 | 159790 | 00001.02 | | 100 |
| LCSD 180-159790/3-A | 11/09/2015 12:44 | 159790 | 00001.04 | | 100 |
| 480-89453-1 | 11/09/2015 12:44 | 159790 | 00001.04 | | 100 |
| 480-89453-2 | 11/09/2015 12:44 | 159790 | 00001.05 | | 100 |
| 480-89453-3 | 11/09/2015 12:44 | 159790 | 00001.01 | | 100 |
| 480-89453-4 | 11/09/2015 12:44 | 159790 | 00001.04 | | 100 |

13-IN
ANALYSIS RUN LOG
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Instrument ID: ICAP2 Method: 6010C

Start Date: 10/23/2015 15:55 End Date: 10/23/2015 21:15

| Lab Sample ID | D/F | Type | Time | Analytes | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ag | As | Ba | Cd | Cr | Pb | Se | | | | | | | | | | | | | |
| ICIS 480-270880/1 | 1 | | 15:55 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| IC 480-270880/2 | | | 15:58 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| IC 480-270880/3 | | | 16:01 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| IC 480-270880/4 | | | 16:04 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ICV 480-270880/5 | 1 | | 16:08 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ICB 480-270880/6 | 1 | | 16:11 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ICVL 480-270880/7 | 1 | | 16:14 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:17 | | | | | | | | | | | | | | | | | | | | |
| ICSA 480-270880/9 | 1 | | 16:20 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ICSAB 480-270880/10 | 1 | | 16:24 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CCV 480-270880/11 | | | 16:27 | | | | | | | | | | | | | | | | | | | | |
| CCB 480-270880/12 | | | 16:30 | | | | | | | | | | | | | | | | | | | | |
| CCVL 480-270880/13 | | | 16:33 | | | | | | | | | | | | | | | | | | | | |
| CCV 480-270880/14 | 1 | | 19:51 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CCB 480-270880/15 | 1 | | 19:54 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CCVL 480-270880/16 | 1 | | 19:57 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| LB2 480-270052/1-C | 1 | P | 20:10 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| MB 480-270374/2-A | 1 | T | 20:14 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| LCS 480-270374/3-A | 1 | T | 20:17 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| 480-89453-1 | 1 | P | 20:20 | X | X | X | X | X | X | | | | | | | | | | | | | | |
| 480-89453-2 | 1 | P | 20:23 | X | X | X | X | X | X | | | | | | | | | | | | | | |
| 480-89453-3 | 1 | P | 20:27 | X | X | X | X | X | X | | | | | | | | | | | | | | |
| CCV 480-270880/23 | 1 | | 20:30 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CCB 480-270880/24 | 1 | | 20:33 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CCVL 480-270880/25 | 1 | | 20:37 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| 480-89453-4 | 1 | P | 20:40 | X | X | X | X | X | X | | | | | | | | | | | | | | |
| 480-89453-4 SD | 5 | P | 20:43 | X | X | X | X | X | X | | | | | | | | | | | | | | |
| 480-89453-4 PDS | 1 | P | 20:47 | X | X | X | X | X | X | | | | | | | | | | | | | | |
| 480-89453-4 MS | 1 | P | 20:50 | X | X | X | X | X | X | | | | | | | | | | | | | | |
| 480-89453-4 MSD | 1 | P | 20:53 | X | X | X | X | X | X | | | | | | | | | | | | | | |
| CCV 480-270880/31 | 1 | | 21:09 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CCB 480-270880/32 | 1 | | 21:12 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CCVL 480-270880/33 | 1 | | 21:15 | X | X | X | X | X | X | X | | | | | | | | | | | | | |

Prep Types
P = TCLP
T = Total/NA

13-IN
ANALYSIS RUN LOG
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Instrument ID: ICAP2 Method: 6010C

Start Date: 10/24/2015 09:32 End Date: 10/24/2015 11:42

| Lab Sample ID | D / F | Type | Time | Analytes | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Se | | | | | | | | | | | | | | | | | | | |
| ICIS 480-271006/1 | 1 | | 09:32 | X | | | | | | | | | | | | | | | | | | | |
| IC 480-271006/2 | | | 09:36 | X | | | | | | | | | | | | | | | | | | | |
| IC 480-271006/3 | | | 09:39 | X | | | | | | | | | | | | | | | | | | | |
| IC 480-271006/4 | | | 09:42 | X | | | | | | | | | | | | | | | | | | | |
| ICV 480-271006/5 | 1 | | 09:45 | X | | | | | | | | | | | | | | | | | | | |
| ICB 480-271006/6 | 1 | | 09:48 | X | | | | | | | | | | | | | | | | | | | |
| ICVL 480-271006/7 | 1 | | 09:52 | X | | | | | | | | | | | | | | | | | | | |
| CRI 480-271006/8 | | | 09:55 | | | | | | | | | | | | | | | | | | | | |
| ICSA 480-271006/9 | 1 | | 09:58 | X | | | | | | | | | | | | | | | | | | | |
| ICSAB 480-271006/10 | 1 | | 10:02 | X | | | | | | | | | | | | | | | | | | | |
| CCV 480-271006/11 | | | 10:05 | | | | | | | | | | | | | | | | | | | | |
| CCB 480-271006/12 | | | 10:08 | | | | | | | | | | | | | | | | | | | | |
| CCVL 480-271006/13 | | | 10:12 | | | | | | | | | | | | | | | | | | | | |
| CCV 480-271006/14 | 1 | | 10:18 | X | | | | | | | | | | | | | | | | | | | |
| CCB 480-271006/15 | 1 | | 10:21 | X | | | | | | | | | | | | | | | | | | | |
| CCVL 480-271006/16 | 1 | | 10:25 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-1 | 5 | P | 10:53 | X | | | | | | | | | | | | | | | | | | | |
| CCV 480-271006/18 | 1 | | 10:56 | X | | | | | | | | | | | | | | | | | | | |
| CCB 480-271006/19 | 1 | | 11:00 | X | | | | | | | | | | | | | | | | | | | |
| CCVL 480-271006/20 | 1 | | 11:03 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-2 | 5 | P | 11:06 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-3 | 5 | P | 11:09 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-4 | 5 | P | 11:13 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-4 SD | 25 | P | 11:16 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-4 PDS | 5 | P | 11:19 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-4 MS | 5 | P | 11:23 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-4 MSD | 5 | P | 11:26 | X | | | | | | | | | | | | | | | | | | | |
| CCV 480-271006/28 | 1 | | 11:36 | X | | | | | | | | | | | | | | | | | | | |
| CCB 480-271006/29 | 1 | | 11:39 | X | | | | | | | | | | | | | | | | | | | |
| CCVL 480-271006/30 | 1 | | 11:42 | X | | | | | | | | | | | | | | | | | | | |

Prep Types
P = TCLP

13-IN
ANALYSIS RUN LOG
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Instrument ID: LEEMAN2 Method: 7470A

Start Date: 10/22/2015 15:26 End Date: 10/22/2015 17:20

| Lab Sample ID | D / F | Type | Time | Analytes | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Hg | | | | | | | | | | | | | | | | | | | |
| ICV 480-270525/1 | 1 | | 15:26 | X | | | | | | | | | | | | | | | | | | | |
| ICB 480-270525/2 | 1 | | 15:28 | X | | | | | | | | | | | | | | | | | | | |
| ICVL 480-270525/3 | 1 | | 15:29 | X | | | | | | | | | | | | | | | | | | | |
| CCV 480-270525/4 | | | 15:31 | | | | | | | | | | | | | | | | | | | | |
| CCB 480-270525/5 | | | 15:33 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:34 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:36 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:38 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:40 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:41 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:43 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:45 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:47 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:48 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:50 | | | | | | | | | | | | | | | | | | | | |
| CCV 480-270525/16 | | | 15:52 | | | | | | | | | | | | | | | | | | | | |
| CCB 480-270525/17 | | | 15:54 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:55 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:57 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 15:59 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:01 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:03 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:04 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:06 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:08 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:09 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:11 | | | | | | | | | | | | | | | | | | | | |
| CCV 480-270525/28 | | | 16:14 | | | | | | | | | | | | | | | | | | | | |
| CCB 480-270525/29 | | | 16:16 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:17 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:19 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:21 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:22 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:24 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:26 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:28 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:29 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:32 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:34 | | | | | | | | | | | | | | | | | | | | |
| CCV 480-270525/40 | 1 | | 16:36 | X | | | | | | | | | | | | | | | | | | | |
| CCB 480-270525/41 | 1 | | 16:38 | X | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:39 | | | | | | | | | | | | | | | | | | | | |

13-IN
ANALYSIS RUN LOG
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Instrument ID: LEEMAN2 Method: 7470A

Start Date: 10/22/2015 15:26 End Date: 10/22/2015 17:20

| Lab Sample ID | D/F | Type | Time | Analytes | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Hg | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:41 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:43 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:45 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:48 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:50 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:51 | | | | | | | | | | | | | | | | | | | | |
| LB2 480-270052/1-E | 1 | P | 16:53 | X | | | | | | | | | | | | | | | | | | | |
| MB 480-270385/2-A | 1 | T | 16:56 | X | | | | | | | | | | | | | | | | | | | |
| LCS 480-270385/3-A | 1 | T | 16:57 | X | | | | | | | | | | | | | | | | | | | |
| CCV 480-270525/52 | 1 | | 16:59 | X | | | | | | | | | | | | | | | | | | | |
| CCB 480-270525/53 | 1 | | 17:01 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-1 | 1 | P | 17:02 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-2 | 1 | P | 17:04 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-3 | 1 | P | 17:05 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-4 | 1 | P | 17:08 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-4 SD | 5 | P | 17:10 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-4 MS | 1 | P | 17:11 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-4 MSD | 1 | P | 17:14 | X | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:15 | | | | | | | | | | | | | | | | | | | | |
| CCV 480-270525/62 | 1 | | 17:17 | X | | | | | | | | | | | | | | | | | | | |
| CCB 480-270525/63 | 1 | | 17:18 | X | | | | | | | | | | | | | | | | | | | |
| CCVL 480-270525/64 | 1 | | 17:20 | X | | | | | | | | | | | | | | | | | | | |

Prep Types
P = TCLP
T = Total/NA

13-IN
ANALYSIS RUN LOG
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Instrument ID: LEEMAN2 Method: 7471B

Start Date: 10/21/2015 16:34 End Date: 10/22/2015 07:38

| Lab Sample ID | D / F | Type | Time | Analytes | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Hg | | | | | | | | | | | | | | | | | | | |
| ICV 480-270289/1 | 1 | | 16:34 | X | | | | | | | | | | | | | | | | | | | |
| ICB 480-270289/2 | 1 | | 16:36 | X | | | | | | | | | | | | | | | | | | | |
| ICVL 480-270289/3 | 1 | | 16:38 | X | | | | | | | | | | | | | | | | | | | |
| CCV 480-270289/4 | | | 16:39 | | | | | | | | | | | | | | | | | | | | |
| CCB 480-270289/5 | | | 16:41 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:42 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:43 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:45 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:47 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:48 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:49 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:51 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:53 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:54 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 16:56 | | | | | | | | | | | | | | | | | | | | |
| CCV 480-270289/16 | 1 | | 16:58 | X | | | | | | | | | | | | | | | | | | | |
| CCB 480-270289/17 | 1 | | 16:59 | X | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:01 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:02 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:03 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:05 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:07 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:08 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:09 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:11 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:13 | | | | | | | | | | | | | | | | | | | | |
| MB 480-270135/1-A | 1 | T | 17:14 | X | | | | | | | | | | | | | | | | | | | |
| CCV 480-270289/28 | 1 | | 17:16 | X | | | | | | | | | | | | | | | | | | | |
| CCB 480-270289/29 | 1 | | 17:17 | X | | | | | | | | | | | | | | | | | | | |
| LCSSRM 480-270135/2-A | 1 | T | 17:18 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-1 | 1 | T | 17:20 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-1 SD | 5 | T | 17:21 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-1 MS | 1 | T | 17:23 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-1 MSD | 1 | T | 17:25 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-2 | 1 | T | 17:26 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-3 | 1 | T | 17:29 | X | | | | | | | | | | | | | | | | | | | |
| 480-89453-4 | 1 | T | 17:30 | X | | | | | | | | | | | | | | | | | | | |
| CCV 480-270289/38 | 1 | | 17:32 | X | | | | | | | | | | | | | | | | | | | |
| CCB 480-270289/39 | 1 | | 17:34 | X | | | | | | | | | | | | | | | | | | | |
| CCVL 480-270289/40 | 1 | | 17:35 | X | | | | | | | | | | | | | | | | | | | |
| CCV 480-270289/41 | | | 07:27 | | | | | | | | | | | | | | | | | | | | |
| CCB 480-270289/42 | | | 07:29 | | | | | | | | | | | | | | | | | | | | |

13-IN
ANALYSIS RUN LOG
METALS

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Instrument ID: LEEMAN2 Method: 7471B

Start Date: 10/21/2015 16:34 End Date: 10/22/2015 07:38

| Lab Sample ID | D / F | Type | Time | Analytes | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Hg | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 07:30 | | | | | | | | | | | | | | | | | | | | |
| CCV 480-270289/44 | | | 07:34 | | | | | | | | | | | | | | | | | | | | |
| CCB 480-270289/45 | | | 07:37 | | | | | | | | | | | | | | | | | | | | |
| CCVL 480-270289/46 | | | 07:38 | | | | | | | | | | | | | | | | | | | | |

Prep Types
T = Total/NA

13-IN
ANALYSIS RUN LOG
METALS

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

Instrument ID: X Method: 6020A

Start Date: 11/09/2015 14:45 End Date: 11/10/2015 12:42

| Lab Sample ID | D / F | Type | Time | Analytes | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ag | As | Ba | Cd | Cr | Pb | Se | | | | | | | | | | | | | |
| ITUNE 180-159963/1 | | | 14:45 | | | | | | | | | | | | | | | | | | | | |
| STD1 180-159963/2 IC | 1 | | 16:23 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| STD2 180-159963/3 IC | 1 | | 16:29 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| STD3 180-159963/4 IC | 1 | | 16:34 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ICV 180-159963/5 | 1 | | 16:39 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ICB 180-159963/6 | 1 | | 16:48 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CRI 180-159963/7 | 1 | | 16:53 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ICSA 180-159963/8 | 1 | | 16:58 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ICSAB 180-159963/9 | 1 | | 17:04 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CCV 180-159963/10 | 1 | | 17:09 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CCB1 180-159963/11 | 1 | | 17:17 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:22 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:27 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:32 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:37 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:42 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:47 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:52 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 17:57 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 18:03 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 18:08 | | | | | | | | | | | | | | | | | | | | |
| CCV 180-159963/22 | 1 | | 18:13 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CCB2 180-159963/23 | 1 | | 18:22 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ZZZZZZ | | | 18:27 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 18:32 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 18:37 | | | | | | | | | | | | | | | | | | | | |
| MB 180-159790/1-A | 1 | T | 18:46 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| LCS 180-159790/2-A | 1 | T | 18:51 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| LCSD 180-159790/3-A | 1 | T | 18:56 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ZZZZZZ | | | 19:05 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 19:11 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 19:16 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 19:21 | | | | | | | | | | | | | | | | | | | | |
| CCV 180-159963/34 | 1 | | 19:26 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CCB3 180-159963/35 | 1 | | 19:35 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ZZZZZZ | | | 19:40 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 19:45 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 19:50 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 19:56 | | | | | | | | | | | | | | | | | | | | |
| 480-89453-1 | 5 | T | 20:01 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| 480-89453-2 | 5 | T | 20:06 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| 480-89453-3 | 5 | T | 20:11 | X | X | X | X | X | X | X | | | | | | | | | | | | | |

13-IN
ANALYSIS RUN LOG
METALS

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

Instrument ID: X Method: 6020A

Start Date: 11/09/2015 14:45 End Date: 11/10/2015 12:42

| Lab Sample ID | D / F | Type | Time | Analytes | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ag | As | Ba | Cd | Cr | Pb | Se | | | | | | | | | | | | | |
| 480-89453-4 | 5 | T | 20:16 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ZZZZZZ | | | 20:25 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 20:30 | | | | | | | | | | | | | | | | | | | | |
| CCV 180-159963/46 | 1 | | 20:35 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| CCB4 180-159963/47 | 1 | | 20:44 | X | X | X | X | X | X | X | | | | | | | | | | | | | |
| ZZZZZZ | | | 20:49 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 20:54 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 20:59 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 21:05 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 21:10 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 21:15 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 21:24 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 21:29 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 21:34 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 21:39 | | | | | | | | | | | | | | | | | | | | |
| CCV 180-159963/58 | | | 21:44 | | | | | | | | | | | | | | | | | | | | |
| CCB5 180-159963/59 | | | 21:53 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 21:58 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 22:03 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 22:08 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 22:13 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 22:19 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 22:24 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 22:29 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 22:34 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 22:39 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 22:44 | | | | | | | | | | | | | | | | | | | | |
| CCV 180-159963/70 | | | 22:53 | | | | | | | | | | | | | | | | | | | | |
| CCB6 180-159963/71 | | | 23:02 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 23:07 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 23:12 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 23:17 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 23:22 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 23:28 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 23:33 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 23:38 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 23:43 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 23:48 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 23:53 | | | | | | | | | | | | | | | | | | | | |
| CCV 180-159963/82 | | | 23:58 | | | | | | | | | | | | | | | | | | | | |
| CCB7 180-159963/83 | | | 00:07 | | | | | | | | | | | | | | | | | | | | |
| CRI 180-159963/84 | 1 | | 00:18 | X | X | X | X | X | X | X | | | | | | | | | | | | | |

13-IN
ANALYSIS RUN LOG
METALS

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

Instrument ID: X Method: 6020A

Start Date: 11/09/2015 14:45 End Date: 11/10/2015 12:42

| Lab Sample ID | D / F | Type | Time | Analytes | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ag | As | Ba | Cd | Cr | Pb | Se | | | | | | | | | | | | | |
| ZZZZZZ | | | 00:23 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 00:28 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 00:33 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 00:38 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 00:43 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 00:48 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 00:53 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 00:58 | | | | | | | | | | | | | | | | | | | | |
| CCV 180-159963/93 | | | 01:03 | | | | | | | | | | | | | | | | | | | | |
| CCB8 180-159963/94 | | | 01:13 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 01:18 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 01:23 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 01:28 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 01:33 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 01:38 | | | | | | | | | | | | | | | | | | | | |
| CCV 180-159963/100 | | | 01:43 | | | | | | | | | | | | | | | | | | | | |
| CCB9 180-159963/101 | | | 01:52 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 12:01 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 12:05 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 12:27 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 12:32 | | | | | | | | | | | | | | | | | | | | |
| CCV 180-159963/106 | | | 12:37 | | | | | | | | | | | | | | | | | | | | |
| CCB 180-159963/107 | | | 12:42 | | | | | | | | | | | | | | | | | | | | |

Prep Types
T = Total/NA

15-IN
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
METALS

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

ICP-MS Instrument ID: X Start Date: 11/09/2015 End Date: 11/10/2015

| Lab Sample ID | Time | Internal Standards %RI For: | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Element Li-6 | Q | Element Sc | Q | Element Y-89 | Q | Element Rh-103 | Q | Element In | Q |
| STD1 180-159963/2 I | 16:23 | 100 | | 100 | | 100 | | 100 | | 100 | |
| STD2 180-159963/3 I | 16:29 | 92 | | 97 | | 106 | | 98 | | 98 | |
| STD3 180-159963/4 I | 16:34 | 107 | | 107 | | 109 | | 107 | | 107 | |
| ICV 180-159963/5 | 16:39 | 104 | | 104 | | 111 | | 103 | | 104 | |
| ICB 180-159963/6 | 16:48 | 108 | | 110 | | 117 | | 112 | | 111 | |
| CRI 180-159963/7 | 16:53 | 105 | | 108 | | 110 | | 110 | | 109 | |
| ICSA 180-159963/8 | 16:58 | 79 | | 90 | | 105 | | 91 | | 95 | |
| ICSAB 180-159963/9 | 17:04 | 77 | | 90 | | 105 | | 92 | | 95 | |
| CCV 180-159963/10 | 17:09 | 90 | | 97 | | 113 | | 102 | | 104 | |
| CCB1 180-159963/11 | 17:17 | 98 | | 105 | | 118 | | 111 | | 111 | |
| CCV 180-159963/22 | 18:13 | 83 | | 92 | | 110 | | 101 | | 101 | |
| CCB2 180-159963/23 | 18:22 | 89 | | 100 | | 113 | | 107 | | 106 | |
| MB 180-159790/1-A | 18:46 | 66 | | 79 | | 97 | | 91 | | 92 | |
| LCS 180-159790/2-A | 18:51 | 69 | | 79 | | 102 | | 87 | | 89 | |
| LCSD 180-159790/3-A | 18:56 | 71 | | 80 | | 101 | | 86 | | 89 | |
| CCV 180-159963/34 | 19:26 | 85 | | 95 | | 109 | | 97 | | 98 | |
| CCB3 180-159963/35 | 19:35 | 86 | | 101 | | 113 | | 105 | | 103 | |
| 480-89453-1 | 20:01 | 52 | | 69 | | 101 | | 76 | | 81 | |
| 480-89453-2 | 20:06 | 55 | | 73 | | 105 | | 82 | | 86 | |
| 480-89453-3 | 20:11 | 55 | | 76 | | 107 | | 80 | | 84 | |
| 480-89453-4 | 20:16 | 54 | | 73 | | 98 | | 78 | | 80 | |
| CCV 180-159963/46 | 20:35 | 78 | | 87 | | 101 | | 90 | | 91 | |
| CCB4 180-159963/47 | 20:44 | 88 | | 96 | | 107 | | 100 | | 99 | |
| CRI 180-159963/84 | 00:18 | 59 | | 71 | | 80 | | 75 | | 76 | |

15-IN
ICP-MS INTERNAL STANDARDS RELATIVE INTENSITY SUMMARY
METALS

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

ICP-MS Instrument ID: X Start Date: 11/09/2015 End Date: 11/10/2015

| Lab Sample ID | Time | Internal Standards %RI For: | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Element Tb | Q | Element Ho | Q | Element Bi | Q | Element | Q | Element | Q |
| STD1 180-159963/2 I | 16:23 | 100 | | 100 | | 100 | | | | | |
| STD2 180-159963/3 I | 16:29 | 102 | | 102 | | 96 | | | | | |
| STD3 180-159963/4 I | 16:34 | 107 | | 107 | | 105 | | | | | |
| ICV 180-159963/5 | 16:39 | 107 | | 106 | | 100 | | | | | |
| ICB 180-159963/6 | 16:48 | 112 | | 111 | | 109 | | | | | |
| CRI 180-159963/7 | 16:53 | 109 | | 108 | | 106 | | | | | |
| ICSA 180-159963/8 | 16:58 | 101 | | 102 | | 94 | | | | | |
| ICSAB 180-159963/9 | 17:04 | 103 | | 104 | | 95 | | | | | |
| CCV 180-159963/10 | 17:09 | 108 | | 107 | | 100 | | | | | |
| CCB1 180-159963/11 | 17:17 | 112 | | 111 | | 109 | | | | | |
| CCV 180-159963/22 | 18:13 | 107 | | 107 | | 100 | | | | | |
| CCB2 180-159963/23 | 18:22 | 108 | | 108 | | 107 | | | | | |
| MB 180-159790/1-A | 18:46 | 97 | | 97 | | 98 | | | | | |
| LCS 180-159790/2-A | 18:51 | 98 | | 99 | | 90 | | | | | |
| LCSD 180-159790/3-A | 18:56 | 98 | | 98 | | 89 | | | | | |
| CCV 180-159963/34 | 19:26 | 105 | | 104 | | 96 | | | | | |
| CCB3 180-159963/35 | 19:35 | 108 | | 107 | | 107 | | | | | |
| 480-89453-1 | 20:01 | 91 | | 92 | | 85 | | | | | |
| 480-89453-2 | 20:06 | 95 | | 96 | | 88 | | | | | |
| 480-89453-3 | 20:11 | 94 | | 94 | | 87 | | | | | |
| 480-89453-4 | 20:16 | 91 | | 92 | | 83 | | | | | |
| CCV 180-159963/46 | 20:35 | 99 | | 99 | | 92 | | | | | |
| CCB4 180-159963/47 | 20:44 | 104 | | 104 | | 103 | | | | | |
| CRI 180-159963/84 | 00:18 | 81 | | 82 | | 83 | | | | | |

# METALS BATCH WORKSHEET

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Batch Number: 270052  Batch Start Date: 10/21/15 09:40  Batch Analyst: Salverson, Jessica L

Batch Method: 1311  Batch End Date:

| Lab Sample ID | Client Sample ID | Method Chain | Basis | InitialAmount | FinalAmount | EFD_PartSizeRed | EFD_SampleWeight | EFD_VolumeWaterAdd | EFD_InitialpH |
|---|---|---|---|---|---|---|---|---|---|
| LB2 480-270052/1 | | 1311, 3010A, 6010C | | | 2000 mL | | | | |
| 480-89453-A-1 | A-01-020415-1600 | 1311, 3010A, 6010C | P | 50.03 g | 1000.6 mL | No | 5.03 g | 96.5 mL | 12.66 SU |
| 480-89453-A-2 | A-01-031915-1600 | 1311, 3010A, 6010C | P | 50.13 g | 1002.6 mL | No | 5.08 g | 96.5 mL | 12.63 SU |
| 480-89453-A-3 | A-01-040215-1505 | 1311, 3010A, 6010C | P | 50.11 g | 1002.2 mL | No | 5.03 g | 96.5 mL | 12.62 SU |
| 480-89453-A-4 | A-01-050815-1600 | 1311, 3010A, 6010C | P | 40.03 g | 800.6 mL | No | 5.14 g | 96.5 mL | 12.58 SU |

| Lab Sample ID | Client Sample ID | Method Chain | Basis | EFD_AddHClpH>5 | EFD_HeatHeld | EFD_SecondpHCheck | ExtractionFluidOne | ExtractionFluidTwo | PartSizeRed |
|---|---|---|---|---|---|---|---|---|---|
| LB2 480-270052/1 | | 1311, 3010A, 6010C | | | | | No | Yes | |
| 480-89453-A-1 | A-01-020415-1600 | 1311, 3010A, 6010C | P | 3.5 mL | Yes | 12.26 SU | No | Yes | No mm |
| 480-89453-A-2 | A-01-031915-1600 | 1311, 3010A, 6010C | P | 3.5 mL | Yes | 12.13 SU | No | Yes | No mm |
| 480-89453-A-3 | A-01-040215-1505 | 1311, 3010A, 6010C | P | 3.5 mL | Yes | 12.39 SU | No | Yes | No mm |
| 480-89453-A-4 | A-01-050815-1600 | 1311, 3010A, 6010C | P | 3.5 mL | Yes | 12.33 SU | No | Yes | No mm |

| Lab Sample ID | Client Sample ID | Method Chain | Basis | VesselNumber | FiltCompDate | FiltCompTime | LeachatepH | LeachVolume | TCLP%Solids |
|---|---|---|---|---|---|---|---|---|---|
| LB2 480-270052/1 | | 1311, 3010A, 6010C | | Plastic | 10/22/15 | 9:00 | 2.81 SU | 900 mL | |
| 480-89453-A-1 | A-01-020415-1600 | 1311, 3010A, 6010C | P | Plastic | 10/22/15 | 9:00 | 12.33 SU | 550 mL | 100 % |
| 480-89453-A-2 | A-01-031915-1600 | 1311, 3010A, 6010C | P | Plastic | 10/22/15 | 9:00 | 12.53 SU | 500 mL | 100 % |
| 480-89453-A-3 | A-01-040215-1505 | 1311, 3010A, 6010C | P | Plastic | 10/22/15 | 9:00 | 12.58 SU | 600 mL | 100 % |
| 480-89453-A-4 | A-01-050815-1600 | 1311, 3010A, 6010C | P | Plastic | 10/22/15 | 9:00 | 12.58 SU | 500 mL | 100 % |

| Lab Sample ID | Client Sample ID | Method Chain | Basis | ExtractFluid |
|---|---|---|---|---|
| LB2 480-270052/1 | | 1311, 3010A, 6010C | | 2 |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

# METALS BATCH WORKSHEET

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Batch Number: 270052  Batch Start Date: 10/21/15 09:40  Batch Analyst: Salverson, Jessica L

Batch Method: 1311  Batch End Date:

| Lab Sample ID | Client Sample ID | Method Chain | Basis | ExtractFluid | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 480-89453-A-1 | A-01-020415-1600 | 1311, 3010A, 6010C | P | 2 | | | | | |
| 480-89453-A-2 | A-01-031915-1600 | 1311, 3010A, 6010C | P | 2 | | | | | |
| 480-89453-A-3 | A-01-040215-1505 | 1311, 3010A, 6010C | P | 2 | | | | | |
| 480-89453-A-4 | A-01-050815-1600 | 1311, 3010A, 6010C | P | 2 | | | | | |

| Batch Notes | |
|---|---|
| 1N HCl Lot # | 2761430 |
| Balance ID | B037067151 |
| Bottle Lot Number | 0229001X |
| pH Buffer 1 ID | 2920232 (2) |
| pH Buffer 2 ID | 2920231 (4) |
| pH Buffer 3 ID | 2942709 (7); Second Source 3012185 (7.05) |
| pH Buffer 4 ID | 2920230 (10) |
| First End time | 07:50 |
| Filter Lot # | 400105-5279 |
| pH Meter Calibration Slope | 94.1% |
| Room Temperature Thermometer ID | 122273689 |
| First Start time | 15:50 |
| TCLP Fluid 2 ID | 3012619;3038066 |
| TCLPFluid 2 pH | 2.93;2.93 |
| Maximum Temperature | 21.60 Degrees C |
| Minimum Temperature | 21.50 Degrees C |
| ID number of the thermometer | 122273689 |
| Tumbler Rotations per Minute | 28 RPM JS 10/21/15 Tumbler #1, Tumbler #2 |
| Uncorrected Maximum Temperature | 21.70 Degrees C |
| Uncorrected Minimum Temperature | 21.60 Degrees C |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Batch Number: 270052  Batch Start Date: 10/21/15 09:40  Batch Analyst: Salverson, Jessica L

Batch Method: 1311  Batch End Date:

| Basis | Basis Description |
|---|---|
| P | TCLP |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

6010C

# METALS BATCH WORKSHEET

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Batch Number: 270374  Batch Start Date: 10/22/15 11:30  Batch Analyst: Javed, Khansa

Batch Method: 3010A  Batch End Date:

| Lab Sample ID | Client Sample ID | Method Chain | Basis | InitialAmount | FinalAmount | MED_TCLP 00013 | MEH_HG_TCLP_W 00073 | | |
|---|---|---|---|---|---|---|---|---|---|
| LB2 480-270052/1-A | | 3010A, 6010C | | 50 mL | 50 mL | | | | |
| MB 480-270374/2 | | 3010A, 6010C | | 50 mL | 50 mL | | | | |
| LCS 480-270374/3 | | 3010A, 6010C | | 50 mL | 50 mL | 0.25 mL | 0.25 mL | | |
| 480-89453-A-1-A | A-01-020415-1600 | 3010A, 6010C | P | 50 mL | 50 mL | | | | |
| 480-89453-A-2-A | A-01-031915-1600 | 3010A, 6010C | P | 50 mL | 50 mL | | | | |
| 480-89453-A-3-A | A-01-040215-1505 | 3010A, 6010C | P | 50 mL | 50 mL | | | | |
| 480-89453-A-4-A | A-01-050815-1600 | 3010A, 6010C | P | 50 mL | 50 mL | | | | |
| 480-89453-A-4-A MS | A-01-050815-1600 | 3010A, 6010C | P | 50 mL | 50 mL | 0.25 mL | 0.25 mL | | |
| 480-89453-A-4-A MSD | A-01-050815-1600 | 3010A, 6010C | P | 50 mL | 50 mL | 0.25 mL | 0.25 mL | | |

| Batch Notes | |
|---|---|
| Batch Comment | Spiked and preserved at pH<2 Paper Lot #HC547770 @ 1103 |
| First End time | 1615 |
| Filter Paper Lot Number | 50630753 (push filters) |
| Lot # of hydrochloric acid | 2956401 |
| Lot # of Nitric Acid | 0000113071 |
| Hot Block ID number | D |
| Oven, Bath or Block Temperature 1 | 94.2 Degrees C |
| Oven, Bath or Block Temperature 2 | 93.0 Degrees C |
| pH Paper Lot Number | HC554612 |
| Pipette ID | AN-7 |
| First Start time | 1130 |
| ID number of the thermometer | 150584583 |
| Digestion Tube/Cup Lot # | 1501179 |
| Uncorrected Temperature | 94.6 Degrees C |
| Uncorrected Temperature 2 | 93.4 Degrees C |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Batch Number: 270374 Batch Start Date: 10/22/15 11:30 Batch Analyst: Javed, Khansa

Batch Method: 3010A Batch End Date:

| Basis | Basis Description |
|---|---|
| P | TCLP |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

# METALS BATCH WORKSHEET

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Batch Number: 270052  Batch Start Date: 10/21/15 09:40  Batch Analyst: Salverson, Jessica L

Batch Method: 1311  Batch End Date:

| Lab Sample ID | Client Sample ID | Method Chain | Basis | InitialAmount | FinalAmount | EFD_PartSizeRed | EFD_SampleWeight | EFD_VolumeWaterAdd | EFD_InitialpH |
|---|---|---|---|---|---|---|---|---|---|
| LB2 480-270052/1 | | 1311, 7470A, 7470A | | | 2000 mL | | | | |
| 480-89453-A-1 | A-01-020415-1600 | 1311, 7470A, 7470A | P | 50.03 g | 1000.6 mL | No | 5.03 g | 96.5 mL | 12.66 SU |
| 480-89453-A-2 | A-01-031915-1600 | 1311, 7470A, 7470A | P | 50.13 g | 1002.6 mL | No | 5.08 g | 96.5 mL | 12.63 SU |
| 480-89453-A-3 | A-01-040215-1505 | 1311, 7470A, 7470A | P | 50.11 g | 1002.2 mL | No | 5.03 g | 96.5 mL | 12.62 SU |
| 480-89453-A-4 | A-01-050815-1600 | 1311, 7470A, 7470A | P | 40.03 g | 800.6 mL | No | 5.14 g | 96.5 mL | 12.58 SU |

| Lab Sample ID | Client Sample ID | Method Chain | Basis | EFD_AddHClpH>5 | EFD_HeatHeld | EFD_SecondpHCheck | ExtractionFluidOne | ExtractionFluidTwo | PartSizeRed |
|---|---|---|---|---|---|---|---|---|---|
| LB2 480-270052/1 | | 1311, 7470A, 7470A | | | | | No | Yes | |
| 480-89453-A-1 | A-01-020415-1600 | 1311, 7470A, 7470A | P | 3.5 mL | Yes | 12.26 SU | No | Yes | No mm |
| 480-89453-A-2 | A-01-031915-1600 | 1311, 7470A, 7470A | P | 3.5 mL | Yes | 12.13 SU | No | Yes | No mm |
| 480-89453-A-3 | A-01-040215-1505 | 1311, 7470A, 7470A | P | 3.5 mL | Yes | 12.39 SU | No | Yes | No mm |
| 480-89453-A-4 | A-01-050815-1600 | 1311, 7470A, 7470A | P | 3.5 mL | Yes | 12.33 SU | No | Yes | No mm |

| Lab Sample ID | Client Sample ID | Method Chain | Basis | VesselNumber | FiltCompDate | FiltCompTime | LeachatepH | LeachVolume | TCLP%Solids |
|---|---|---|---|---|---|---|---|---|---|
| LB2 480-270052/1 | | 1311, 7470A, 7470A | | Plastic | 10/22/15 | 9:00 | 2.81 SU | 900 mL | |
| 480-89453-A-1 | A-01-020415-1600 | 1311, 7470A, 7470A | P | Plastic | 10/22/15 | 9:00 | 12.33 SU | 550 mL | 100 % |
| 480-89453-A-2 | A-01-031915-1600 | 1311, 7470A, 7470A | P | Plastic | 10/22/15 | 9:00 | 12.53 SU | 500 mL | 100 % |
| 480-89453-A-3 | A-01-040215-1505 | 1311, 7470A, 7470A | P | Plastic | 10/22/15 | 9:00 | 12.58 SU | 600 mL | 100 % |
| 480-89453-A-4 | A-01-050815-1600 | 1311, 7470A, 7470A | P | Plastic | 10/22/15 | 9:00 | 12.58 SU | 500 mL | 100 % |

| Lab Sample ID | Client Sample ID | Method Chain | Basis | ExtractFluid |
|---|---|---|---|---|
| LB2 480-270052/1 | | 1311, 7470A, 7470A | | 2 |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

# METALS BATCH WORKSHEET

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Batch Number: 270052  Batch Start Date: 10/21/15 09:40  Batch Analyst: Salverson, Jessica L

Batch Method: 1311  Batch End Date:

| Lab Sample ID | Client Sample ID | Method Chain | Basis | ExtractFluid | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 480-89453-A-1 | A-01-020415-1600 | 1311, 7470A, 7470A | P | 2 | | | | | |
| 480-89453-A-2 | A-01-031915-1600 | 1311, 7470A, 7470A | P | 2 | | | | | |
| 480-89453-A-3 | A-01-040215-1505 | 1311, 7470A, 7470A | P | 2 | | | | | |
| 480-89453-A-4 | A-01-050815-1600 | 1311, 7470A, 7470A | P | 2 | | | | | |

| Batch Notes | |
|---|---|
| 1N HCl Lot # | 2761430 |
| Balance ID | B037067151 |
| Bottle Lot Number | 0229001X |
| pH Buffer 1 ID | 2920232 (2) |
| pH Buffer 2 ID | 2920231 (4) |
| pH Buffer 3 ID | 2942709 (7); Second Source 3012185 (7.05) |
| pH Buffer 4 ID | 2920230 (10) |
| First End time | 07:50 |
| Filter Lot # | 400105-5279 |
| pH Meter Calibration Slope | 94.1% |
| Room Temperature Thermometer ID | 122273689 |
| First Start time | 15:50 |
| TCLP Fluid 2 ID | 3012619;3038066 |
| TCLPFluid 2 pH | 2.93;2.93 |
| Maximum Temperature | 21.60 Degrees C |
| Minimum Temperature | 21.50 Degrees C |
| ID number of the thermometer | 122273689 |
| Tumbler Rotations per Minute | 28 RPM JS 10/21/15 Tumbler #1, Tumbler #2 |
| Uncorrected Maximum Temperature | 21.70 Degrees C |
| Uncorrected Minimum Temperature | 21.60 Degrees C |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: TestAmerica Buffalo Job No.: 480-89453-1

SDG No.:

Batch Number: 270052 Batch Start Date: 10/21/15 09:40 Batch Analyst: Salverson, Jessica L

Batch Method: 1311 Batch End Date:

| Basis | Basis Description |
|---|---|
| P | TCLP |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

# METALS BATCH WORKSHEET

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Batch Number: 270385  Batch Start Date: 10/22/15 12:15  Batch Analyst: Seger, Tiffany A

Batch Method: 7470A  Batch End Date:

| Lab Sample ID | Client Sample ID | Method Chain | Basis | InitialAmount | FinalAmount | MEH_HG_TCLP_W 00073 | | | |
|---|---|---|---|---|---|---|---|---|---|
| LB2 480-270052/1-A | | 7470A, 7470A | | 30 mL | 50 mL | | | | |
| MB 480-270385/2 | | 7470A, 7470A | | 30 mL | 50 mL | | | | |
| LCS 480-270385/3 | | 7470A, 7470A | | 30 mL | 50 mL | 0.15 mL | | | |
| 480-89453-A-1-A | A-01-020415-1600 | 7470A, 7470A | P | 30 mL | 50 mL | | | | |
| 480-89453-A-2-A | A-01-031915-1600 | 7470A, 7470A | P | 30 mL | 50 mL | | | | |
| 480-89453-A-3-A | A-01-040215-1505 | 7470A, 7470A | P | 30 mL | 50 mL | | | | |
| 480-89453-A-4-A | A-01-050815-1600 | 7470A, 7470A | P | 30 mL | 50 mL | | | | |
| 480-89453-A-4-A MS | A-01-050815-1600 | 7470A, 7470A | P | 30 mL | 50 mL | 0.15 mL | | | |
| 480-89453-A-4-A MSD | A-01-050815-1600 | 7470A, 7470A | P | 30 mL | 50 mL | 0.15 mL | | | |

| Batch Notes | |
|---|---|
| Hydroxylamine Hydrochloride Lot | 3032375 |
| Batch Comment | Cal Batch: 270301 |
| Digestion End Time | 1415 |
| Digestion Start Time | 1215 |
| Sulfuric Acid Lot Number | 3014228 |
| Lot # of Nitric Acid | 3021848 |
| Hot Block ID number | HG-A |
| Potassium Persulfate Lot Number | 3011385 |
| Potassium Permanganate Lot Number | 3021103 |
| Oven, Bath or Block Temperature 1 | 95.5 Celsius |
| Pipette ID | HGL-4 @ 1025 10/22/2015 |
| Stannous Chloride Lot Number | 3036153 |
| ID number of the thermometer | S/N52942 |
| Digestion Tube/Cup Lot # | 1501179 |
| Uncorrected Temperature | 95.0 Celsius |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Batch Number: 270385  Batch Start Date: 10/22/15 12:15  Batch Analyst: Seger, Tiffany A

Batch Method: 7470A  Batch End Date:

| Basis | Basis Description |
|---|---|
| P | TCLP |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

# METALS BATCH WORKSHEET

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Batch Number: 270135  Batch Start Date: 10/21/15 15:00  Batch Analyst: Seger, Tiffany A

Batch Method: 7471B  Batch End Date:

| Lab Sample ID | Client Sample ID | Method Chain | Basis | InitialAmount | FinalAmount | MED_SRM_D085 00002 | MEH_HG2_WKG 01023 | | |
|---|---|---|---|---|---|---|---|---|---|
| MB 480-270135/1 | | 7471B, 7471B | | +0.5937 g | 50 mL | | | | |
| LCSSRM 480-270135/2 | | 7471B, 7471B | | +0.0239 g | 50 mL | +0.0239 g | | | |
| 480-89453-A-1 | A-01-020415-1600 | 7471B, 7471B | T | +0.5970 g | 50 mL | | | | |
| 480-89453-A-1 MS | A-01-020415-1600 | 7471B, 7471B | T | +0.5942 g | 50 mL | | 2 mL | | |
| 480-89453-A-1 MSD | A-01-020415-1600 | 7471B, 7471B | T | +0.5954 g | 50 mL | | 2 mL | | |
| 480-89453-A-2 | A-01-031915-1600 | 7471B, 7471B | T | +0.5845 g | 50 mL | | | | |
| 480-89453-A-3 | A-01-040215-1505 | 7471B, 7471B | T | +0.5921 g | 50 mL | | | | |
| 480-89453-A-4 | A-01-050815-1600 | 7471B, 7471B | T | +0.5874 g | 50 mL | | | | |

| Batch Notes | |
|---|---|
| Hydroxylamine Hydrochloride Lot | 3032375 |
| Balance ID | 25850472 |
| Batch Comment | Cal Batch: 270075 |
| Blank Soil Lot Number | 3033791 |
| Digestion End Time | 1530 |
| Digestion Start Time | 1500 |
| Lot # of hydrochlotic acid | 3021075 |
| Lot # of Nitric Acid | 3021845 |
| Hot Block ID number | HG-A |
| Potassium Permanganate Lot Number | 3021103 |
| Oven, Bath or Block Temperature 1 | 95.5 Celsius |
| Pipette ID | HGL-5 |
| Stannous Chloride Lot Number | 3011365 |
| ID number of the thermometer | S/N52492 |
| Digestion Tube/Cup Lot # | 1501179 |
| Uncorrected Temperature | 95.0 Celsius |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: TestAmerica Buffalo  Job No.: 480-89453-1

SDG No.:

Batch Number: 270135  Batch Start Date: 10/21/15 15:00  Batch Analyst: Seger, Tiffany A

Batch Method: 7471B  Batch End Date:

| Basis | Basis Description |
|---|---|
| T | Total/NA |



The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

# METALS BATCH WORKSHEET

Lab Name: TestAmerica Pittsburgh  Job No.: 480-89453-1

SDG No.:

Batch Number: 159790  Batch Start Date: 11/09/15 12:50  Batch Analyst: Hartsock, Bobbi M

Batch Method: 3050B  Batch End Date: 11/09/15 14:50

| Lab Sample ID | Client Sample ID | Method Chain | Basis | CalcMeg | InitialAmount | FinalAmount | MTAPITTICPMS 00022 | MTAPITTMSA 00027 | MTAPITTMSC 00033 |
|---|---|---|---|---|---|---|---|---|---|
| MB 180-159790/1 | | 3050B, 6020A | | CALC NOT SET TO RUN | 00001.04 g | 100 mL | | | |
| LCS 180-159790/2 | | 3050B, 6020A | | CALC NOT SET TO RUN | 00001.02 g | 100 mL | 1 mL | 1 mL | 1 mL |
| LCSD 180-159790/3 | | 3050B, 6020A | | CALC NOT SET TO RUN | 00001.04 g | 100 mL | 1 mL | 1 mL | 1 mL |
| 480-89453-A-1 | A-01-020415-1600 | 3050B, 6020A | T | CALC NOT SET TO RUN | 00001.04 g | 100 mL | | | |
| 480-89453-A-2 | A-01-031915-1600 | 3050B, 6020A | T | CALC NOT SET TO RUN | 00001.05 g | 100 mL | | | |
| 480-89453-A-3 | A-01-040215-1505 | 3050B, 6020A | T | CALC NOT SET TO RUN | 00001.01 g | 100 mL | | | |
| 480-89453-A-4 | A-01-050815-1600 | 3050B, 6020A | T | CALC NOT SET TO RUN | 00001.04 g | 100 mL | | | |

| Batch Notes | |
|---|---|
| Balance ID | P1856710 |
| Batch Comment | Metals C3 |
| Blank Soil Lot Number | 1736518 |
| First End time | 1450 |
| Filter Paper Lot Number | 9664849 |
| Hydrogen peroxide lot number | 10ml 1776515 |
| Lot # of hydrochloric acid | 10ml 1779189 |
| Logbook ID for diluted Nitric | 10ml 1776088 |
| Lot # of Nitric Acid | 5ml 1734536 |
| Hot Block ID number | HB11 |
| Oven, Bath or Block Temperature 1 | 95C Degrees C |
| Pipette ID | L12015110 |
| Person's name who witnessed reagent drop | BMH |
| Perform Calculation (0=No, 1=Yes) | 0 |
| First Start time | 1250 |
| ID number of the thermometer | IR3-14-METALS CF0.0 C1 |
| Digestion Tube/Cup Lot # | 1504103 |
| Uncorrected Temperature | 95C Celsius |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

METALS BATCH WORKSHEET

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

Batch Number: 159790 Batch Start Date: 11/09/15 12:50 Batch Analyst: Hartsock, Bobbi M

Batch Method: 3050B Batch End Date: 11/09/15 14:50

| Basis | Basis Description |
|---|---|
| T | Total/NA |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

# GENERAL CHEMISTRY

COVER PAGE
GENERAL CHEMISTRY

Lab Name: TestAmerica Pittsburgh Job Number: 480-89453-1

SDG No.:

Project: Cerl Gasifier - Research Project

| Client Sample ID | Lab Sample ID |
|---|---|
| A-01-020415-1600 | 480-89453-1 |
| A-01-031915-1600 | 480-89453-2 |
| A-01-040215-1505 | 480-89453-3 |
| A-01-050815-1600 | 480-89453-4 |

Comments:

9-IN
DETECTION LIMITS
GENERAL CHEMISTRY

Lab Name: TestAmerica Pittsburgh Job Number: 480-89453-1

SDG Number:

Matrix: Solid Instrument ID: NOEQUIP

Method: 2540G RL Date: 01/31/2010 13:27

| Analyte | Wavelength/ Mass | RL (%) | |
|---|---|---|---|
| Percent Moisture | | 0.1 | |
| Percent Solids | | 0.1 | |

9-IN
CALIBRATION BLANK DETECTION LIMITS
GENERAL CHEMISTRY

Lab Name: TestAmerica Pittsburgh Job Number: 480-89453-1

SDG Number:

Matrix: Solid Instrument ID: NOEQUIP

Method: 2540G XRL Date: 01/31/2010 13:31

| Analyte | Wavelength/ Mass | XRL (%) | |
|---|---|---|---|
| Percent Moisture | | 0.1 | |
| Percent Solids | | 0.1 | |

13-IN
ANALYSIS RUN LOG
GENERAL CHEMISTRY

Lab Name: TestAmerica Pittsburgh Job No.: 480-89453-1

SDG No.:

Instrument ID: NOEQUIP Method: 2540G

Start Date: 10/27/2015 08:35 End Date: 10/27/2015 08:35

| Lab Sample ID | D/F | Type | Time | Analytes | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | %Sol | Moist | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| 480-89453-1 | 1 | T | 08:35 | X | X | | | | | | | | | | | | | | | | | | |
| 480-89453-2 | 1 | T | 08:35 | X | X | | | | | | | | | | | | | | | | | | |
| 480-89453-3 | 1 | T | 08:35 | X | X | | | | | | | | | | | | | | | | | | |
| 480-89453-4 | 1 | T | 08:35 | X | X | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |
| ZZZZZZ | | | 08:35 | | | | | | | | | | | | | | | | | | | | |

Prep Types
T = Total/NA

GENERAL CHEMISTRY BATCH WORKSHEET

Lab Name: TestAmerica Pittsburgh  Job No.: 480-89453-1

SDG No.:

Batch Number: 158347  Batch Start Date: 10/27/15 08:35  Batch Analyst: Loheyde, Cheryl

Batch Method: 2540G  Batch End Date:

| Lab Sample ID | Client Sample ID | Method Chain | Basis | DISH# | DishWeight | SampleMassWet | SampleMassDry | | |
|---|---|---|---|---|---|---|---|---|---|
| 480-89453-A-1 | A-01-020415-1600 | 2540G | T | v3259 0.1188 | 2.56 g | 5.87 g | 5.52 g | | |
| 480-89453-A-2 | A-01-031915-1600 | 2540G | T | Aw0br 0.1266 | 2.51 g | 6.12 g | 6.12 g | | |
| 480-89453-A-3 | A-01-040215-1505 | 2540G | T | Aw014 0.1120 | 2.48 g | 6.29 g | 6.29 g | | |
| 480-89453-A-4 | A-01-050815-1600 | 2540G | T | Aw018 0.1125 | 2.48 g | 5.02 g | 5.00 g | | |

| Batch Notes | |
|---|---|
| Balance ID | 1126472457 No Unit |
| Date and Time Samples in Desiccator | 10/28/15 04:45 |
| Date and Time Samples out of Desiccator | 10/28/15 05:45 |
| Date samples were placed in the oven | 10/27/15 |
| Oven Temp when samples are put in oven | 104.5 Degrees C |
| Time samples were place in the oven | 09:40 |
| Date samples were removed from oven | 10/28/15 |
| Oven Temp when samples removed from oven | 104.5 Degrees C |
| Time Samples were removed from oven | 04:45 |
| Oven ID | 5005 |
| ID number of the thermometer | WET 34 |
| Uncorrected In Temperature | 105 Celsius |
| Uncorrected Out Temperature | 105 Celsius |

| Basis | Basis Description |
|---|---|
| T | Total/NA |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

# Subcontract Data

# Shipping and Receiving Documents

**TestAmerica Buffalo**
10 Hazelwood Drive
Amherst, NY 14228-2298
Phone (716) 691-2600 Fax (716) 691-7991

# Chain of Custody Record

480-89453 Chain of Custody

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

| | | | |
|---|---|---|---|
| **Client Information (Sub Contract Lab)** | Sampler: | Lab PM: Fischer, Brian J | COC No: 480-26416.1 |
| Client Contact: Shipping/Receiving | Phone: | E-Mail: brian.fischer@testa | Page: Page 1 of 1 |
| Company: TestAmerica Laboratories, Inc. | | | Job #: 480-89453-1 |
| Address: 301 Alpha Drive, RIDC Park | Due Date Requested: 10/21/2015 | | |
| City: Pittsburgh | TAT Requested (days): | | |
| State, Zip: PA, 15238 | | | |
| Phone: 412-963-7058(Tel) 412-963-2468(Fax) | PO #: | | |
| Email: | WO #: | | |
| Project Name: Cerl Gasifier - Research Project | Project #: 48012846 | | |
| Site: | SSOW#: | | |

**Analysis Requested**

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2SO3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
Other:

| Sample Identification - Client ID (Lab ID) | Sample Date | Sample Time | Sample Type (C=Comp, G=grab) | Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air) | Field Filtered Sample (Yes or No) | Perform MS/MSD (Yes or No) | Moisture | 8020A/8060B RCRA Metals by ICP/MS 6020A | Total Number of containers | Special Instructions/Note: |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Preservation Code: | | | | | | | |
| A-01-020415-1600 (480-89453-1) | 2/4/15 | 16:00 Eastern | | Solid | | | X | X | | |
| A-01-031915-1600 (480-89453-2) | 3/19/15 | 16:00 Eastern | | Solid | | | X | X | | |
| A-01-040215-1505 (480-89453-3) | 4/2/15 | 15:05 Eastern | | Solid | | | X | X | | |
| A-01-050815-1600 (480-89453-4) | 5/8/15 | 16:00 Eastern | | Solid | | | X | X | | |

***Possible Hazard Identification***
*Unconfirmed*
Deliverable Requested: I, II, III, IV, Other (specify)

***Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month)***
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Special Instructions/QC Requirements:

| | | | | | |
|---|---|---|---|---|---|
| Empty Kit Relinquished by: | Date: | | Time: | Method of Shipment: | |
| Relinquished by: C Walter | Date/Time: 10/21/15 1700 | Company: TAB | Received by: D Nation | Date/Time: 10/22/15 850 | Company: TAT |
| Relinquished by: | Date/Time: | Company | Received by: | Date/Time: | Company |
| Relinquished by: | Date/Time: | Company | Received by: | Date/Time: | Company |
| Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | | Cooler Temperature(s) °C and Other Remarks: | | |

## Login Sample Receipt Checklist

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

**Login Number: 89453**
**List Number: 1**
**Creator: Kinecki, Kenneth P**

**List Source: TestAmerica Buffalo**

| Question | Answer | Comment |
|---|---|---|
| Radioactivity either was not measured or, if measured, is at or below background | True | |
| The cooler's custody seal, if present, is intact. | True | |
| The cooler or samples do not appear to have been compromised or tampered with. | True | |
| Samples were received on ice. | False | |
| Cooler Temperature is acceptable | False | |
| Cooler Temperature is recorded. | True | |
| COC is present. | False | Filled out by TA Buffalo |
| COC is filled out in ink and legible. | True | |
| COC is filled out with all pertinent information | True | |
| Is the Field Sampler's name present on COC? | False | |
| There are no discrepancies between the sample IDs on the containers and the COC. | True | |
| Samples are received within Holding Time. | False | |
| Sample containers have legible labels. | True | |
| Containers are not broken or leaking. | True | |
| Sample collection date/times are provided. | True | Imbedded in the sample ID's |
| Appropriate sample containers are used. | False | Canning Jars |
| Sample bottles are completely filled. | False | |
| Sample Preservation Verified | True | |
| There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs | False | Samople -04 contains 59 grams |
| VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter. | True | |
| If necessary, staff have been informed of any short hold time or quick TAT needs | True | |
| Multiphasic samples are not present. | True | |
| Samples do not require splitting or compositing. | True | |
| Sampling Company provided. | True | USACE |
| Samples received within 48 hours of sampling. | True | |
| Samples requiring field filtration have been filtered in the field. | N/A | |
| Chlorine Residual checked. | N/A | |

## Login Sample Receipt Checklist

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89453-1

**Login Number: 89453**
**List Number: 2**
**Creator: Watson, Debbie**

**List Source: TestAmerica Pittsburgh**
**List Creation: 10/22/15 03:02 PM**

| Question | Answer | Comment |
|---|---|---|
| Radioactivity wasn't checked or is </= background as measured by a survey meter. | True | |
| The cooler's custody seal, if present, is intact. | True | |
| Sample custody seals, if present, are intact. | True | |
| The cooler or samples do not appear to have been compromised or tampered with. | True | |
| Samples were received on ice. | True | |
| Cooler Temperature is acceptable. | True | |
| Cooler Temperature is recorded. | True | |
| COC is present. | True | |
| COC is filled out in ink and legible. | True | |
| COC is filled out with all pertinent information. | True | |
| Is the Field Sampler's name present on COC? | True | |
| There are no discrepancies between the containers received and the COC. | True | |
| Samples are received within Holding Time. | True | |
| Sample containers have legible labels. | True | |
| Containers are not broken or leaking. | True | |
| Sample collection date/times are provided. | True | |
| Appropriate sample containers are used. | True | |
| Sample bottles are completely filled. | True | |
| Sample Preservation Verified. | True | |
| There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs | True | |
| Containers requiring zero headspace have no headspace or bubble is <6mm (1/4"). | True | |
| Multiphasic samples are not present. | True | |
| Samples do not require splitting or compositing. | True | |
| Residual Chlorine Checked. | N/A | |

# Appendix G : Analyses of Condensate and Pyro Oil

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

Job Number: 480-89467-1

Job Description: Cerl Gasifier - Research Project

For:
U.S. Army Construction Engineering Resea
2902 Newmark Drive
Champaign, IL 61822

Attention: Mr. Stephen Cosper

Joseph V. Giacomazza

Approved for release
Joe V Giacomazza
Project Management Assistant I
11/13/2015 5:04 PM

Designee for
Brian J Fischer, Manager of Project Management
10 Hazelwood Drive, Amherst, NY, 14228-2298
(716)504-9835
brian.fischer@testamericainc.com
11/13/2015

The test results in this report meet all NELAP requirements for analytes for which accreditation is required or available. Any exceptions to the NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory. All questions regarding this test report should be directed to the TestAmerica Project Manager who has signed this report.

TestAmerica Buffalo NELAC Certifications: CADPH 01169CA, FLDOH E87672, ILEPA 200003, KSDOH E-10187, LADEQ 30708, MDH 036-999-337, NHELAP 2973, NJDEP NY455, NHDOH 10026, ORELAP NY200003, PADEP 68-00281, TXCEQ T-104704412-10-1

# Table of Contents


Cover Title Page . . . 1
Data Summaries . . . 4
Report Narrative . . . 4
Manual Integration Summary . . . 5
Sample Summary . . . 16
Executive Summary . . . 17
Method Summary . . . 21
Method / Analyst Summary . . . 22
Sample Datasheets . . . 23
Surrogate Summary . . . 50
QC Data Summary . . . 53
Data Qualifiers . . . 59
QC Association Summary . . . 60
Lab Chronicle . . . 62
Reagent Traceability . . . 67
Certification Summary . . . 158
Organic Sample Data . . . 159
GC/MS Semi VOA . . . 159
Method 8270D . . . 159
Method 8270D QC Summary . . . 160
Method 8270D Sample Data . . . 185
Standards Data . . . 202
Method 8270D ICAL Data . . . 202
Method 8270D Resolution Data . . . 222
Method 8270D CCAL Data . . . 226
Raw QC Data . . . 238

# Table of Contents


Method 8270D Blank Data ..... 238

Method 8270D LCS/LCSD Data ..... 240

Method 8270D Run Logs ..... 243

Method 8270D Prep Data ..... 249

GC VOA ..... 252

Method 8021B ..... 252

Method 8021B QC Summary ..... 253

Method 8021B Sample Data ..... 267

Standards Data ..... 277

Method 8021B ICAL Data ..... 277

Method 8021B CCAL Data ..... 291

Raw QC Data ..... 315

Method 8021B Blank Data ..... 315

Method 8021B LCS/LCSD Data ..... 316

Method 8021B Run Logs ..... 318

Shipping and Receiving Documents ..... 321

Client Chain of Custody ..... 322

Sample Receipt Checklist ..... 326

**Receipt**
The samples were received on 10/20/2015 9:20 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 20.0° C.

**Receipt Exceptions**
Samples for 8021 analyses were pre-diluted in sample control by a DF of 40.

Samples for 8270 analyses were pre-diluted in sample control by a DF of 100.

**GC/MS VOA**
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

**GC/MS Semi VOA**
Method(s) 8270D: The following samples required a dilution due to the nature of the sample matrix: OS-01-042815-1600 (480-89467-16) and OS-01-101514-0910 (480-89467-22). Because of this dilution, the surrogate spike concentration in the sample was reduced to a level where the recovery calculation does not provide useful information.

Method(s) 8270D: The following samples were diluted due to viscosity: OS-01-031815-1530 (480-89467-14), OS-01-042415-1600 (480-89467-15), OS-01-042815-1600 (480-89467-16), OS-01-050715-1630 (480-89467-17) and OS-01-101514-0910 (480-89467-22). Elevated reporting limits (RL) are provided.

Method(s) 8270D: The following samples were diluted due to the nature of the sample matrix: WW-02-030515-1557 (480-89467-2), WW-01-030515-1352 (480-89467-5), WW-01-042815-1600 (480-89467-6), WW-01-050715-1600 (480-89467-8), P-01-030515-1557 (480-89467-10), P-01-051315-1530 (480-89467-13), P-01-101514-0910 (480-89467-18), P-01-100814-1120 (480-89467-19) and P-01-013015-0915 (480-89467-20). As such, surrogate recoveries are below the calibration range or are not reported, and elevated reporting limits (RLs) are provided.

Method(s) 8270D: The following samples were diluted due to the abundance of target analytes: WW-01-042815-1600 (480-89467-6), WW-01-050715-1600 (480-89467-8) and P-01-013015-0915 (480-89467-20). As such, surrogate recoveries are below the calibration range or are not reported, and elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

**GC VOA**
Method(s) 8021B: The following samples were analyzed outside of analytical holding time due to analysis request date outside of holding time: WW-01-101514-1120 (480-89467-1), WW-01-031915-1550 (480-89467-3), WW-01-041415-1640 (480-89467-4), WW-01-050615-1552 (480-89467-7), WW-01-052015-1500 (480-89467-9), P-01-031315-1531 (480-89467-11), P-01-050615-1552 (480-89467-12), P-01-040115-1600 (480-89467-21), P-01-012215-0948 (480-89467-23) and WW-01-031315-1531 (480-89467-24).

Method(s) 8021B: The following samples were diluted to bring the concentration of target analytes within the calibration range: WW-01-101514-1120 (480-89467-1), WW-01-031915-1550 (480-89467-3), WW-01-041415-1640 (480-89467-4), WW-01-050615-1552 (480-89467-7), WW-01-052015-1500 (480-89467-9), P-01-031315-1531 (480-89467-11), P-01-050615-1552 (480-89467-12), P-01-040115-1600 (480-89467-21), P-01-012215-0948 (480-89467-23) and WW-01-031315-1531 (480-89467-24). Elevated reporting limits (RLs) are provided.

Method(s) 8021B: The recovery of the one surrogate in samples WW-01-031315-1531 (480-89467-24) exceeds quality control limits due to the sample matrix. The recovery of the secondary surrogate is within quality control criteria; no corrective action is required.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

**Organic Prep**
Method(s) 3510C: The following samples was prepared outside of preparation holding time: WW-02-030515-1557 (480-89467-2), WW-01-030515-1352 (480-89467-5), WW-01-042815-1600 (480-89467-6), WW-01-050715-1600 (480-89467-8), P-01-030515-1557 (480-89467-10), P-01-051315-1530 (480-89467-13), P-01-101514-0910 (480-89467-18), P-01-100814-1120 (480-89467-19) and P-01-013015-0915 (480-89467-20).

Method(s) 3580A: The following samples were prepared outside of preparation holding time due to test added after holding time expired: OS-01-031815-1530 (480-89467-14), OS-01-042415-1600 (480-89467-15), OS-01-042815-1600 (480-89467-16), OS-01-050715-1630 (480-89467-17) and OS-01-101514-0910 (480-89467-22).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC/MS SEMI VOA MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.:

SDG No.:

Instrument ID: HP5973V Analysis Batch Number: 271208

Lab Sample ID: IC 480-271208/3 Client Sample ID:

Date Analyzed: 10/26/15 19:36 Lab File ID: V53780.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzoic acid | 7.65 | Assign Peak | richardsd | 10/27/15 10:23 |
| Indeno[1,2,3-cd]pyrene | 18.23 | Incomplete Integration | richardsd | 10/27/15 10:23 |

Lab Sample ID: ICIS 480-271208/6 Client Sample ID:

Date Analyzed: 10/26/15 21:04 Lab File ID: V53783.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Caprolactam | 8.30 | Incomplete Integration | richardsd | 10/27/15 10:26 |

Lab Sample ID: IC 480-271208/7 Client Sample ID:

Date Analyzed: 10/26/15 21:33 Lab File ID: V53784.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Caprolactam | 8.32 | Incomplete Integration | richardsd | 10/27/15 10:28 |

Lab Sample ID: IC 480-271208/8 Client Sample ID:

Date Analyzed: 10/26/15 22:02 Lab File ID: V53785.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Caprolactam | 8.32 | Incomplete Integration | richardsd | 10/27/15 10:28 |

Lab Sample ID: IC 480-271208/9 Client Sample ID:

Date Analyzed: 10/26/15 22:31 Lab File ID: V53786.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Caprolactam | 8.33 | Incomplete Integration | richardsd | 10/27/15 10:28 |

GC/MS SEMI VOA MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5973V Analysis Batch Number: 273999

Lab Sample ID: CCVIS 480-273999/3 Client Sample ID:

Date Analyzed: 11/10/15 11:07 Lab File ID: V60002.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| 4-Chloroaniline | 7.96 | Peak Tail | richardsd | 11/10/15 12:44 |
| Pentachlorophenol | 10.52 | Peak Tail | richardsd | 11/10/15 12:44 |

GC/MS SEMI VOA MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5973V Analysis Batch Number: 274392

Lab Sample ID: CCVIS 480-274392/3 Client Sample ID:

Date Analyzed: 11/11/15 12:49 Lab File ID: V60044.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| 4-Chloroaniline | 7.95 | Baseline | richardsd | 11/11/15 14:14 |
| Pentachlorophenol | 10.51 | Peak Tail | richardsd | 11/11/15 14:14 |

GC/MS SEMI VOA MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.:

SDG No.:

Instrument ID: HP5973X Analysis Batch Number: 270613

Lab Sample ID: IC 480-270613/3 Client Sample ID:

Date Analyzed: 10/23/15 08:33 Lab File ID: X009013899.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzoic acid | 7.88 | Assign Peak | WolfL | 10/26/15 16:12 |

Lab Sample ID: IC 480-270613/4 Client Sample ID:

Date Analyzed: 10/23/15 09:00 Lab File ID: X009013900.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzoic acid | 7.90 | Assign Peak | WolfL | 10/26/15 16:13 |

Lab Sample ID: ICIS 480-270613/5 Client Sample ID:

Date Analyzed: 10/23/15 09:27 Lab File ID: X009013901.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzoic acid | 7.93 | Assign Peak | WolfL | 10/26/15 16:04 |
| Caprolactam | 8.75 | Poor chromatography | WolfL | 10/26/15 16:04 |

Lab Sample ID: IC 480-270613/6 Client Sample ID:

Date Analyzed: 10/23/15 09:54 Lab File ID: X009013902.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzoic acid | 7.96 | Assign Peak | WolfL | 10/26/15 16:07 |
| Caprolactam | 8.77 | Poor chromatography | WolfL | 10/26/15 16:07 |

414

GC/MS SEMI VOA MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.:

SDG No.:

Instrument ID: HP5973X Analysis Batch Number: 270613

Lab Sample ID: IC 480-270613/7 Client Sample ID:

Date Analyzed: 10/23/15 10:21 Lab File ID: X009013903.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzoic acid | 7.96 | Assign Peak | WolfL | 10/26/15 16:08 |
| Caprolactam | 8.77 | Poor chromatography | WolfL | 10/26/15 16:08 |

Lab Sample ID: IC 480-270613/8 Client Sample ID:

Date Analyzed: 10/23/15 10:48 Lab File ID: X009013904.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzoic acid | 7.97 | Assign Peak | WolfL | 10/26/15 16:10 |
| Caprolactam | 8.78 | Poor chromatography | WolfL | 10/26/15 16:10 |

415

GC/MS SEMI VOA MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5973X Analysis Batch Number: 273506

Lab Sample ID: CCVIS 480-273506/3 Client Sample ID:

Date Analyzed: 11/05/15 10:42 Lab File ID: X009014095.D GC Column: RXI-5Sil MS ID: 0.25(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzoic acid | 7.98 | Assign Peak | WolfL | 11/06/15 07:52 |

GC VOA MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.:

SDG No.:

Instrument ID: HP5890-3 Analysis Batch Number: 262944

Lab Sample ID: STD1 480-262944/2 IC Client Sample ID:

Date Analyzed: 09/10/15 17:44 Lab File ID: 3_67061.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| a,a,a-Trifluorotoluene | 4.41 | Baseline Smoothing | larsonj | 09/11/15 08:11 |
| Toluene | 5.16 | Baseline Smoothing | larsonj | 09/11/15 08:37 |
| n-Propylbenzene | 10.83 | Baseline Smoothing | larsonj | 09/11/15 08:11 |
| 1,3,5-Trimethylbenzene | 11.50 | Baseline Smoothing | larsonj | 09/11/15 08:11 |

Lab Sample ID: STD1 480-262944/2 IC Client Sample ID:

Date Analyzed: 09/10/15 17:44 Lab File ID: 3_67061.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Toluene | 6.35 | Baseline Smoothing | larsonj | 09/11/15 08:37 |
| Naphthalene | 18.42 | Split Peak | larsonj | 09/11/15 08:18 |

Lab Sample ID: STD2 480-262944/3 IC Client Sample ID:

Date Analyzed: 09/10/15 18:16 Lab File ID: 3_67062.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| n-Propylbenzene | 10.82 | Baseline Smoothing | larsonj | 09/11/15 08:17 |

Lab Sample ID: STD2 480-262944/3 IC Client Sample ID:

Date Analyzed: 09/10/15 18:16 Lab File ID: 3_67062.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Naphthalene | 18.42 | Split Peak | larsonj | 09/11/15 08:17 |

417

GC VOA MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.:

SDG No.:

Instrument ID: HP5890-3 Analysis Batch Number: 262944

Lab Sample ID: STD3 480-262944/4 IC Client Sample ID:

Date Analyzed: 09/10/15 18:48 Lab File ID: 3_67063.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Isopropylbenzene | 9.70 | Split Peak | larsonj | 09/11/15 08:19 |
| n-Propylbenzene | 10.80 | Split Peak | larsonj | 09/11/15 08:19 |

Lab Sample ID: STD3 480-262944/4 IC Client Sample ID:

Date Analyzed: 09/10/15 18:48 Lab File ID: 3_67063.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| n-Butylbenzene | 16.47 | Split Peak | larsonj | 09/11/15 08:19 |

Lab Sample ID: STD4 480-262944/5 IC Client Sample ID:

Date Analyzed: 09/10/15 19:20 Lab File ID: 3_67064.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Isopropylbenzene | 9.69 | Split Peak | larsonj | 09/11/15 08:20 |
| 4-Bromofluorobenzene | 10.32 | Split Peak | larsonj | 09/11/15 08:20 |
| n-Propylbenzene | 10.80 | Split Peak | larsonj | 09/11/15 08:20 |

Lab Sample ID: STD4 480-262944/5 IC Client Sample ID:

Date Analyzed: 09/10/15 19:20 Lab File ID: 3_67064.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| n-Butylbenzene | 16.47 | Split Peak | larsonj | 09/11/15 08:20 |

418

GC VOA MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.:

SDG No.:

Instrument ID: HP5890-3 Analysis Batch Number: 262944

Lab Sample ID: STD5 480-262944/6 IC Client Sample ID:

Date Analyzed: 09/10/15 19:52 Lab File ID: 3_67065.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzene | 4.16 | Split Peak | larsonj | 09/11/15 08:21 |
| n-Butylbenzene | 16.47 | Split Peak | larsonj | 09/11/15 08:21 |

419

GC VOA MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5890-3 Analysis Batch Number: 273207

Lab Sample ID: 480-89467-3 Client Sample ID: WW-01-031915-1550

Date Analyzed: 11/05/15 12:05 Lab File ID: 3_69028.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzene | 3.50 | Split Peak | larsonj | 11/06/15 08:44 |
| Toluene | 5.17 | Split Peak | larsonj | 11/06/15 08:44 |

Lab Sample ID: 480-89467-4 Client Sample ID: WW-01-041415-1640

Date Analyzed: 11/05/15 12:38 Lab File ID: 3_69029.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Toluene | 5.17 | Split Peak | larsonj | 11/06/15 08:45 |

Lab Sample ID: 480-89467-11 Client Sample ID: P-01-031315-1531

Date Analyzed: 11/05/15 15:10 Lab File ID: 3_69033.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzene | 3.51 | Split Peak | larsonj | 11/06/15 08:51 |

Lab Sample ID: 480-89467-12 Client Sample ID: P-01-050615-1552

Date Analyzed: 11/05/15 16:14 Lab File ID: 3_69035.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzene | 3.51 | Split Peak | larsonj | 11/06/15 08:52 |

Lab Sample ID: 480-89467-21 Client Sample ID: P-01-040115-1600

Date Analyzed: 11/05/15 16:45 Lab File ID: 3_69036.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Benzene | 3.51 | Split Peak | larsonj | 11/06/15 08:52 |

8021B

GC VOA MANUAL INTEGRATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5890-3 Analysis Batch Number: 273207

Lab Sample ID: 480-89467-9 Client Sample ID: WW-01-052015-1500

Date Analyzed: 11/05/15 18:41 Lab File ID: 3_69039.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| Toluene | 5.17 | Split Peak | larsonj | 11/06/15 08:53 |

Lab Sample ID: 480-89467-23 Client Sample ID: P-01-012215-0948

Date Analyzed: 11/05/15 19:13 Lab File ID: 3_69040.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| 4-Bromofluorobenzene | 10.32 | Split Peak | larsonj | 11/06/15 10:54 |

Lab Sample ID: 480-89467-24 Client Sample ID: WW-01-031315-1531

Date Analyzed: 11/05/15 19:44 Lab File ID: 3_69041.D GC Column: RTX-VGC ID: 0.53(mm)

| COMPOUND NAME | RETENTION TIME | MANUAL INTEGRATION | | |
|---|---|---|---|---|
| | | REASON | ANALYST | DATE |
| 4-Bromofluorobenzene | 10.32 | Baseline Smoothing | larsonj | 11/06/15 10:54 |

421

## SAMPLE SUMMARY

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89467-1

| Lab Sample ID | Client Sample ID | Client Matrix | Date/Time Sampled | Date/Time Received |
|---|---|---|---|---|
| 480-89467-1 | WW-01-101514-1120 | Water | 10/15/2014 1120 | 10/20/2015 0920 |
| 480-89467-2 | WW-02-030515-1557 | Water | 03/05/2015 1557 | 10/20/2015 0920 |
| 480-89467-3 | WW-01-031915-1550 | Water | 03/19/2015 1550 | 10/20/2015 0920 |
| 480-89467-4 | WW-01-041415-1640 | Water | 04/14/2015 1640 | 10/20/2015 0920 |
| 480-89467-5 | WW-01-030515-1352 | Water | 03/05/2015 1352 | 10/20/2015 0920 |
| 480-89467-6 | WW-01-042815-1600 | Water | 04/28/2015 1600 | 10/20/2015 0920 |
| 480-89467-7 | WW-01-050615-1552 | Water | 05/06/2015 1552 | 10/20/2015 0920 |
| 480-89467-8 | WW-01-050715-1600 | Water | 05/07/2015 1600 | 10/20/2015 0920 |
| 480-89467-9 | WW-01-052015-1500 | Water | 05/20/2015 1500 | 10/20/2015 0920 |
| 480-89467-10 | P-01-030515-1557 | Water | 03/05/2015 1557 | 10/20/2015 0920 |
| 480-89467-11 | P-01-031315-1531 | Water | 03/13/2015 1531 | 10/20/2015 0920 |
| 480-89467-12 | P-01-050615-1552 | Water | 05/06/2015 1552 | 10/20/2015 0920 |
| 480-89467-13 | P-01-051315-1530 | Water | 05/13/2015 1530 | 10/20/2015 0920 |
| 480-89467-14 | OS-01-031815-1530 | Waste | 03/18/2015 1530 | 10/20/2015 0920 |
| 480-89467-15 | OS-01-042415-1600 | Waste | 04/24/2015 1600 | 10/20/2015 0920 |
| 480-89467-16 | OS-01-042815-1600 | Waste | 04/28/2015 1600 | 10/20/2015 0920 |
| 480-89467-17 | OS-01-050715-1630 | Waste | 05/07/2015 1630 | 10/20/2015 0920 |
| 480-89467-18 | P-01-101514-0910 | Water | 10/15/2014 0910 | 10/20/2015 0920 |
| 480-89467-19 | P-01-100814-1120 | Water | 10/08/2014 1120 | 10/20/2015 0920 |
| 480-89467-20 | P-01-013015-0915 | Water | 01/30/2015 0915 | 10/20/2015 0920 |
| 480-89467-21 | P-01-040115-1600 | Water | 04/01/2015 1600 | 10/20/2015 0920 |
| 480-89467-22 | OS-01-101514-0910 | Waste | 10/15/2014 0910 | 10/20/2015 0920 |
| 480-89467-23 | P-01-012215-0948 | Water | 01/22/2015 0948 | 10/20/2015 0920 |
| 480-89467-24 | WW-01-031315-1531 | Water | 03/13/2015 1531 | 10/20/2015 0920 |

## EXECUTIVE SUMMARY - Detections

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89467-1

| Lab Sample ID<br>Analyte | Client Sample ID | Result | Qualifier | Reporting Limit | Units | Method |
|---|---|---|---|---|---|---|
| **480-89467-1** | **WW-01-101514-1120** | | | | | |
| Benzene | | 320 | H | 40 | ug/L | 8021B |
| Toluene | | 11 | J H | 40 | ug/L | 8021B |
| **480-89467-2** | **WW-02-030515-1557** | | | | | |
| Naphthalene | | 34 | J H | 97 | ug/L | 8270D |
| **480-89467-3** | **WW-01-031915-1550** | | | | | |
| Benzene | | 1500 | H | 160 | ug/L | 8021B |
| Toluene | | 240 | H | 160 | ug/L | 8021B |
| m,p-Xylene | | 75 | J H | 320 | ug/L | 8021B |
| Xylenes, Total | | 75 | J H | 480 | ug/L | 8021B |
| **480-89467-4** | **WW-01-041415-1640** | | | | | |
| Benzene | | 1600 | H | 40 | ug/L | 8021B |
| Toluene | | 890 | H | 40 | ug/L | 8021B |
| Ethylbenzene | | 450 | H | 40 | ug/L | 8021B |
| m,p-Xylene | | 300 | H | 80 | ug/L | 8021B |
| Xylenes, Total | | 300 | H | 120 | ug/L | 8021B |
| **480-89467-5** | **WW-01-030515-1352** | | | | | |
| Naphthalene | | 15 | J H | 97 | ug/L | 8270D |
| **480-89467-6** | **WW-01-042815-1600** | | | | | |
| Acenaphthene | | 30 | J H | 96 | ug/L | 8270D |
| Acenaphthylene | | 130 | H | 96 | ug/L | 8270D |
| Anthracene | | 7.4 | J H | 96 | ug/L | 8270D |
| Fluorene | | 26 | J H | 96 | ug/L | 8270D |
| Naphthalene | | 1700 | H | 480 | ug/L | 8270D |
| Phenanthrene | | 24 | J H | 96 | ug/L | 8270D |
| **480-89467-7** | **WW-01-050615-1552** | | | | | |
| Benzene | | 1900 | H | 40 | ug/L | 8021B |
| Toluene | | 1400 | H | 40 | ug/L | 8021B |
| Ethylbenzene | | 890 | H | 40 | ug/L | 8021B |
| m,p-Xylene | | 2200 | H | 80 | ug/L | 8021B |
| Xylenes, Total | | 2200 | H | 120 | ug/L | 8021B |

## EXECUTIVE SUMMARY - Detections

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89467-1

| Lab Sample ID<br>Analyte | Client Sample ID | Result | Qualifier | Reporting Limit | Units | Method |
|---|---|---|---|---|---|---|
| **480-89467-8** | **WW-01-050715-1600** | | | | | |
| Acenaphthene | | 64 | J H | 96 | ug/L | 8270D |
| Acenaphthylene | | 210 | H | 96 | ug/L | 8270D |
| Anthracene | | 15 | J H | 96 | ug/L | 8270D |
| Fluorene | | 48 | J H | 96 | ug/L | 8270D |
| Naphthalene | | 1800 | H | 480 | ug/L | 8270D |
| Phenanthrene | | 51 | J H | 96 | ug/L | 8270D |
| **480-89467-9** | **WW-01-052015-1500** | | | | | |
| Benzene | | 670 | H | 40 | ug/L | 8021B |
| Toluene | | 87 | H | 40 | ug/L | 8021B |
| m,p-Xylene | | 55 | J H | 80 | ug/L | 8021B |
| o-Xylene | | 160 | H | 40 | ug/L | 8021B |
| Xylenes, Total | | 220 | H | 120 | ug/L | 8021B |
| **480-89467-10** | **P-01-030515-1557** | | | | | |
| Naphthalene | | 160 | H | 97 | ug/L | 8270D |
| **480-89467-11** | **P-01-031315-1531** | | | | | |
| Benzene | | 2400 | H | 400 | ug/L | 8021B |
| Toluene | | 260 | J H | 400 | ug/L | 8021B |
| m,p-Xylene | | 110 | J H | 800 | ug/L | 8021B |
| Xylenes, Total | | 110 | J H | 1200 | ug/L | 8021B |
| **480-89467-12** | **P-01-050615-1552** | | | | | |
| Benzene | | 1400 | H | 80 | ug/L | 8021B |
| Toluene | | 120 | H | 80 | ug/L | 8021B |
| m,p-Xylene | | 50 | J H | 160 | ug/L | 8021B |
| Xylenes, Total | | 50 | J H | 240 | ug/L | 8021B |
| **480-89467-13** | **P-01-051315-1530** | | | | | |
| Naphthalene | | 28 | J H | 100 | ug/L | 8270D |

## EXECUTIVE SUMMARY - Detections

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89467-1

| Lab Sample ID / Analyte | Client Sample ID | Result | Qualifier | Reporting Limit | Units | Method |
|---|---|---|---|---|---|---|
| **480-89467-14** | **OS-01-031815-1530** | | | | | |
| Acenaphthene | | 430000 | H | 260000 | ug/Kg | 8270D |
| Acenaphthylene | | 930000 | H | 260000 | ug/Kg | 8270D |
| Fluoranthene | | 400000 | H | 260000 | ug/Kg | 8270D |
| Fluorene | | 770000 | H | 260000 | ug/Kg | 8270D |
| Naphthalene | | 2300000 | H | 260000 | ug/Kg | 8270D |
| Phenanthrene | | 270000 | H | 260000 | ug/Kg | 8270D |
| Pyrene | | 560000 | H | 260000 | ug/Kg | 8270D |
| **480-89467-15** | **OS-01-042415-1600** | | | | | |
| Acenaphthene | | 390000 | H | 31000 | ug/Kg | 8270D |
| Acenaphthylene | | 1400000 | H | 31000 | ug/Kg | 8270D |
| Anthracene | | 230000 | H | 31000 | ug/Kg | 8270D |
| Benzo[a]anthracene | | 150000 | H | 31000 | ug/Kg | 8270D |
| Benzo[a]pyrene | | 96000 | H | 31000 | ug/Kg | 8270D |
| Benzo[b]fluoranthene | | 34000 | H | 31000 | ug/Kg | 8270D |
| Benzo[g,h,i]perylene | | 62000 | H | 31000 | ug/Kg | 8270D |
| Benzo[k]fluoranthene | | 82000 | H | 31000 | ug/Kg | 8270D |
| Chrysene | | 140000 | H | 31000 | ug/Kg | 8270D |
| Fluoranthene | | 410000 | H | 31000 | ug/Kg | 8270D |
| Fluorene | | 590000 | H | 31000 | ug/Kg | 8270D |
| Indeno[1,2,3-cd]pyrene | | 42000 | H | 31000 | ug/Kg | 8270D |
| Naphthalene | | 3600000 | H | 31000 | ug/Kg | 8270D |
| Phenanthrene | | 1200000 | H | 31000 | ug/Kg | 8270D |
| Pyrene | | 580000 | H | 31000 | ug/Kg | 8270D |
| **480-89467-16** | **OS-01-042815-1600** | | | | | |
| Acenaphthene | | 220000 | J H | 570000 | ug/Kg | 8270D |
| Acenaphthylene | | 610000 | H | 570000 | ug/Kg | 8270D |
| Fluoranthene | | 270000 | J H | 570000 | ug/Kg | 8270D |
| Fluorene | | 420000 | J H | 570000 | ug/Kg | 8270D |
| Naphthalene | | 1100000 | H | 570000 | ug/Kg | 8270D |
| Pyrene | | 450000 | J H | 570000 | ug/Kg | 8270D |
| **480-89467-17** | **OS-01-050715-1630** | | | | | |
| Acenaphthylene | | 980000 | H | 280000 | ug/Kg | 8270D |
| Benzo[a]pyrene | | 120000 | J H | 280000 | ug/Kg | 8270D |
| Chrysene | | 170000 | J H | 280000 | ug/Kg | 8270D |
| Fluoranthene | | 610000 | H | 280000 | ug/Kg | 8270D |
| Fluorene | | 590000 | H | 280000 | ug/Kg | 8270D |
| Naphthalene | | 1200000 | H | 280000 | ug/Kg | 8270D |
| Phenanthrene | | 410000 | H | 280000 | ug/Kg | 8270D |
| Pyrene | | 750000 | H | 280000 | ug/Kg | 8270D |

## EXECUTIVE SUMMARY - Detections

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89467-1

| Lab Sample ID<br>Analyte | Client Sample ID | Result | Qualifier | Reporting Limit | Units | Method |
|---|---|---|---|---|---|---|
| **480-89467-18** | **P-01-101514-0910** | | | | | |
| Naphthalene | | 20 | J H | 94 | ug/L | 8270D |
| **480-89467-19** | **P-01-100814-1120** | | | | | |
| Naphthalene | | 18 | J H | 97 | ug/L | 8270D |
| **480-89467-20** | **P-01-013015-0915** | | | | | |
| Acenaphthene | | 17 | J H | 98 | ug/L | 8270D |
| Acenaphthylene | | 140 | H | 98 | ug/L | 8270D |
| Anthracene | | 11 | J H | 98 | ug/L | 8270D |
| Fluoranthene | | 9.7 | J H | 98 | ug/L | 8270D |
| Fluorene | | 26 | J H | 98 | ug/L | 8270D |
| Naphthalene | | 1600 | H | 490 | ug/L | 8270D |
| Phenanthrene | | 33 | J H | 98 | ug/L | 8270D |
| **480-89467-21** | **P-01-040115-1600** | | | | | |
| Benzene | | 14000 | H | 160 | ug/L | 8021B |
| Toluene | | 5500 | H | 160 | ug/L | 8021B |
| Ethylbenzene | | 3700 | H | 160 | ug/L | 8021B |
| m,p-Xylene | | 7700 | H | 320 | ug/L | 8021B |
| Xylenes, Total | | 7700 | H | 480 | ug/L | 8021B |
| **480-89467-22** | **OS-01-101514-0910** | | | | | |
| Acenaphthylene | | 470000 | H | 260000 | ug/Kg | 8270D |
| Fluoranthene | | 190000 | J H | 260000 | ug/Kg | 8270D |
| Fluorene | | 300000 | H | 260000 | ug/Kg | 8270D |
| Naphthalene | | 1200000 | H | 260000 | ug/Kg | 8270D |
| Pyrene | | 200000 | J H | 260000 | ug/Kg | 8270D |
| **480-89467-23** | **P-01-012215-0948** | | | | | |
| Benzene | | 160 | H | 3.6 | ug/L | 8021B |
| Toluene | | 7.9 | H | 3.6 | ug/L | 8021B |
| m,p-Xylene | | 6.8 | J H | 7.3 | ug/L | 8021B |
| Xylenes, Total | | 6.8 | J H | 11 | ug/L | 8021B |
| **480-89467-24** | **WW-01-031315-1531** | | | | | |
| Benzene | | 12 | H | 0.91 | ug/L | 8021B |
| Toluene | | 1.4 | H | 0.91 | ug/L | 8021B |
| o-Xylene | | 3.7 | H | 0.91 | ug/L | 8021B |
| Xylenes, Total | | 3.7 | H | 2.7 | ug/L | 8021B |

## METHOD SUMMARY

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

| Description | Lab Location | Method | Preparation Method |
|---|---|---|---|
| **Matrix:** | | | |
| **Matrix: Waste** | | | |
| Semivolatile Organic Compounds (GC/MS) | TAL BUF | SW846 8270D | |
| Waste Dilution | TAL BUF | | SW846 3580A |
| **Matrix: Water** | | | |
| Semivolatile Organic Compounds (GC/MS) | TAL BUF | SW846 8270D | |
| Liquid-Liquid Extraction (Separatory Funnel) | TAL BUF | | SW846 3510C |
| Volatile Organic Compounds (GC) | TAL BUF | SW846 8021B | |
| Purge and Trap | TAL BUF | | SW846 5030B |

**Lab References:**

TAL BUF = TestAmerica Buffalo

**Method References:**

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

## METHOD / ANALYST SUMMARY

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89467-1

| Method | Analyst | Analyst ID |
|---|---|---|
| SW846 8270D | Richards, Devon M | DMR |
| SW846 8270D | Sosinski, Courtney A | CAS |
| SW846 8021B | Larson, Joseph R | JRL |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** WW-02-030515-1557

Lab Sample ID: 480-89467-2 | Date Sampled: 03/05/2015 1557
Client Matrix: Water | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273999 | Instrument ID: | HP5973V |
| Prep Method: | 3510C | Prep Batch: | 480-273586 | Lab File ID: | V60015.D |
| Dilution: | 20 | | | Initial Weight/Volume: | 258 mL |
| Analysis Date: | 11/10/2015 1723 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | ND | H | 7.9 | 97 |
| Acenaphthylene | ND | H | 7.4 | 97 |
| Anthracene | ND | H | 5.4 | 97 |
| Benzo[a]anthracene | ND | H | 7.0 | 97 |
| Benzo[a]pyrene | ND | H | 9.1 | 97 |
| Benzo[b]fluoranthene | ND | H | 6.6 | 97 |
| Benzo[g,h,i]perylene | ND | H | 6.8 | 97 |
| Benzo[k]fluoranthene | ND | H | 14 | 97 |
| Chrysene | ND | H | 6.4 | 97 |
| Dibenz(a,h)anthracene | ND | H | 8.1 | 97 |
| Fluoranthene | ND | H | 7.8 | 97 |
| Fluorene | ND | H | 7.0 | 97 |
| Indeno[1,2,3-cd]pyrene | ND | H | 9.1 | 97 |
| Naphthalene | 34 | J H | 15 | 97 |
| Phenanthrene | ND | H | 8.5 | 97 |
| Pyrene | ND | H | 6.6 | 97 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 101 | | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 152 | X | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 76 | | 67 - 150 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** WW-01-030515-1352

Lab Sample ID: 480-89467-5 | Date Sampled: 03/05/2015 1352
Client Matrix: Water | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273999 | Instrument ID: | HP5973V |
| Prep Method: | 3510C | Prep Batch: | 480-273586 | Lab File ID: | V60016.D |
| Dilution: | 20 | | | Initial Weight/Volume: | 258.9 mL |
| Analysis Date: | 11/10/2015 1752 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | ND | H | 7.9 | 97 |
| Acenaphthylene | ND | H | 7.3 | 97 |
| Anthracene | ND | H | 5.4 | 97 |
| Benzo[a]anthracene | ND | H | 7.0 | 97 |
| Benzo[a]pyrene | ND | H | 9.1 | 97 |
| Benzo[b]fluoranthene | ND | H | 6.6 | 97 |
| Benzo[g,h,i]perylene | ND | H | 6.8 | 97 |
| Benzo[k]fluoranthene | ND | H | 14 | 97 |
| Chrysene | ND | H | 6.4 | 97 |
| Dibenz(a,h)anthracene | ND | H | 8.1 | 97 |
| Fluoranthene | ND | H | 7.7 | 97 |
| Fluorene | ND | H | 7.0 | 97 |
| Indeno[1,2,3-cd]pyrene | ND | H | 9.1 | 97 |
| Naphthalene | 15 | J H | 15 | 97 |
| Phenanthrene | ND | H | 8.5 | 97 |
| Pyrene | ND | H | 6.6 | 97 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 91 | | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 76 | | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 73 | | 67 - 150 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** WW-01-042815-1600

Lab Sample ID: 480-89467-6 | Date Sampled: 04/28/2015 1600
Client Matrix: Water | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273999 | Instrument ID: | HP5973V |
| Prep Method: | 3510C | Prep Batch: | 480-273586 | Lab File ID: | V60017.D |
| Dilution: | 20 | | | Initial Weight/Volume: | 259.7 mL |
| Analysis Date: | 11/10/2015 1821 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | 30 | J H | 7.9 | 96 |
| Acenaphthylene | 130 | H | 7.3 | 96 |
| Anthracene | 7.4 | J H | 5.4 | 96 |
| Benzo[a]anthracene | ND | H | 6.9 | 96 |
| Benzo[a]pyrene | ND | H | 9.0 | 96 |
| Benzo[b]fluoranthene | ND | H | 6.5 | 96 |
| Benzo[g,h,i]perylene | ND | H | 6.7 | 96 |
| Benzo[k]fluoranthene | ND | H | 14 | 96 |
| Chrysene | ND | H | 6.4 | 96 |
| Dibenz(a,h)anthracene | ND | H | 8.1 | 96 |
| Fluoranthene | ND | H | 7.7 | 96 |
| Fluorene | 26 | J H | 6.9 | 96 |
| Indeno[1,2,3-cd]pyrene | ND | H | 9.0 | 96 |
| Naphthalene | 1500 | E H | 15 | 96 |
| Phenanthrene | 24 | J H | 8.5 | 96 |
| Pyrene | ND | H | 6.5 | 96 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 106 | | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 108 | | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 85 | | 67 - 150 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** WW-01-042815-1600

Lab Sample ID: 480-89467-6 | Date Sampled: 04/28/2015 1600
Client Matrix: Water | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-274392 | Instrument ID: | HP5973V |
| Prep Method: | 3510C | Prep Batch: | 480-273586 | Lab File ID: | V60046.D |
| Dilution: | 100 | | | Initial Weight/Volume: | 259.7 mL |
| Analysis Date: | 11/11/2015 1347 | Run Type: | DL | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | 41 | J H | 39 | 480 |
| Acenaphthylene | 140 | J H | 37 | 480 |
| Anthracene | ND | H | 27 | 480 |
| Benzo[a]anthracene | ND | H | 35 | 480 |
| Benzo[a]pyrene | ND | H | 45 | 480 |
| Benzo[b]fluoranthene | ND | H | 33 | 480 |
| Benzo[g,h,i]perylene | ND | H | 34 | 480 |
| Benzo[k]fluoranthene | ND | H | 70 | 480 |
| Chrysene | ND | H | 32 | 480 |
| Dibenz(a,h)anthracene | ND | H | 40 | 480 |
| Fluoranthene | ND | H | 39 | 480 |
| Fluorene | ND | H | 35 | 480 |
| Indeno[1,2,3-cd]pyrene | ND | H | 45 | 480 |
| Naphthalene | 1700 | H | 73 | 480 |
| Phenanthrene | ND | H | 42 | 480 |
| Pyrene | ND | H | 33 | 480 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 99 | | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 0 | X | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 104 | | 67 - 150 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** WW-01-050715-1600

Lab Sample ID: 480-89467-8 | Date Sampled: 05/07/2015 1600
Client Matrix: Water | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273999 | Instrument ID: | HP5973V |
| Prep Method: | 3510C | Prep Batch: | 480-273586 | Lab File ID: | V60018.D |
| Dilution: | 20 | | | Initial Weight/Volume: | 259.1 mL |
| Analysis Date: | 11/10/2015 1850 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | 64 | J H | 7.9 | 96 |
| Acenaphthylene | 210 | H | 7.3 | 96 |
| Anthracene | 15 | J H | 5.4 | 96 |
| Benzo[a]anthracene | ND | H | 6.9 | 96 |
| Benzo[a]pyrene | ND | H | 9.1 | 96 |
| Benzo[b]fluoranthene | ND | H | 6.6 | 96 |
| Benzo[g,h,i]perylene | ND | H | 6.8 | 96 |
| Benzo[k]fluoranthene | ND | H | 14 | 96 |
| Chrysene | ND | H | 6.4 | 96 |
| Dibenz(a,h)anthracene | ND | H | 8.1 | 96 |
| Fluoranthene | ND | H | 7.7 | 96 |
| Fluorene | 48 | J H | 6.9 | 96 |
| Indeno[1,2,3-cd]pyrene | ND | H | 9.1 | 96 |
| Naphthalene | 1700 | E H | 15 | 96 |
| Phenanthrene | 51 | J H | 8.5 | 96 |
| Pyrene | ND | H | 6.6 | 96 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 98 | | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 0 | X | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 72 | | 67 - 150 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** WW-01-050715-1600

Lab Sample ID: 480-89467-8 | Date Sampled: 05/07/2015 1600
Client Matrix: Water | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-274392 | Instrument ID: | HP5973V |
| Prep Method: | 3510C | Prep Batch: | 480-273586 | Lab File ID: | V60047.D |
| Dilution: | 100 | | | Initial Weight/Volume: | 259.1 mL |
| Analysis Date: | 11/11/2015 1416 | Run Type: | DL | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | 52 | J H | 40 | 480 |
| Acenaphthylene | 210 | J H | 37 | 480 |
| Anthracene | ND | H | 27 | 480 |
| Benzo[a]anthracene | ND | H | 35 | 480 |
| Benzo[a]pyrene | ND | H | 45 | 480 |
| Benzo[b]fluoranthene | ND | H | 33 | 480 |
| Benzo[g,h,i]perylene | ND | H | 34 | 480 |
| Benzo[k]fluoranthene | ND | H | 70 | 480 |
| Chrysene | ND | H | 32 | 480 |
| Dibenz(a,h)anthracene | ND | H | 41 | 480 |
| Fluoranthene | ND | H | 39 | 480 |
| Fluorene | 47 | J H | 35 | 480 |
| Indeno[1,2,3-cd]pyrene | ND | H | 45 | 480 |
| Naphthalene | 1800 | H | 73 | 480 |
| Phenanthrene | 49 | J H | 42 | 480 |
| Pyrene | ND | H | 33 | 480 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 87 | | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 0 | X | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 76 | | 67 - 150 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **P-01-030515-1557**

Lab Sample ID: 480-89467-10 | Date Sampled: 03/05/2015 1557
Client Matrix: Water | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273999 | Instrument ID: | HP5973V |
| Prep Method: | 3510C | Prep Batch: | 480-273586 | Lab File ID: | V60019.D |
| Dilution: | 20 | | | Initial Weight/Volume: | 257.5 mL |
| Analysis Date: | 11/10/2015 1919 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | ND | H | 8.0 | 97 |
| Acenaphthylene | ND | H | 7.4 | 97 |
| Anthracene | ND | H | 5.4 | 97 |
| Benzo[a]anthracene | ND | H | 7.0 | 97 |
| Benzo[a]pyrene | ND | H | 9.1 | 97 |
| Benzo[b]fluoranthene | ND | H | 6.6 | 97 |
| Benzo[g,h,i]perylene | ND | H | 6.8 | 97 |
| Benzo[k]fluoranthene | ND | H | 14 | 97 |
| Chrysene | ND | H | 6.4 | 97 |
| Dibenz(a,h)anthracene | ND | H | 8.2 | 97 |
| Fluoranthene | ND | H | 7.8 | 97 |
| Fluorene | ND | H | 7.0 | 97 |
| Indeno[1,2,3-cd]pyrene | ND | H | 9.1 | 97 |
| Naphthalene | 160 | H | 15 | 97 |
| Phenanthrene | ND | H | 8.5 | 97 |
| Pyrene | ND | H | 6.6 | 97 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 81 | | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 0 | X | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 67 | | 67 - 150 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **P-01-051315-1530**

Lab Sample ID: 480-89467-13 | Date Sampled: 05/13/2015 1530
Client Matrix: Water | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273999 | Instrument ID: | HP5973V |
| Prep Method: | 3510C | Prep Batch: | 480-273586 | Lab File ID: | V60020.D |
| Dilution: | 20 | | | Initial Weight/Volume: | 242.4 mL |
| Analysis Date: | 11/10/2015 1948 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | ND | H | 8.5 | 100 |
| Acenaphthylene | ND | H | 7.8 | 100 |
| Anthracene | ND | H | 5.8 | 100 |
| Benzo[a]anthracene | ND | H | 7.4 | 100 |
| Benzo[a]pyrene | ND | H | 9.7 | 100 |
| Benzo[b]fluoranthene | ND | H | 7.0 | 100 |
| Benzo[g,h,i]perylene | ND | H | 7.2 | 100 |
| Benzo[k]fluoranthene | ND | H | 15 | 100 |
| Chrysene | ND | H | 6.8 | 100 |
| Dibenz(a,h)anthracene | ND | H | 8.7 | 100 |
| Fluoranthene | ND | H | 8.3 | 100 |
| Fluorene | ND | H | 7.4 | 100 |
| Indeno[1,2,3-cd]pyrene | ND | H | 9.7 | 100 |
| Naphthalene | 28 | J H | 16 | 100 |
| Phenanthrene | ND | H | 9.1 | 100 |
| Pyrene | ND | H | 7.0 | 100 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 95 | | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 0 | X | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 83 | | 67 - 150 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **OS-01-031815-1530**

Lab Sample ID: 480-89467-14 | Date Sampled: 03/18/2015 1530
Client Matrix: Waste | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273506 | Instrument ID: | HP5973X |
| Prep Method: | 3580A | Prep Batch: | 480-273073 | Lab File ID: | X009014108.D |
| Dilution: | 100 | | | Initial Weight/Volume: | +0.13 g |
| Analysis Date: | 11/05/2015 1634 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/04/2015 1345 | | | Injection Volume: | 1 uL |

| Analyte | DryWt Corrected: N | Result (ug/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Acenaphthene | | 430000 | H | 3100 | 260000 |
| Acenaphthylene | | 930000 | H | 2200 | 260000 |
| Anthracene | | ND | H | 6600 | 260000 |
| Benzo[a]anthracene | | ND | H | 4500 | 260000 |
| Benzo[a]pyrene | | ND | H | 6300 | 260000 |
| Benzo[b]fluoranthene | | ND | H | 5100 | 260000 |
| Benzo[g,h,i]perylene | | ND | H | 3100 | 260000 |
| Benzo[k]fluoranthene | | ND | H | 2900 | 260000 |
| Chrysene | | ND | H | 2600 | 260000 |
| Dibenz(a,h)anthracene | | ND | H | 3100 | 260000 |
| Fluoranthene | | 400000 | H | 3700 | 260000 |
| Fluorene | | 770000 | H | 6000 | 260000 |
| Indeno[1,2,3-cd]pyrene | | ND | H | 7200 | 260000 |
| Naphthalene | | 2300000 | H | 4300 | 260000 |
| Phenanthrene | | 270000 | H | 5400 | 260000 |
| Pyrene | | 560000 | H | 1700 | 260000 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 94 | | 37 - 120 |
| Nitrobenzene-d5 (Surr) | 65 | | 34 - 132 |
| p-Terphenyl-d14 (Surr) | 94 | | 65 - 153 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **OS-01-042415-1600**

Lab Sample ID: 480-89467-15 | Date Sampled: 04/24/2015 1600
Client Matrix: Waste | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273506 | Instrument ID: | HP5973X |
| Prep Method: | 3580A | Prep Batch: | 480-273073 | Lab File ID: | X009014109.D |
| Dilution: | 10 | | | Initial Weight/Volume: | +0.11 g |
| Analysis Date: | 11/05/2015 1701 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/04/2015 1345 | | | Injection Volume: | 1 uL |

| Analyte | DryWt Corrected: N | Result (ug/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Acenaphthene | | 390000 | H | 360 | 31000 |
| Acenaphthylene | | 1400000 | H | 250 | 31000 |
| Anthracene | | 230000 | H | 780 | 31000 |
| Benzo[a]anthracene | | 150000 | H | 530 | 31000 |
| Benzo[a]pyrene | | 96000 | H | 750 | 31000 |
| Benzo[b]fluoranthene | | 34000 | H | 600 | 31000 |
| Benzo[g,h,i]perylene | | 62000 | H | 360 | 31000 |
| Benzo[k]fluoranthene | | 82000 | H | 350 | 31000 |
| Chrysene | | 140000 | H | 310 | 31000 |
| Dibenz(a,h)anthracene | | ND | H | 360 | 31000 |
| Fluoranthene | | 410000 | H | 440 | 31000 |
| Fluorene | | 590000 | H | 710 | 31000 |
| Indeno[1,2,3-cd]pyrene | | 42000 | H | 850 | 31000 |
| Naphthalene | | 3600000 | H | 510 | 31000 |
| Phenanthrene | | 1200000 | H | 640 | 31000 |
| Pyrene | | 580000 | H | 200 | 31000 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 102 | | 37 - 120 |
| Nitrobenzene-d5 (Surr) | 88 | | 34 - 132 |
| p-Terphenyl-d14 (Surr) | 101 | | 65 - 153 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **OS-01-042815-1600**

Lab Sample ID: 480-89467-16 | Date Sampled: 04/28/2015 1600
Client Matrix: Waste | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273506 | Instrument ID: | HP5973X |
| Prep Method: | 3580A | Prep Batch: | 480-273073 | Lab File ID: | X009014110.D |
| Dilution: | 200 | | | Initial Weight/Volume: | +0.12 g |
| Analysis Date: | 11/05/2015 1728 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/04/2015 1345 | | | Injection Volume: | 1 uL |

| Analyte | DryWt Corrected: N | Result (ug/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Acenaphthene | | 220000 | J H | 6700 | 570000 |
| Acenaphthylene | | 610000 | H | 4700 | 570000 |
| Anthracene | | ND | H | 14000 | 570000 |
| Benzo[a]anthracene | | ND | H | 9700 | 570000 |
| Benzo[a]pyrene | | ND | H | 14000 | 570000 |
| Benzo[b]fluoranthene | | ND | H | 11000 | 570000 |
| Benzo[g,h,i]perylene | | ND | H | 6700 | 570000 |
| Benzo[k]fluoranthene | | ND | H | 6300 | 570000 |
| Chrysene | | ND | H | 5700 | 570000 |
| Dibenz(a,h)anthracene | | ND | H | 6700 | 570000 |
| Fluoranthene | | 270000 | J H | 8000 | 570000 |
| Fluorene | | 420000 | J H | 13000 | 570000 |
| Indeno[1,2,3-cd]pyrene | | ND | H | 16000 | 570000 |
| Naphthalene | | 1100000 | H | 9300 | 570000 |
| Phenanthrene | | ND | H | 12000 | 570000 |
| Pyrene | | 450000 | J H | 3700 | 570000 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 83 | | 37 - 120 |
| Nitrobenzene-d5 (Surr) | 0 | X | 34 - 132 |
| p-Terphenyl-d14 (Surr) | 81 | | 65 - 153 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **OS-01-050715-1630**

Lab Sample ID: 480-89467-17 | Date Sampled: 05/07/2015 1630
Client Matrix: Waste | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273506 | Instrument ID: | HP5973X |
| Prep Method: | 3580A | Prep Batch: | 480-273073 | Lab File ID: | X009014111.D |
| Dilution: | 100 | | | Initial Weight/Volume: | +0.12 g |
| Analysis Date: | 11/05/2015 1755 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/04/2015 1345 | | | Injection Volume: | 1 uL |

| Analyte | DryWt Corrected: N | Result (ug/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Acenaphthene | | ND | H | 3300 | 280000 |
| Acenaphthylene | | 980000 | H | 2300 | 280000 |
| Anthracene | | ND | H | 7200 | 280000 |
| Benzo[a]anthracene | | ND | H | 4800 | 280000 |
| Benzo[a]pyrene | | 120000 | J H | 6800 | 280000 |
| Benzo[b]fluoranthene | | ND | H | 5500 | 280000 |
| Benzo[g,h,i]perylene | | ND | H | 3300 | 280000 |
| Benzo[k]fluoranthene | | ND | H | 3200 | 280000 |
| Chrysene | | 170000 | J H | 2800 | 280000 |
| Dibenz(a,h)anthracene | | ND | H | 3300 | 280000 |
| Fluoranthene | | 610000 | H | 4000 | 280000 |
| Fluorene | | 590000 | H | 6500 | 280000 |
| Indeno[1,2,3-cd]pyrene | | ND | H | 7800 | 280000 |
| Naphthalene | | 1200000 | H | 4700 | 280000 |
| Phenanthrene | | 410000 | H | 5800 | 280000 |
| Pyrene | | 750000 | H | 1800 | 280000 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 97 | | 37 - 120 |
| Nitrobenzene-d5 (Surr) | 94 | | 34 - 132 |
| p-Terphenyl-d14 (Surr) | 103 | | 65 - 153 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **P-01-101514-0910**

Lab Sample ID: 480-89467-18 | Date Sampled: 10/15/2014 0910
Client Matrix: Water | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273999 | Instrument ID: | HP5973V |
| Prep Method: | 3510C | Prep Batch: | 480-273586 | Lab File ID: | V60021.D |
| Dilution: | 20 | | | Initial Weight/Volume: | 267 mL |
| Analysis Date: | 11/10/2015 2017 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | ND | H | 7.7 | 94 |
| Acenaphthylene | ND | H | 7.1 | 94 |
| Anthracene | ND | H | 5.2 | 94 |
| Benzo[a]anthracene | ND | H | 6.7 | 94 |
| Benzo[a]pyrene | ND | H | 8.8 | 94 |
| Benzo[b]fluoranthene | ND | H | 6.4 | 94 |
| Benzo[g,h,i]perylene | ND | H | 6.6 | 94 |
| Benzo[k]fluoranthene | ND | H | 14 | 94 |
| Chrysene | ND | H | 6.2 | 94 |
| Dibenz(a,h)anthracene | ND | H | 7.9 | 94 |
| Fluoranthene | ND | H | 7.5 | 94 |
| Fluorene | ND | H | 6.7 | 94 |
| Indeno[1,2,3-cd]pyrene | ND | H | 8.8 | 94 |
| Naphthalene | 20 | J H | 14 | 94 |
| Phenanthrene | ND | H | 8.2 | 94 |
| Pyrene | ND | H | 6.4 | 94 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 93 | | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 0 | X | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 74 | | 67 - 150 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **P-01-100814-1120**

Lab Sample ID: 480-89467-19 | Date Sampled: 10/08/2014 1120
Client Matrix: Water | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273999 | Instrument ID: | HP5973V |
| Prep Method: | 3510C | Prep Batch: | 480-273586 | Lab File ID: | V60022.D |
| Dilution: | 20 | | | Initial Weight/Volume: | 257.5 mL |
| Analysis Date: | 11/10/2015 2046 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | ND | H | 8.0 | 97 |
| Acenaphthylene | ND | H | 7.4 | 97 |
| Anthracene | ND | H | 5.4 | 97 |
| Benzo[a]anthracene | ND | H | 7.0 | 97 |
| Benzo[a]pyrene | ND | H | 9.1 | 97 |
| Benzo[b]fluoranthene | ND | H | 6.6 | 97 |
| Benzo[g,h,i]perylene | ND | H | 6.8 | 97 |
| Benzo[k]fluoranthene | ND | H | 14 | 97 |
| Chrysene | ND | H | 6.4 | 97 |
| Dibenz(a,h)anthracene | ND | H | 8.2 | 97 |
| Fluoranthene | ND | H | 7.8 | 97 |
| Fluorene | ND | H | 7.0 | 97 |
| Indeno[1,2,3-cd]pyrene | ND | H | 9.1 | 97 |
| Naphthalene | 18 | J H | 15 | 97 |
| Phenanthrene | ND | H | 8.5 | 97 |
| Pyrene | ND | H | 6.6 | 97 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 94 | | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 0 | X | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 98 | | 67 - 150 |

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89467-1

**Client Sample ID:** **P-01-013015-0915**

Lab Sample ID: 480-89467-20
Client Matrix: Water

Date Sampled: 01/30/2015 0915
Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273999 | Instrument ID: | HP5973V |
| Prep Method: | 3510C | Prep Batch: | 480-273586 | Lab File ID: | V60023.D |
| Dilution: | 20 | | | Initial Weight/Volume: | 255.5 mL |
| Analysis Date: | 11/10/2015 2115 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | 17 | J H | 8.0 | 98 |
| Acenaphthylene | 140 | H | 7.4 | 98 |
| Anthracene | 11 | J H | 5.5 | 98 |
| Benzo[a]anthracene | ND | H | 7.0 | 98 |
| Benzo[a]pyrene | ND | H | 9.2 | 98 |
| Benzo[b]fluoranthene | ND | H | 6.7 | 98 |
| Benzo[g,h,i]perylene | ND | H | 6.8 | 98 |
| Benzo[k]fluoranthene | ND | H | 14 | 98 |
| Chrysene | ND | H | 6.5 | 98 |
| Dibenz(a,h)anthracene | ND | H | 8.2 | 98 |
| Fluoranthene | 9.7 | J H | 7.8 | 98 |
| Fluorene | 26 | J H | 7.0 | 98 |
| Indeno[1,2,3-cd]pyrene | ND | H | 9.2 | 98 |
| Naphthalene | 1400 | E H | 15 | 98 |
| Phenanthrene | 33 | J H | 8.6 | 98 |
| Pyrene | ND | H | 6.7 | 98 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 118 | | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 0 | X | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 65 | X | 67 - 150 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **P-01-013015-0915**

Lab Sample ID: 480-89467-20 | Date Sampled: 01/30/2015 0915
Client Matrix: Water | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-274392 | Instrument ID: | HP5973V |
| Prep Method: | 3510C | Prep Batch: | 480-273586 | Lab File ID: | V60048.D |
| Dilution: | 100 | | | Initial Weight/Volume: | 255.5 mL |
| Analysis Date: | 11/11/2015 1445 | Run Type: | DL | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | ND | H | 40 | 490 |
| Acenaphthylene | 140 | J H | 37 | 490 |
| Anthracene | ND | H | 27 | 490 |
| Benzo[a]anthracene | ND | H | 35 | 490 |
| Benzo[a]pyrene | ND | H | 46 | 490 |
| Benzo[b]fluoranthene | ND | H | 33 | 490 |
| Benzo[g,h,i]perylene | ND | H | 34 | 490 |
| Benzo[k]fluoranthene | ND | H | 71 | 490 |
| Chrysene | ND | H | 32 | 490 |
| Dibenz(a,h)anthracene | ND | H | 41 | 490 |
| Fluoranthene | ND | H | 39 | 490 |
| Fluorene | ND | H | 35 | 490 |
| Indeno[1,2,3-cd]pyrene | ND | H | 46 | 490 |
| Naphthalene | 1600 | H | 74 | 490 |
| Phenanthrene | ND | H | 43 | 490 |
| Pyrene | ND | H | 33 | 490 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 89 | | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 0 | X | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 72 | | 67 - 150 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **OS-01-101514-0910**

Lab Sample ID: 480-89467-22 | Date Sampled: 10/15/2014 0910
Client Matrix: Waste | Date Received: 10/20/2015 0920

**8270D Semivolatile Organic Compounds (GC/MS)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8270D | Analysis Batch: | 480-273506 | Instrument ID: | HP5973X |
| Prep Method: | 3580A | Prep Batch: | 480-273073 | Lab File ID: | X009014112.D |
| Dilution: | 100 | | | Initial Weight/Volume: | +0.13 g |
| Analysis Date: | 11/05/2015 1821 | | | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/04/2015 1345 | | | Injection Volume: | 1 uL |

| Analyte | DryWt Corrected: N | Result (ug/Kg) | Qualifier | MDL | RL |
|---|---|---|---|---|---|
| Acenaphthene | | ND | H | 3100 | 260000 |
| Acenaphthylene | | 470000 | H | 2200 | 260000 |
| Anthracene | | ND | H | 6600 | 260000 |
| Benzo[a]anthracene | | ND | H | 4500 | 260000 |
| Benzo[a]pyrene | | ND | H | 6300 | 260000 |
| Benzo[b]fluoranthene | | ND | H | 5100 | 260000 |
| Benzo[g,h,i]perylene | | ND | H | 3100 | 260000 |
| Benzo[k]fluoranthene | | ND | H | 2900 | 260000 |
| Chrysene | | ND | H | 2600 | 260000 |
| Dibenz(a,h)anthracene | | ND | H | 3100 | 260000 |
| Fluoranthene | | 190000 | J H | 3700 | 260000 |
| Fluorene | | 300000 | H | 6000 | 260000 |
| Indeno[1,2,3-cd]pyrene | | ND | H | 7200 | 260000 |
| Naphthalene | | 1200000 | H | 4300 | 260000 |
| Phenanthrene | | ND | H | 5400 | 260000 |
| Pyrene | | 200000 | J H | 1700 | 260000 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 73 | | 37 - 120 |
| Nitrobenzene-d5 (Surr) | 0 | X | 34 - 132 |
| p-Terphenyl-d14 (Surr) | 78 | | 65 - 153 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** WW-01-101514-1120

Lab Sample ID: 480-89467-1 | Date Sampled: 10/15/2014 1120
Client Matrix: Water | Date Received: 10/20/2015 0920

**8021B Volatile Organic Compounds (GC)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8021B | Analysis Batch: | 480-273207 | Instrument ID: | HP5890-3 |
| Prep Method: | 5030B | | N/A | Initial Weight/Volume: | 44 mL |
| Dilution: | 200 | | | Final Weight/Volume: | |
| Analysis Date: | 11/05/2015 1133 | | | Injection Volume: | 1 uL |
| Prep Date: | 11/05/2015 1133 | | | Result Type: | PRIMARY |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Benzene | 320 | H | 4.7 | 40 |
| Toluene | 11 | J H | 7.1 | 40 |
| Ethylbenzene | ND | H | 5.7 | 40 |
| m,p-Xylene | ND | H | 11 | 80 |
| o-Xylene | ND | H | 5.4 | 40 |
| Xylenes, Total | ND | H | 11 | 120 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| a,a,a-Trifluorotoluene | 139 | | 63 - 145 |
| 4-Bromofluorobenzene | 122 | | 64 - 141 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** WW-01-031915-1550

Lab Sample ID: 480-89467-3 | Date Sampled: 03/19/2015 1550
Client Matrix: Water | Date Received: 10/20/2015 0920

**8021B Volatile Organic Compounds (GC)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8021B | Analysis Batch: | 480-273207 | Instrument ID: | HP5890-3 |
| Prep Method: | 5030B | | N/A | Initial Weight/Volume: | 44 mL |
| Dilution: | 800 | | | Final Weight/Volume: | |
| Analysis Date: | 11/05/2015 1205 | | | Injection Volume: | 1 uL |
| Prep Date: | 11/05/2015 1205 | | | Result Type: | PRIMARY |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Benzene | 1500 | H | 19 | 160 |
| Toluene | 240 | H | 28 | 160 |
| Ethylbenzene | ND | H | 23 | 160 |
| m,p-Xylene | 75 | J H | 43 | 320 |
| o-Xylene | ND | H | 22 | 160 |
| Xylenes, Total | 75 | J H | 43 | 480 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| a,a,a-Trifluorotoluene | 138 | | 63 - 145 |
| 4-Bromofluorobenzene | 125 | | 64 - 141 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** WW-01-041415-1640

Lab Sample ID: 480-89467-4 | Date Sampled: 04/14/2015 1640
Client Matrix: Water | Date Received: 10/20/2015 0920

**8021B Volatile Organic Compounds (GC)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8021B | Analysis Batch: | 480-273207 | Instrument ID: | HP5890-3 |
| Prep Method: | 5030B | | N/A | Initial Weight/Volume: | 44 mL |
| Dilution: | 200 | | | Final Weight/Volume: | |
| Analysis Date: | 11/05/2015 1238 | | | Injection Volume: | 1 uL |
| Prep Date: | 11/05/2015 1238 | | | Result Type: | PRIMARY |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Benzene | 1800 | H | 4.7 | 40 |
| Toluene | 890 | H | 7.1 | 40 |
| Ethylbenzene | 450 | H | 5.7 | 40 |
| m,p-Xylene | 300 | H | 11 | 80 |
| o-Xylene | ND | H | 5.4 | 40 |
| Xylenes, Total | 300 | H | 11 | 120 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| a,a,a-Trifluorotoluene | 104 | | 63 - 145 |
| 4-Bromofluorobenzene | 96 | | 64 - 141 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** WW-01-050615-1552

Lab Sample ID: 480-89467-7 | Date Sampled: 05/06/2015 1552
Client Matrix: Water | Date Received: 10/20/2015 0920

**8021B Volatile Organic Compounds (GC)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8021B | Analysis Batch: | 480-273207 | Instrument ID: | HP5890-3 |
| Prep Method: | 5030B | | N/A | Initial Weight/Volume: | 44 mL |
| Dilution: | 200 | | | Final Weight/Volume: | |
| Analysis Date: | 11/05/2015 1310 | | | Injection Volume: | 1 uL |
| Prep Date: | 11/05/2015 1310 | | | Result Type: | PRIMARY |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Benzene | 1900 | H | 4.7 | 40 |
| Toluene | 1400 | H | 7.1 | 40 |
| Ethylbenzene | 890 | H | 5.7 | 40 |
| m,p-Xylene | 2200 | H | 11 | 80 |
| o-Xylene | ND | H | 5.4 | 40 |
| Xylenes, Total | 2200 | H | 11 | 120 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| a,a,a-Trifluorotoluene | 125 | | 63 - 145 |
| 4-Bromofluorobenzene | 116 | | 64 - 141 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** WW-01-052015-1500

Lab Sample ID: 480-89467-9 | Date Sampled: 05/20/2015 1500
Client Matrix: Water | Date Received: 10/20/2015 0920

**8021B Volatile Organic Compounds (GC)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8021B | Analysis Batch: | 480-273207 | Instrument ID: | HP5890-3 |
| Prep Method: | 5030B | | N/A | Initial Weight/Volume: | 44 mL |
| Dilution: | 200 | | | Final Weight/Volume: | |
| Analysis Date: | 11/05/2015 1841 | | | Injection Volume: | 1 uL |
| Prep Date: | 11/05/2015 1841 | | | Result Type: | PRIMARY |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Benzene | 670 | H | 4.7 | 40 |
| Toluene | 87 | H | 7.1 | 40 |
| Ethylbenzene | ND | H | 5.7 | 40 |
| m,p-Xylene | 55 | J H | 11 | 80 |
| o-Xylene | 160 | H | 5.4 | 40 |
| Xylenes, Total | 220 | H | 11 | 120 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| a,a,a-Trifluorotoluene | 109 | | 63 - 145 |
| 4-Bromofluorobenzene | 91 | | 64 - 141 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **P-01-031315-1531**

Lab Sample ID: 480-89467-11 | Date Sampled: 03/13/2015 1531
Client Matrix: Water | Date Received: 10/20/2015 0920

**8021B Volatile Organic Compounds (GC)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8021B | Analysis Batch: | 480-273207 | Instrument ID: | HP5890-3 |
| Prep Method: | 5030B | | N/A | Initial Weight/Volume: | 44 mL |
| Dilution: | 2000 | | | Final Weight/Volume: | |
| Analysis Date: | 11/05/2015 1510 | | | Injection Volume: | 1 uL |
| Prep Date: | 11/05/2015 1510 | | | Result Type: | PRIMARY |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Benzene | 2400 | H | 47 | 400 |
| Toluene | 260 | J H | 71 | 400 |
| Ethylbenzene | ND | H | 57 | 400 |
| m,p-Xylene | 110 | J H | 110 | 800 |
| o-Xylene | ND | H | 54 | 400 |
| Xylenes, Total | 110 | J H | 110 | 1200 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| a,a,a-Trifluorotoluene | 94 | | 63 - 145 |
| 4-Bromofluorobenzene | 88 | | 64 - 141 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **P-01-050615-1552**

Lab Sample ID: 480-89467-12 | Date Sampled: 05/06/2015 1552
Client Matrix: Water | Date Received: 10/20/2015 0920

**8021B Volatile Organic Compounds (GC)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8021B | Analysis Batch: | 480-273207 | Instrument ID: | HP5890-3 |
| Prep Method: | 5030B | | N/A | Initial Weight/Volume: | 44 mL |
| Dilution: | 400 | | | Final Weight/Volume: | |
| Analysis Date: | 11/05/2015 1614 | | | Injection Volume: | 1 uL |
| Prep Date: | 11/05/2015 1614 | | | Result Type: | PRIMARY |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Benzene | 1400 | H | 9.3 | 80 |
| Toluene | 120 | H | 14 | 80 |
| Ethylbenzene | ND | H | 11 | 80 |
| m,p-Xylene | 50 | J H | 22 | 160 |
| o-Xylene | ND | H | 11 | 80 |
| Xylenes, Total | 50 | J H | 22 | 240 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| a,a,a-Trifluorotoluene | 135 | | 63 - 145 |
| 4-Bromofluorobenzene | 123 | | 64 - 141 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **P-01-040115-1600**

Lab Sample ID: 480-89467-21 | Date Sampled: 04/01/2015 1600
Client Matrix: Water | Date Received: 10/20/2015 0920

**8021B Volatile Organic Compounds (GC)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8021B | Analysis Batch: | 480-273207 | Instrument ID: | HP5890-3 |
| Prep Method: | 5030B | | N/A | Initial Weight/Volume: | 44 mL |
| Dilution: | 800 | | | Final Weight/Volume: | |
| Analysis Date: | 11/05/2015 1645 | | | Injection Volume: | 1 uL |
| Prep Date: | 11/05/2015 1645 | | | Result Type: | PRIMARY |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Benzene | 14000 | H | 19 | 160 |
| Toluene | 5500 | H | 28 | 160 |
| Ethylbenzene | 3700 | H | 23 | 160 |
| m,p-Xylene | 7700 | H | 43 | 320 |
| o-Xylene | ND | H | 22 | 160 |
| Xylenes, Total | 7700 | H | 43 | 480 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| a,a,a-Trifluorotoluene | 131 | | 63 - 145 |
| 4-Bromofluorobenzene | 125 | | 64 - 141 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** **P-01-012215-0948**

Lab Sample ID: 480-89467-23 | Date Sampled: 01/22/2015 0948
Client Matrix: Water | Date Received: 10/20/2015 0920

**8021B Volatile Organic Compounds (GC)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8021B | Analysis Batch: | 480-273207 | Instrument ID: | HP5890-3 |
| Prep Method: | 5030B | | N/A | Initial Weight/Volume: | 44 mL |
| Dilution: | 800 | | | Final Weight/Volume: | 1.0 mL |
| Analysis Date: | 11/05/2015 1913 | | | Injection Volume: | 1 uL |
| Prep Date: | 11/05/2015 1913 | | | Result Type: | PRIMARY |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Benzene | 160 | H | 0.42 | 3.6 |
| Toluene | 7.9 | H | 0.65 | 3.6 |
| Ethylbenzene | ND | H | 0.52 | 3.6 |
| m,p-Xylene | 6.8 | J H | 0.98 | 7.3 |
| o-Xylene | ND | H | 0.49 | 3.6 |
| Xylenes, Total | 6.8 | J H | 0.98 | 11 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| a,a,a-Trifluorotoluene | 124 | | 63 - 145 |
| 4-Bromofluorobenzene | 114 | | 64 - 141 |

Client: U.S. Army Construction Engineering Resea | Job Number: 480-89467-1

**Client Sample ID:** WW-01-031315-1531

Lab Sample ID: 480-89467-24 | Date Sampled: 03/13/2015 1531
Client Matrix: Water | Date Received: 10/20/2015 0920

**8021B Volatile Organic Compounds (GC)**

| | | | | | |
|---|---|---|---|---|---|
| Analysis Method: | 8021B | Analysis Batch: | 480-273207 | Instrument ID: | HP5890-3 |
| Prep Method: | 5030B | | N/A | Initial Weight/Volume: | 44 mL |
| Dilution: | 200 | | | Final Weight/Volume: | 1.0 mL |
| Analysis Date: | 11/05/2015 1944 | | | Injection Volume: | 1 uL |
| Prep Date: | 11/05/2015 1944 | | | Result Type: | PRIMARY |

| Analyte | Result (ug/L) | Qualifier | MDL | RL |
|---|---|---|---|---|
| Benzene | 12 | H | 0.11 | 0.91 |
| Toluene | 1.4 | H | 0.16 | 0.91 |
| Ethylbenzene | ND | H | 0.13 | 0.91 |
| m,p-Xylene | ND | H | 0.25 | 1.8 |
| o-Xylene | 3.7 | H | 0.12 | 0.91 |
| Xylenes, Total | 3.7 | H | 0.25 | 2.7 |

| Surrogate | %Rec | Qualifier | Acceptance Limits |
|---|---|---|---|
| a,a,a-Trifluorotoluene | 146 | X | 63 - 145 |
| 4-Bromofluorobenzene | 126 | | 64 - 141 |

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89467-1

## Surrogate Recovery Report

**8270D Semivolatile Organic Compounds (GC/MS)**

**Client Matrix: Waste**

| Lab Sample ID | Client Sample ID | NBZ %Rec | FBP %Rec | TPH %Rec |
|---|---|---|---|---|
| 480-89467-14 | OS-01-031815-1530 | 65 | 94 | 94 |
| 480-89467-15 | OS-01-042415-1600 | 88 | 102 | 101 |
| 480-89467-16 | OS-01-042815-1600 | 0X | 83 | 81 |
| 480-89467-17 | OS-01-050715-1630 | 94 | 97 | 103 |
| 480-89467-22 | OS-01-101514-0910 | 0X | 73 | 78 |
| MB 480-273073/1-A | | 86 | 98 | 99 |
| LCS 480-273073/2-A | | 79 | 93 | 102 |
| LCSD 480-273073/3-A | | 82 | 93 | 96 |

| Surrogate | Acceptance Limits |
|---|---|
| NBZ = Nitrobenzene-d5 (Surr) | 34-132 |
| FBP = 2-Fluorobiphenyl | 37-120 |
| TPH = p-Terphenyl-d14 (Surr) | 65-153 |

## Surrogate Recovery Report

**8270D Semivolatile Organic Compounds (GC/MS)**

**Client Matrix: Water**

| Lab Sample ID | Client Sample ID | NBZ %Rec | FBP %Rec | TPH %Rec |
|---|---|---|---|---|
| 480-89467-2 | WW-02-030515-1557 | 152X | 101 | 76 |
| 480-89467-5 | WW-01-030515-1352 | 76 | 91 | 73 |
| 480-89467-6 | WW-01-042815-1600 | 106 | 106 | 85 |
| 480-89467-6 DL | WW-01-042815-1600 DL | 0X | 99 | 104 |
| 480-89467-8 | WW-01-050715-1600 | 0X | 98 | 72 |
| 480-89467-8 DL | WW-01-050715-1600 DL | 0X | 87 | 76 |
| 480-89467-10 | P-01-030515-1557 | 0X | 81 | 67 |
| 480-89467-13 | P-01-051315-1530 | 0X | 95 | 83 |
| 480-89467-18 | P-01-101514-0910 | 0X | 93 | 74 |
| 480-89467-19 | P-01-100814-1120 | 0X | 94 | 98 |
| 480-89467-20 | P-01-013015-0915 | 0X | 118 | 65X |
| 480-89467-20 DL | P-01-013015-0915 DL | 0X | 89 | 72 |
| MB 480-273586/1-A | | 82 | 86 | 99 |
| LCS 480-273586/2-A | | 83 | 83 | 98 |

| Surrogate | Acceptance Limits |
|---|---|
| NBZ = Nitrobenzene-d5 (Surr) | 46-120 |
| FBP = 2-Fluorobiphenyl | 48-120 |
| TPH = p-Terphenyl-d14 (Surr) | 67-150 |

## Surrogate Recovery Report

**8021B_Volatile Organic Compounds (GC)**

**Client Matrix: Water**

| Lab Sample ID | Client Sample ID | TFT1 %Rec | BFB1 %Rec |
|---|---|---|---|
| 480-89467-1 | WW-01-101514-1120 | 139 | 122 |
| 480-89467-3 | WW-01-031915-1550 | 138 | 125 |
| 480-89467-4 | WW-01-041415-1640 | 104 | 96 |
| 480-89467-7 | WW-01-050615-1552 | 125 | 116 |
| 480-89467-9 | WW-01-052015-1500 | 109 | 91 |
| 480-89467-11 | P-01-031315-1531 | 94 | 88 |
| 480-89467-12 | P-01-050615-1552 | 135 | 123 |
| 480-89467-21 | P-01-040115-1600 | 131 | 125 |
| 480-89467-23 | P-01-012215-0948 | 124 | 114 |
| 480-89467-24 | WW-01-031315-1531 | 146X | 126 |
| MB 480-273207/3 | | 128 | 123 |
| LCS 480-273207/4 | | 127 | 119 |
| LCSD 480-273207/5 | | 133 | 125 |

| Surrogate | Acceptance Limits |
|---|---|
| TFT = a,a,a-Trifluorotoluene | 63-145 |
| BFB = 4-Bromofluorobenzene | 64-141 |

**Method Blank - Batch: 480-273073**

**Method: 8270D**
**Preparation: 3580A**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | MB 480-273073/1-A | Analysis Batch: | 480-273506 | Instrument ID: | HP5973X |
| Client Matrix: | Waste | Prep Batch: | 480-273073 | Lab File ID: | X009014105.D |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 0.10 g |
| Analysis Date: | 11/05/2015 1513 | Units: | ug/Kg | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/04/2015 1345 | | | Injection Volume: | 1 uL |
| Leach Date: | N/A | | | | |

| Analyte | Result | Qual | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | ND | | 40 | 3400 |
| Acenaphthylene | ND | | 28 | 3400 |
| Anthracene | ND | | 86 | 3400 |
| Benzo[a]anthracene | ND | | 58 | 3400 |
| Benzo[a]pyrene | ND | | 82 | 3400 |
| Benzo[b]fluoranthene | ND | | 66 | 3400 |
| Benzo[g,h,i]perylene | ND | | 40 | 3400 |
| Benzo[k]fluoranthene | ND | | 38 | 3400 |
| Chrysene | ND | | 34 | 3400 |
| Dibenz(a,h)anthracene | ND | | 40 | 3400 |
| Fluoranthene | ND | | 48 | 3400 |
| Fluorene | ND | | 78 | 3400 |
| Indeno[1,2,3-cd]pyrene | ND | | 94 | 3400 |
| Naphthalene | ND | | 56 | 3400 |
| Phenanthrene | ND | | 70 | 3400 |
| Pyrene | ND | | 22 | 3400 |

| Surrogate | % Rec | Acceptance Limits |
|---|---|---|
| 2-Fluorobiphenyl | 98 | 37 - 120 |
| Nitrobenzene-d5 (Surr) | 86 | 34 - 132 |
| p-Terphenyl-d14 (Surr) | 99 | 65 - 153 |

**Lab Control Sample/**
**Lab Control Sample Duplicate Recovery Report - Batch: 480-273073**

**Method: 8270D**
**Preparation: 3580A**

| | | | | | |
|---|---|---|---|---|---|
| LCS Lab Sample ID: | LCS 480-273073/2-A | Analysis Batch: | 480-273506 | Instrument ID: | HP5973X |
| Client Matrix: | Waste | Prep Batch: | 480-273073 | Lab File ID: | X009014106.D |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 0.10 g |
| Analysis Date: | 11/05/2015 1540 | Units: | ug/Kg | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/04/2015 1345 | | | Injection Volume: | 1 uL |
| Leach Date: | N/A | | | | |

| | | | | | |
|---|---|---|---|---|---|
| LCSD Lab Sample ID: | LCSD 480-273073/3-A | Analysis Batch: | 480-273506 | Instrument ID: | HP5973X |
| Client Matrix: | Waste | Prep Batch: | 480-273073 | Lab File ID: | X009014107.D |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 0.10 g |
| Analysis Date: | 11/05/2015 1607 | Units: | ug/Kg | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/04/2015 1345 | | | Injection Volume: | 1 uL |
| Leach Date: | N/A | | | | |

| | % Rec. | | | | | |
|---|---|---|---|---|---|---|
| Analyte | LCS | LCSD | Limit | RPD | RPD Limit | LCS Qual | LCSD Qual |
| Acenaphthene | 92 | 91 | 53 - 120 | 1 | 35 | | |
| Acenaphthylene | 91 | 90 | 58 - 121 | 0 | 18 | | |
| Anthracene | 103 | 98 | 62 - 129 | 5 | 15 | | |
| Benzo[a]anthracene | 100 | 94 | 65 - 133 | 7 | 15 | | |
| Benzo[a]pyrene | 99 | 94 | 64 - 127 | 5 | 15 | | |
| Benzo[b]fluoranthene | 98 | 93 | 64 - 135 | 5 | 15 | | |
| Benzo[g,h,i]perylene | 102 | 96 | 50 - 152 | 5 | 15 | | |
| Benzo[k]fluoranthene | 103 | 98 | 58 - 138 | 5 | 22 | | |
| Chrysene | 98 | 93 | 64 - 131 | 5 | 15 | | |
| Dibenz(a,h)anthracene | 101 | 96 | 54 - 148 | 5 | 15 | | |
| Fluoranthene | 101 | 97 | 62 - 131 | 3 | 15 | | |
| Fluorene | 97 | 94 | 63 - 126 | 3 | 15 | | |
| Indeno[1,2,3-cd]pyrene | 101 | 95 | 56 - 149 | 6 | 15 | | |
| Naphthalene | 88 | 86 | 46 - 120 | 2 | 29 | | |
| Phenanthrene | 104 | 99 | 60 - 130 | 5 | 15 | | |
| Pyrene | 103 | 96 | 51 - 133 | 8 | 35 | | |

| Surrogate | LCS % Rec | LCSD % Rec | Acceptance Limits |
|---|---|---|---|
| 2-Fluorobiphenyl | 93 | 93 | 37 - 120 |
| Nitrobenzene-d5 (Surr) | 79 | 82 | 34 - 132 |
| p-Terphenyl-d14 (Surr) | 102 | 96 | 65 - 153 |

**Laboratory Control/**
**Laboratory Duplicate Data Report - Batch: 480-273073**

**Method: 8270D**
**Preparation: 3580A**

| | | | |
|---|---|---|---|
| LCS Lab Sample ID: | LCS 480-273073/2-A | Units: ug/Kg | |
| Client Matrix: | Waste | | |
| Dilution: | 1.0 | | |
| Analysis Date: | 11/05/2015 1540 | | |
| Prep Date: | 11/04/2015 1345 | | |
| Leach Date: | N/A | | |

| | |
|---|---|
| LCSD Lab Sample ID: | LCSD 480-273073/3-A |
| Client Matrix: | Waste |
| Dilution: | 1.0 |
| Analysis Date: | 11/05/2015 1607 |
| Prep Date: | 11/04/2015 1345 |
| Leach Date: | N/A |

| Analyte | LCS Spike Amount | LCSD Spike Amount | LCS Result/Qual | LCSD Result/Qual |
|---|---|---|---|---|
| Acenaphthene | 500000 | 500000 | 460000 | 455000 |
| Acenaphthylene | 500000 | 500000 | 453000 | 452000 |
| Anthracene | 500000 | 500000 | 517000 | 492000 |
| Benzo[a]anthracene | 500000 | 500000 | 502000 | 469000 |
| Benzo[a]pyrene | 500000 | 500000 | 497000 | 471000 |
| Benzo[b]fluoranthene | 500000 | 500000 | 488000 | 466000 |
| Benzo[g,h,i]perylene | 500000 | 500000 | 508000 | 482000 |
| Benzo[k]fluoranthene | 500000 | 500000 | 514000 | 491000 |
| Chrysene | 500000 | 500000 | 492000 | 467000 |
| Dibenz(a,h)anthracene | 500000 | 500000 | 506000 | 481000 |
| Fluoranthene | 500000 | 500000 | 503000 | 486000 |
| Fluorene | 500000 | 500000 | 483000 | 469000 |
| Indeno[1,2,3-cd]pyrene | 500000 | 500000 | 505000 | 474000 |
| Naphthalene | 500000 | 500000 | 438000 | 428000 |
| Phenanthrene | 500000 | 500000 | 518000 | 495000 |
| Pyrene | 500000 | 500000 | 516000 | 478000 |

**Method Blank - Batch: 480-273586**

**Method: 8270D**
**Preparation: 3510C**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | MB 480-273586/1-A | Analysis Batch: | 480-273910 | Instrument ID: | HP5973V |
| Client Matrix: | Water | Prep Batch: | 480-273586 | Lab File ID: | V54275.D |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 250 mL |
| Analysis Date: | 11/09/2015 1426 | Units: | ug/L | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |
| Leach Date: | N/A | | | | |

| Analyte | Result | Qual | MDL | RL |
|---|---|---|---|---|
| Acenaphthene | ND | | 0.41 | 5.0 |
| Acenaphthylene | ND | | 0.38 | 5.0 |
| Anthracene | ND | | 0.28 | 5.0 |
| Benzo[a]anthracene | ND | | 0.36 | 5.0 |
| Benzo[a]pyrene | ND | | 0.47 | 5.0 |
| Benzo[b]fluoranthene | ND | | 0.34 | 5.0 |
| Benzo[g,h,i]perylene | ND | | 0.35 | 5.0 |
| Benzo[k]fluoranthene | ND | | 0.73 | 5.0 |
| Chrysene | ND | | 0.33 | 5.0 |
| Dibenz(a,h)anthracene | ND | | 0.42 | 5.0 |
| Fluoranthene | ND | | 0.40 | 5.0 |
| Fluorene | ND | | 0.36 | 5.0 |
| Indeno[1,2,3-cd]pyrene | ND | | 0.47 | 5.0 |
| Naphthalene | ND | | 0.76 | 5.0 |
| Phenanthrene | ND | | 0.44 | 5.0 |
| Pyrene | ND | | 0.34 | 5.0 |

| Surrogate | % Rec | Acceptance Limits |
|---|---|---|
| 2-Fluorobiphenyl | 86 | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 82 | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 99 | 67 - 150 |

**Lab Control Sample - Batch: 480-273586**

**Method: 8270D**
**Preparation: 3510C**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | LCS 480-273586/2-A | Analysis Batch: | 480-273910 | Instrument ID: | HP5973V |
| Client Matrix: | Water | Prep Batch: | 480-273586 | Lab File ID: | V54276.D |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 250 mL |
| Analysis Date: | 11/09/2015 1456 | Units: | ug/L | Final Weight/Volume: | 1 mL |
| Prep Date: | 11/06/2015 1233 | | | Injection Volume: | 2 uL |
| Leach Date: | N/A | | | | |

| Analyte | Spike Amount | Result | % Rec. | Limit | Qual |
|---|---|---|---|---|---|
| Acenaphthene | 16.0 | 14.5 | 91 | 60 - 120 | |
| Acenaphthylene | 16.0 | 14.7 | 92 | 63 - 120 | |
| Anthracene | 16.0 | 14.8 | 92 | 58 - 148 | |
| Benzo[a]anthracene | 16.0 | 15.0 | 94 | 55 - 151 | |
| Benzo[a]pyrene | 16.0 | 14.5 | 90 | 60 - 145 | |
| Benzo[b]fluoranthene | 16.0 | 14.5 | 91 | 54 - 140 | |
| Benzo[g,h,i]perylene | 16.0 | 17.1 | 107 | 66 - 152 | |
| Benzo[k]fluoranthene | 16.0 | 14.4 | 90 | 51 - 153 | |
| Chrysene | 16.0 | 15.0 | 93 | 69 - 140 | |
| Dibenz(a,h)anthracene | 16.0 | 15.9 | 99 | 57 - 148 | |
| Fluoranthene | 16.0 | 15.4 | 96 | 55 - 147 | |
| Fluorene | 16.0 | 15.0 | 94 | 55 - 143 | |
| Indeno[1,2,3-cd]pyrene | 16.0 | 15.8 | 99 | 69 - 146 | |
| Naphthalene | 16.0 | 12.8 | 80 | 35 - 130 | |
| Phenanthrene | 16.0 | 14.9 | 93 | 57 - 147 | |
| Pyrene | 16.0 | 15.5 | 97 | 58 - 136 | |

| Surrogate | % Rec | Acceptance Limits |
|---|---|---|
| 2-Fluorobiphenyl | 83 | 48 - 120 |
| Nitrobenzene-d5 (Surr) | 83 | 46 - 120 |
| p-Terphenyl-d14 (Surr) | 98 | 67 - 150 |

**Method Blank - Batch: 480-273207**

**Method: 8021B**
**Preparation: 5030B**

| | | | | | |
|---|---|---|---|---|---|
| Lab Sample ID: | MB 480-273207/3 | Analysis Batch: | 480-273207 | Instrument ID: | HP5890-3 |
| Client Matrix: | Water | Prep Batch: | N/A | Lab File ID: | 3_69023.D |
| Dilution: | 1.0 | Leach Batch: | N/A | Initial Weight/Volume: | 44 mL |
| Analysis Date: | 11/05/2015 0828 | Units: | ug/L | Final Weight/Volume: | |
| Prep Date: | 11/05/2015 0828 | | | Injection Volume: | 1 uL |
| Leach Date: | N/A | | | Column ID: | PRIMARY |

| Analyte | Result | Qual | MDL | RL |
|---|---|---|---|---|
| Benzene | ND | | 0.023 | 0.20 |
| Toluene | ND | | 0.036 | 0.20 |
| Ethylbenzene | ND | | 0.029 | 0.20 |
| m,p-Xylene | ND | | 0.054 | 0.40 |
| o-Xylene | ND | | 0.027 | 0.20 |
| Xylenes, Total | ND | | 0.054 | 0.60 |

| Surrogate | % Rec | Acceptance Limits |
|---|---|---|
| a,a,a-Trifluorotoluene | 128 | 63 - 145 |
| 4-Bromofluorobenzene | 123 | 64 - 141 |

| Surrogate | LCS % Rec | LCSD % Rec | Acceptance Limits |
|---|---|---|---|
| a,a,a-Trifluorotoluene | 127 | 133 | 63 - 145 |
| 4-Bromofluorobenzene | 119 | 125 | 64 - 141 |

## DATA REPORTING QUALIFIERS

Client: U.S. Army Construction Engineering Resea Job Number: 480-89467-1

| Lab Section | Qualifier | Description |
|---|---|---|
| GC/MS Semi VOA | | |
| | E | Result exceeded calibration range. |
| | J | Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value. |
| | H | Sample was prepped or analyzed beyond the specified holding time |
| | X | Surrogate is outside control limits |
| GC VOA | | |
| | J | Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value. |
| | H | Sample was prepped or analyzed beyond the specified holding time |
| | X | Surrogate is outside control limits |

## QC Association Summary

| Lab Sample ID | Client Sample ID | Report Basis | Client Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| **GC/MS Semi VOA** | | | | | |
| **Prep Batch: 480-273073** | | | | | |
| LCS 480-273073/2-A | Lab Control Sample | T | Waste | 3580A | |
| LCSD 480-273073/3-A | Lab Control Sample Duplicate | T | Waste | 3580A | |
| MB 480-273073/1-A | Method Blank | T | Waste | 3580A | |
| 480-89467-14 | OS-01-031815-1530 | T | Waste | 3580A | |
| 480-89467-15 | OS-01-042415-1600 | T | Waste | 3580A | |
| 480-89467-16 | OS-01-042815-1600 | T | Waste | 3580A | |
| 480-89467-17 | OS-01-050715-1630 | T | Waste | 3580A | |
| 480-89467-22 | OS-01-101514-0910 | T | Waste | 3580A | |
| **Analysis Batch:480-273506** | | | | | |
| LCS 480-273073/2-A | Lab Control Sample | T | Waste | 8270D | 480-273073 |
| LCSD 480-273073/3-A | Lab Control Sample Duplicate | T | Waste | 8270D | 480-273073 |
| MB 480-273073/1-A | Method Blank | T | Waste | 8270D | 480-273073 |
| 480-89467-14 | OS-01-031815-1530 | T | Waste | 8270D | 480-273073 |
| 480-89467-15 | OS-01-042415-1600 | T | Waste | 8270D | 480-273073 |
| 480-89467-16 | OS-01-042815-1600 | T | Waste | 8270D | 480-273073 |
| 480-89467-17 | OS-01-050715-1630 | T | Waste | 8270D | 480-273073 |
| 480-89467-22 | OS-01-101514-0910 | T | Waste | 8270D | 480-273073 |
| **Prep Batch: 480-273586** | | | | | |
| LCS 480-273586/2-A | Lab Control Sample | T | Water | 3510C | |
| MB 480-273586/1-A | Method Blank | T | Water | 3510C | |
| 480-89467-2 | WW-02-030515-1557 | T | Water | 3510C | |
| 480-89467-5 | WW-01-030515-1352 | T | Water | 3510C | |
| 480-89467-6 | WW-01-042815-1600 | T | Water | 3510C | |
| 480-89467-6DL | WW-01-042815-1600 | T | Water | 3510C | |
| 480-89467-8 | WW-01-050715-1600 | T | Water | 3510C | |
| 480-89467-8DL | WW-01-050715-1600 | T | Water | 3510C | |
| 480-89467-10 | P-01-030515-1557 | T | Water | 3510C | |
| 480-89467-13 | P-01-051315-1530 | T | Water | 3510C | |
| 480-89467-18 | P-01-101514-0910 | T | Water | 3510C | |
| 480-89467-19 | P-01-100814-1120 | T | Water | 3510C | |
| 480-89467-20 | P-01-013015-0915 | T | Water | 3510C | |
| 480-89467-20DL | P-01-013015-0915 | T | Water | 3510C | |
| **Analysis Batch:480-273910** | | | | | |
| LCS 480-273586/2-A | Lab Control Sample | T | Water | 8270D | 480-273586 |
| MB 480-273586/1-A | Method Blank | T | Water | 8270D | 480-273586 |

## QC Association Summary

| Lab Sample ID | Client Sample ID | Report Basis | Client Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| **GC/MS Semi VOA** | | | | | |
| **Analysis Batch:480-273999** | | | | | |
| 480-89467-2 | WW-02-030515-1557 | T | Water | 8270D | 480-273586 |
| 480-89467-5 | WW-01-030515-1352 | T | Water | 8270D | 480-273586 |
| 480-89467-6 | WW-01-042815-1600 | T | Water | 8270D | 480-273586 |
| 480-89467-8 | WW-01-050715-1600 | T | Water | 8270D | 480-273586 |
| 480-89467-10 | P-01-030515-1557 | T | Water | 8270D | 480-273586 |
| 480-89467-13 | P-01-051315-1530 | T | Water | 8270D | 480-273586 |
| 480-89467-18 | P-01-101514-0910 | T | Water | 8270D | 480-273586 |
| 480-89467-19 | P-01-100814-1120 | T | Water | 8270D | 480-273586 |
| 480-89467-20 | P-01-013015-0915 | T | Water | 8270D | 480-273586 |
| **Analysis Batch:480-274392** | | | | | |
| 480-89467-6DL | WW-01-042815-1600 | T | Water | 8270D | 480-273586 |
| 480-89467-8DL | WW-01-050715-1600 | T | Water | 8270D | 480-273586 |
| 480-89467-20DL | P-01-013015-0915 | T | Water | 8270D | 480-273586 |

**Report Basis**
T = Total

**GC VOA**

**Analysis Batch:480-266158**

8021B

**Analysis Batch:480-273207**

| | | | | |
|---|---|---|---|---|
| LCS 480-273207/4 | Lab Control Sample | T | Water | 8021B |
| LCSD 480-273207/5 | Lab Control Sample Duplicate | T | Water | 8021B |
| MB 480-273207/3 | Method Blank | T | Water | 8021B |
| 480-89467-1 | WW-01-101514-1120 | T | Water | 8021B |
| 480-89467-3 | WW-01-031915-1550 | T | Water | 8021B |
| 480-89467-4 | WW-01-041415-1640 | T | Water | 8021B |
| 480-89467-7 | WW-01-050615-1552 | T | Water | 8021B |
| 480-89467-9 | WW-01-052015-1500 | T | Water | 8021B |
| 480-89467-11 | P-01-031315-1531 | T | Water | 8021B |
| 480-89467-12 | P-01-050615-1552 | T | Water | 8021B |
| 480-89467-21 | P-01-040115-1600 | T | Water | 8021B |
| 480-89467-23 | P-01-012215-0948 | T | Water | 8021B |
| 480-89467-24 | WW-01-031315-1531 | T | Water | 8021B |

**Report Basis**
T = Total

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89467-1

## Laboratory Chronicle

**Lab ID: 480-89467-1** **Client ID: WW-01-101514-1120**

Sample Date/Time: 10/15/2014 11:20 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:5030B | 480-89467-B-1 | | 480-273207 | | 11/05/2015 11:33 | 200 | TAL BUF | JRL |
| A:8021B | 480-89467-B-1 | | 480-273207 | | 11/05/2015 11:33 | 200 | TAL BUF | JRL |

**Lab ID: 480-89467-2** **Client ID: WW-02-030515-1557**

Sample Date/Time: 03/05/2015 15:57 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3510C | 480-89467-B-2-A | | 480-273999 | 480-273586 | 11/06/2015 12:33 | 20 | TAL BUF | CPH |
| A:8270D | 480-89467-B-2-A | | 480-273999 | 480-273586 | 11/10/2015 17:23 | 20 | TAL BUF | DMR |

**Lab ID: 480-89467-3** **Client ID: WW-01-031915-1550**

Sample Date/Time: 03/19/2015 15:50 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:5030B | 480-89467-B-3 | | 480-273207 | | 11/05/2015 12:05 | 800 | TAL BUF | JRL |
| A:8021B | 480-89467-B-3 | | 480-273207 | | 11/05/2015 12:05 | 800 | TAL BUF | JRL |

**Lab ID: 480-89467-4** **Client ID: WW-01-041415-1640**

Sample Date/Time: 04/14/2015 16:40 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:5030B | 480-89467-B-4 | | 480-273207 | | 11/05/2015 12:38 | 200 | TAL BUF | JRL |
| A:8021B | 480-89467-B-4 | | 480-273207 | | 11/05/2015 12:38 | 200 | TAL BUF | JRL |

**Lab ID: 480-89467-5** **Client ID: WW-01-030515-1352**

Sample Date/Time: 03/05/2015 13:52 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3510C | 480-89467-B-5-A | | 480-273999 | 480-273586 | 11/06/2015 12:33 | 20 | TAL BUF | CPH |
| A:8270D | 480-89467-B-5-A | | 480-273999 | 480-273586 | 11/10/2015 17:52 | 20 | TAL BUF | DMR |

**Lab ID: 480-89467-6** **Client ID: WW-01-042815-1600**

Sample Date/Time: 04/28/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3510C | 480-89467-B-6-A | | 480-273999 | 480-273586 | 11/06/2015 12:33 | 20 | TAL BUF | CPH |
| A:8270D | 480-89467-B-6-A | | 480-273999 | 480-273586 | 11/10/2015 18:21 | 20 | TAL BUF | DMR |
| P:3510C | 480-89467-B-6-A | DL | 480-274392 | 480-273586 | 11/06/2015 12:33 | 100 | TAL BUF | CPH |
| A:8270D | 480-89467-B-6-A | DL | 480-274392 | 480-273586 | 11/11/2015 13:47 | 100 | TAL BUF | DMR |

## Laboratory Chronicle

**Lab ID: 480-89467-7** **Client ID: WW-01-050615-1552**

Sample Date/Time: 05/06/2015 15:52 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:5030B | 480-89467-B-7 | | 480-273207 | | 11/05/2015 13:10 | 200 | TAL BUF | JRL |
| A:8021B | 480-89467-B-7 | | 480-273207 | | 11/05/2015 13:10 | 200 | TAL BUF | JRL |

**Lab ID: 480-89467-8** **Client ID: WW-01-050715-1600**

Sample Date/Time: 05/07/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3510C | 480-89467-B-8-A | | 480-273999 | 480-273586 | 11/06/2015 12:33 | 20 | TAL BUF | CPH |
| A:8270D | 480-89467-B-8-A | | 480-273999 | 480-273586 | 11/10/2015 18:50 | 20 | TAL BUF | DMR |
| P:3510C | 480-89467-B-8-A | DL | 480-274392 | 480-273586 | 11/06/2015 12:33 | 100 | TAL BUF | CPH |
| A:8270D | 480-89467-B-8-A | DL | 480-274392 | 480-273586 | 11/11/2015 14:16 | 100 | TAL BUF | DMR |

**Lab ID: 480-89467-9** **Client ID: WW-01-052015-1500**

Sample Date/Time: 05/20/2015 15:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:5030B | 480-89467-B-9 | | 480-273207 | | 11/05/2015 18:41 | 200 | TAL BUF | JRL |
| A:8021B | 480-89467-B-9 | | 480-273207 | | 11/05/2015 18:41 | 200 | TAL BUF | JRL |

**Lab ID: 480-89467-10** **Client ID: P-01-030515-1557**

Sample Date/Time: 03/05/2015 15:57 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3510C | 480-89467-B-10-A | | 480-273999 | 480-273586 | 11/06/2015 12:33 | 20 | TAL BUF | CPH |
| A:8270D | 480-89467-B-10-A | | 480-273999 | 480-273586 | 11/10/2015 19:19 | 20 | TAL BUF | DMR |

**Lab ID: 480-89467-11** **Client ID: P-01-031315-1531**

Sample Date/Time: 03/13/2015 15:31 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:5030B | 480-89467-B-11 | | 480-273207 | | 11/05/2015 15:10 | 2000 | TAL BUF | JRL |
| A:8021B | 480-89467-B-11 | | 480-273207 | | 11/05/2015 15:10 | 2000 | TAL BUF | JRL |

**Lab ID: 480-89467-12** **Client ID: P-01-050615-1552**

Sample Date/Time: 05/06/2015 15:52 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:5030B | 480-89467-B-12 | | 480-273207 | | 11/05/2015 16:14 | 400 | TAL BUF | JRL |
| A:8021B | 480-89467-B-12 | | 480-273207 | | 11/05/2015 16:14 | 400 | TAL BUF | JRL |

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89467-1

## Laboratory Chronicle

**Lab ID: 480-89467-13** **Client ID: P-01-051315-1530**

Sample Date/Time: 05/13/2015 15:30 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3510C | 480-89467-B-13-A | | 480-273999 | 480-273586 | 11/06/2015 12:33 | 20 | TAL BUF | CPH |
| A:8270D | 480-89467-B-13-A | | 480-273999 | 480-273586 | 11/10/2015 19:48 | 20 | TAL BUF | DMR |

**Lab ID: 480-89467-14** **Client ID: OS-01-031815-1530**

Sample Date/Time: 03/18/2015 15:30 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3580A | 480-89467-A-14-A | | 480-273506 | 480-273073 | 11/04/2015 13:45 | 100 | TAL BUF | CAM |
| A:8270D | 480-89467-A-14-A | | 480-273506 | 480-273073 | 11/05/2015 16:34 | 100 | TAL BUF | CAS |

**Lab ID: 480-89467-15** **Client ID: OS-01-042415-1600**

Sample Date/Time: 04/24/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3580A | 480-89467-A-15-A | | 480-273506 | 480-273073 | 11/04/2015 13:45 | 10 | TAL BUF | CAM |
| A:8270D | 480-89467-A-15-A | | 480-273506 | 480-273073 | 11/05/2015 17:01 | 10 | TAL BUF | CAS |

**Lab ID: 480-89467-16** **Client ID: OS-01-042815-1600**

Sample Date/Time: 04/28/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3580A | 480-89467-A-16-A | | 480-273506 | 480-273073 | 11/04/2015 13:45 | 200 | TAL BUF | CAM |
| A:8270D | 480-89467-A-16-A | | 480-273506 | 480-273073 | 11/05/2015 17:28 | 200 | TAL BUF | CAS |

**Lab ID: 480-89467-17** **Client ID: OS-01-050715-1630**

Sample Date/Time: 05/07/2015 16:30 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3580A | 480-89467-A-17-A | | 480-273506 | 480-273073 | 11/04/2015 13:45 | 100 | TAL BUF | CAM |
| A:8270D | 480-89467-A-17-A | | 480-273506 | 480-273073 | 11/05/2015 17:55 | 100 | TAL BUF | CAS |

**Lab ID: 480-89467-18** **Client ID: P-01-101514-0910**

Sample Date/Time: 10/15/2014 09:10 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3510C | 480-89467-B-18-A | | 480-273999 | 480-273586 | 11/06/2015 12:33 | 20 | TAL BUF | CPH |
| A:8270D | 480-89467-B-18-A | | 480-273999 | 480-273586 | 11/10/2015 20:17 | 20 | TAL BUF | DMR |

## Laboratory Chronicle

**Lab ID: 480-89467-19** **Client ID: P-01-100814-1120**

Sample Date/Time: 10/08/2014 11:20 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3510C | 480-89467-B-19-A | | 480-273999 | 480-273586 | 11/06/2015 12:33 | 20 | TAL BUF | CPH |
| A:8270D | 480-89467-B-19-A | | 480-273999 | 480-273586 | 11/10/2015 20:46 | 20 | TAL BUF | DMR |

**Lab ID: 480-89467-20** **Client ID: P-01-013015-0915**

Sample Date/Time: 01/30/2015 09:15 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3510C | 480-89467-B-20-A | | 480-273999 | 480-273586 | 11/06/2015 12:33 | 20 | TAL BUF | CPH |
| A:8270D | 480-89467-B-20-A | | 480-273999 | 480-273586 | 11/10/2015 21:15 | 20 | TAL BUF | DMR |
| P:3510C | 480-89467-B-20-A | DL | 480-274392 | 480-273586 | 11/06/2015 12:33 | 100 | TAL BUF | CPH |
| A:8270D | 480-89467-B-20-A | DL | 480-274392 | 480-273586 | 11/11/2015 14:45 | 100 | TAL BUF | DMR |

**Lab ID: 480-89467-21** **Client ID: P-01-040115-1600**

Sample Date/Time: 04/01/2015 16:00 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:5030B | 480-89467-B-21 | | 480-273207 | | 11/05/2015 16:45 | 800 | TAL BUF | JRL |
| A:8021B | 480-89467-B-21 | | 480-273207 | | 11/05/2015 16:45 | 800 | TAL BUF | JRL |

**Lab ID: 480-89467-22** **Client ID: OS-01-101514-0910**

Sample Date/Time: 10/15/2014 09:10 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3580A | 480-89467-A-22-A | | 480-273506 | 480-273073 | 11/04/2015 13:45 | 100 | TAL BUF | CAM |
| A:8270D | 480-89467-A-22-A | | 480-273506 | 480-273073 | 11/05/2015 18:21 | 100 | TAL BUF | CAS |

**Lab ID: 480-89467-23** **Client ID: P-01-012215-0948**

Sample Date/Time: 01/22/2015 09:48 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:5030B | 480-89467-B-23 | | 480-273207 | | 11/05/2015 19:13 | 800 | TAL BUF | JRL |
| A:8021B | 480-89467-B-23 | | 480-273207 | | 11/05/2015 19:13 | 800 | TAL BUF | JRL |

**Lab ID: 480-89467-24** **Client ID: WW-01-031315-1531**

Sample Date/Time: 03/13/2015 15:31 Received Date/Time: 10/20/2015 09:20

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:5030B | 480-89467-B-24 | | 480-273207 | | 11/05/2015 19:44 | 200 | TAL BUF | JRL |
| A:8021B | 480-89467-B-24 | | 480-273207 | | 11/05/2015 19:44 | 200 | TAL BUF | JRL |

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89467-1

## Laboratory Chronicle

**Lab ID: MB** **Client ID: N/A**

Sample Date/Time: N/A Received Date/Time: N/A

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3580A | MB 480-273073/1-A | | 480-273506 | 480-273073 | 11/04/2015 13:45 | 1 | TAL BUF | CAM |
| A:8270D | MB 480-273073/1-A | | 480-273506 | 480-273073 | 11/05/2015 15:13 | 1 | TAL BUF | CAS |
| P:3510C | MB 480-273586/1-A | | 480-273910 | 480-273586 | 11/06/2015 12:33 | 1 | TAL BUF | CPH |
| A:8270D | MB 480-273586/1-A | | 480-273910 | 480-273586 | 11/09/2015 14:26 | 1 | TAL BUF | DMR |
| P:5030B | MB 480-273207/3 | | 480-273207 | | 11/05/2015 08:28 | 1 | TAL BUF | JRL |
| A:8021B | MB 480-273207/3 | | 480-273207 | | 11/05/2015 08:28 | 1 | TAL BUF | JRL |

**Lab ID: LCS** **Client ID: N/A**

Sample Date/Time: N/A Received Date/Time: N/A

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3580A | LCS 480-273073/2-A | | 480-273506 | 480-273073 | 11/04/2015 13:45 | 1 | TAL BUF | CAM |
| A:8270D | LCS 480-273073/2-A | | 480-273506 | 480-273073 | 11/05/2015 15:40 | 1 | TAL BUF | CAS |
| P:3510C | LCS 480-273586/2-A | | 480-273910 | 480-273586 | 11/06/2015 12:33 | 1 | TAL BUF | CPH |
| A:8270D | LCS 480-273586/2-A | | 480-273910 | 480-273586 | 11/09/2015 14:56 | 1 | TAL BUF | DMR |
| P:5030B | LCS 480-273207/4 | | 480-273207 | | 11/05/2015 09:00 | 1 | TAL BUF | JRL |
| A:8021B | LCS 480-273207/4 | | 480-273207 | | 11/05/2015 09:00 | 1 | TAL BUF | JRL |

**Lab ID: LCSD** **Client ID: N/A**

Sample Date/Time: N/A Received Date/Time: N/A

| Method | Bottle ID | Run | Analysis Batch | Prep Batch | Date Prepared / Analyzed | Dil | Lab | Analyst |
|---|---|---|---|---|---|---|---|---|
| P:3580A | LCSD 480-273073/3-A | | 480-273506 | 480-273073 | 11/04/2015 13:45 | 1 | TAL BUF | CAM |
| A:8270D | LCSD 480-273073/3-A | | 480-273506 | 480-273073 | 11/05/2015 16:07 | 1 | TAL BUF | CAS |
| P:5030B | LCSD 480-273207/5 | | 480-273207 | | 11/05/2015 09:31 | 1 | TAL BUF | JRL |
| A:8021B | LCSD 480-273207/5 | | 480-273207 | | 11/05/2015 09:31 | 1 | TAL BUF | JRL |

**Lab References:**
TAL BUF = TestAmerica Buffalo

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| **8021_alt_40ng_00011** | 12/02/15 | 11/02/15 | Methanol, Lot 0000099494 | 1 mL | 8021_ALT_200_00016 | 200 uL | Benzene | 40 ug/mL |
| | | | | | | | Ethylbenzene | 40 ug/mL |
| | | | | | | | m,p-Xylene | 80 ug/mL |
| | | | | | | | o-Xylene | 40 ug/mL |
| | | | | | | | Toluene | 40 ug/mL |
| .8021_ALT_200_00016 | 12/02/15 | | Restek, Lot A0110888 | | (Purchased Reagent) | | Benzene | 200 ug/mL |
| | | | | | | | Ethylbenzene | 200 ug/mL |
| | | | | | | | m,p-Xylene | 400 ug/mL |
| | | | | | | | o-Xylene | 200 ug/mL |
| | | | | | | | Toluene | 200 ug/mL |
| **8021_INT_.02_00032** | 09/13/15 | 08/18/15 | water, Lot na | 100 mL | 8021_STK200_00060 | 10 uL | 1,2,4-Trimethylbenzene | 0.02 ug/mL |
| | | | | | | | 1,3,5-Trimethylbenzene | 0.02 ug/mL |
| | | | | | | | 4-Isopropyltoluene | 0.02 ug/mL |
| | | | | | | | Benzene | 0.02 ug/mL |
| | | | | | | | Ethylbenzene | 0.02 ug/mL |
| | | | | | | | Isopropylbenzene | 0.02 ug/mL |
| | | | | | | | m,p-Xylene | 0.04 ug/mL |
| | | | | | | | Methyl tert-butyl ether | 0.02 ug/mL |
| | | | | | | | n-Butylbenzene | 0.02 ug/mL |
| | | | | | | | N-Propylbenzene | 0.02 ug/mL |
| | | | | | | | Naphthalene | 0.02 ug/mL |
| | | | | | | | o-Xylene | 0.02 ug/mL |
| | | | | | | | sec-Butylbenzene | 0.02 ug/mL |
| | | | | | | | tert-Butylbenzene | 0.02 ug/mL |
| | | | | | | | Toluene | 0.02 ug/mL |
| .8021_STK200_00060 | 09/13/15 | | Ultra, Lot CM-2339 | | (Purchased Reagent) | | 1,2,4-Trimethylbenzene | 200 ug/mL |
| | | | | | | | 1,3,5-Trimethylbenzene | 200 ug/mL |
| | | | | | | | 4-Isopropyltoluene | 200 ug/mL |
| | | | | | | | Benzene | 200 ug/mL |
| | | | | | | | Ethylbenzene | 200 ug/mL |
| | | | | | | | Isopropylbenzene | 200 ug/mL |
| | | | | | | | m,p-Xylene | 400 ug/mL |
| | | | | | | | Methyl tert-butyl ether | 200 ug/mL |
| | | | | | | | n-Butylbenzene | 200 ug/mL |
| | | | | | | | N-Propylbenzene | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | o-Xylene | 200 ug/mL |
| | | | | | | | sec-Butylbenzene | 200 ug/mL |
| | | | | | | | tert-Butylbenzene | 200 ug/mL |
| | | | | | | | Toluene | 200 ug/mL |
| **8021_INT_.06_00015** | 09/13/15 | 08/18/15 | P&T Methanol, Lot na | 100 mL | 8021_STK200_00060 | 30 uL | 1,2,4-Trimethylbenzene | 0.06 ug/mL |
| | | | | | | | 1,3,5-Trimethylbenzene | 0.06 ug/mL |
| | | | | | | | 4-Isopropyltoluene | 0.06 ug/mL |
| | | | | | | | Benzene | 0.06 ug/mL |
| | | | | | | | Ethylbenzene | 0.06 ug/mL |
| | | | | | | | Isopropylbenzene | 0.06 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | m,p-Xylene | 0.12 ug/mL |
| | | | | | | | Methyl tert-butyl ether | 0.06 ug/mL |
| | | | | | | | n-Butylbenzene | 0.06 ug/mL |
| | | | | | | | N-Propylbenzene | 0.06 ug/mL |
| | | | | | | | Naphthalene | 0.06 ug/mL |
| | | | | | | | o-Xylene | 0.06 ug/mL |
| | | | | | | | sec-Butylbenzene | 0.06 ug/mL |
| | | | | | | | tert-Butylbenzene | 0.06 ug/mL |
| | | | | | | | Toluene | 0.06 ug/mL |
| .8021_STK200_00060 | 09/13/15 | | Ultra, Lot CM-2339 | | (Purchased Reagent) | | 1,2,4-Trimethylbenzene | 200 ug/mL |
| | | | | | | | 1,3,5-Trimethylbenzene | 200 ug/mL |
| | | | | | | | 4-Isopropyltoluene | 200 ug/mL |
| | | | | | | | Benzene | 200 ug/mL |
| | | | | | | | Ethylbenzene | 200 ug/mL |
| | | | | | | | Isopropylbenzene | 200 ug/mL |
| | | | | | | | m,p-Xylene | 400 ug/mL |
| | | | | | | | Methyl tert-butyl ether | 200 ug/mL |
| | | | | | | | n-Butylbenzene | 200 ug/mL |
| | | | | | | | N-Propylbenzene | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | o-Xylene | 200 ug/mL |
| | | | | | | | sec-Butylbenzene | 200 ug/mL |
| | | | | | | | tert-Butylbenzene | 200 ug/mL |
| | | | | | | | Toluene | 200 ug/mL |
| **8021_STK200_00063** | 12/02/15 | | Ultra, Lot CM-2339 | | (Purchased Reagent) | | Benzene | 200 ug/mL |
| | | | | | | | Ethylbenzene | 200 ug/mL |
| | | | | | | | m,p-Xylene | 400 ug/mL |
| | | | | | | | o-Xylene | 200 ug/mL |
| | | | | | | | Toluene | 200 ug/mL |
| **8021_Surr150_00055** | 10/02/15 | 09/02/15 | Methanol, Lot 0000099494 | 10 mL | 8021_SURR5000_00067 | 300 uL | 4-Bromofluorobenzene | 150 ug/mL |
| | | | | | | | a,a,a-Trifluorotoluene | 150 ug/mL |
| .8021_SURR5000_00067 | 10/02/15 | | ULTRA, Lot CM-2340 | | (Purchased Reagent) | | 4-Bromofluorobenzene | 5000 ug/mL |
| | | | | | | | a,a,a-Trifluorotoluene | 5000 ug/mL |
| **8021_Surr150_00057** | 12/02/15 | 11/02/15 | Methanol, Lot 0000099494 | 10 mL | 8021_SURR5000_00069 | 300 uL | 4-Bromofluorobenzene | 150 ug/mL |
| | | | | | | | a,a,a-Trifluorotoluene | 150 ug/mL |
| .8021_SURR5000_00069 | 12/02/15 | | ULTRA, Lot CM-2340 | | (Purchased Reagent) | | 4-Bromofluorobenzene | 5000 ug/mL |
| | | | | | | | a,a,a-Trifluorotoluene | 5000 ug/mL |
| **MB_INTSTD_STK_00014** | 10/01/16 | | Restek, Lot A0112833 | | (Purchased Reagent) | | 1,4-Dichlorobenzene-d4 | 2000 ug/mL |
| | | | | | | | Acenaphthene-d10 | 2000 ug/mL |
| | | | | | | | Chrysene-d12 | 2000 ug/mL |
| | | | | | | | Naphthalene-d8 | 2000 ug/mL |
| | | | | | | | Perylene-d12 | 2000 ug/mL |
| | | | | | | | Phenanthrene-d10 | 2000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| MB_L1LVI_WRK_00103 | 03/21/16 | 09/22/15 | Methylene Chloride, Lot 118685 | 10 mL | MB_List1_INT_00021 | 12.5 uL | 1,1'-Biphenyl | 0.25 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 0.25 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 0.25 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 0.25 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 0.25 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 0.25 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 0.25 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 0.25 ug/mL |
| | | | | | | | 1,4-Dioxane | 0.25 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 0.25 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 0.25 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 0.25 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 0.25 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 0.25 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 0.25 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 0.25 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 0.5 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 0.25 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 0.25 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 0.25 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 0.25 ug/mL |
| | | | | | | | 2-Chlorophenol | 0.25 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 0.25 ug/mL |
| | | | | | | | 2-Methylphenol | 0.25 ug/mL |
| | | | | | | | 2-Nitroaniline | 0.25 ug/mL |
| | | | | | | | 2-Nitrophenol | 0.25 ug/mL |
| | | | | | | | 3-Nitroaniline | 0.25 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 0.5 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 0.25 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 0.25 ug/mL |
| | | | | | | | 4-Chloroaniline | 0.25 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 0.25 ug/mL |
| | | | | | | | 4-Methylphenol | 0.25 ug/mL |
| | | | | | | | 4-Nitroaniline | 0.25 ug/mL |
| | | | | | | | 4-Nitrophenol | 0.5 ug/mL |
| | | | | | | | Acenaphthene | 0.25 ug/mL |
| | | | | | | | Acenaphthylene | 0.25 ug/mL |
| | | | | | | | Acetophenone | 0.25 ug/mL |
| | | | | | | | Aniline | 0.25 ug/mL |
| | | | | | | | Anthracene | 0.25 ug/mL |
| | | | | | | | Azobenzene | 0.25 ug/mL |
| | | | | | | | Benzo[a]anthracene | 0.25 ug/mL |
| | | | | | | | Benzo[a]pyrene | 0.25 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 0.25 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 0.25 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 0.25 ug/mL |
| | | | | | | | Benzyl alcohol | 0.25 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Bis(2-chloroethoxy)methane | 0.25 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 0.25 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 0.25 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 0.25 ug/mL |
| | | | | | | | Carbazole | 0.25 ug/mL |
| | | | | | | | Chrysene | 0.25 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 0.25 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 0.25 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 0.25 ug/mL |
| | | | | | | | Dibenzofuran | 0.25 ug/mL |
| | | | | | | | Diethyl phthalate | 0.25 ug/mL |
| | | | | | | | Dimethyl phthalate | 0.25 ug/mL |
| | | | | | | | Diphenylamine | 0.4275 ug/mL |
| | | | | | | | Fluoranthene | 0.25 ug/mL |
| | | | | | | | Fluorene | 0.25 ug/mL |
| | | | | | | | Hexachlorobenzene | 0.25 ug/mL |
| | | | | | | | Hexachlorobutadiene | 0.25 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 0.25 ug/mL |
| | | | | | | | Hexachloroethane | 0.25 ug/mL |
| | | | | | | | Hexadecane | 0.25 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 0.25 ug/mL |
| | | | | | | | Isophorone | 0.25 ug/mL |
| | | | | | | | n-Decane | 0.25 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 0.25 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 0.25 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 0.5 ug/mL |
| | | | | | | | n-Octadecane | 0.25 ug/mL |
| | | | | | | | Naphthalene | 0.25 ug/mL |
| | | | | | | | Nitrobenzene | 0.25 ug/mL |
| | | | | | | | Pentachlorophenol | 0.5 ug/mL |
| | | | | | | | Phenanthrene | 0.25 ug/mL |
| | | | | | | | Phenol | 0.25 ug/mL |
| | | | | | | | Pyrene | 0.25 ug/mL |
| | | | | | | | Pyridine | 0.25 ug/mL |
| | | | | | | | Benzoic acid | 0.25 ug/mL |
| | | | | | | | Indene | 0.25 ug/mL |
| | | | | | | | Atrazine | 0.25 ug/mL |
| | | | | | | | Benzaldehyde | 0.25 ug/mL |
| | | | | | | | Caprolactam | 0.25 ug/mL |
| | | | | | | | 3,3'-Dichlorobenzidine | 0.25 ug/mL |
| | | | | | | | Benzidine | 0.25 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 0.25 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 0.25 ug/mL |
| | | | | | | | 2-Fluorophenol | 0.25 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 0.25 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 0.25 ug/mL |
| | | | | | | | Phenol-d5 | 0.25 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| .MB_List1_INT_00021 | 07/31/16 | 09/21/15 | Methylene Chloride, Lot 118685 | 10 mL | MB_LIS1_STK_00023 | 2000 ul | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 200 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_LIS10_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |
| | | | | | MB_LIS11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_LIS9_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_LIS1_STK_00023 | 12/31/14 | | Restek, Lot A0111934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| ..MB_L1S10_STK_00002 | 08/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_L1S11_STK_00002 | 08/31/16 | | Rektek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_L1S9_STK_00002 | 07/31/16 | | Restek, Lot A0110231 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SURR_STK_00042 | 01/13/16 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| **MB_L1LVI_WRK_00110** | 03/21/16 | 09/22/15 | Methylene Chloride, Lot 118685 | 10 mL | MB_List1_INT_00021 | 100 uL | 1,1'-Biphenyl | 2 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 2 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 1,2,4-Trichlorobenzene | 2 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 2 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 2 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 2 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 2 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 2 ug/mL |
| | | | | | | | 1,4-Dioxane | 2 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 2 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 2 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 2 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 2 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 2 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 2 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 2 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 4 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 2 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 2 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 2 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 2 ug/mL |
| | | | | | | | 2-Chlorophenol | 2 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 2 ug/mL |
| | | | | | | | 2-Methylphenol | 2 ug/mL |
| | | | | | | | 2-Nitroaniline | 2 ug/mL |
| | | | | | | | 2-Nitrophenol | 2 ug/mL |
| | | | | | | | 3-Nitroaniline | 2 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 4 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 2 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 2 ug/mL |
| | | | | | | | 4-Chloroaniline | 2 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 2 ug/mL |
| | | | | | | | 4-Methylphenol | 2 ug/mL |
| | | | | | | | 4-Nitroaniline | 2 ug/mL |
| | | | | | | | 4-Nitrophenol | 4 ug/mL |
| | | | | | | | Acenaphthene | 2 ug/mL |
| | | | | | | | Acenaphthylene | 2 ug/mL |
| | | | | | | | Acetophenone | 2 ug/mL |
| | | | | | | | Aniline | 2 ug/mL |
| | | | | | | | Anthracene | 2 ug/mL |
| | | | | | | | Azobenzene | 2 ug/mL |
| | | | | | | | Benzo[a]anthracene | 2 ug/mL |
| | | | | | | | Benzo[a]pyrene | 2 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 2 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 2 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 2 ug/mL |
| | | | | | | | Benzyl alcohol | 2 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 2 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 2 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 2 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Butyl benzyl phthalate | 2 ug/mL |
| | | | | | | | Carbazole | 2 ug/mL |
| | | | | | | | Chrysene | 2 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 2 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 2 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 2 ug/mL |
| | | | | | | | Dibenzofuran | 2 ug/mL |
| | | | | | | | Diethyl phthalate | 2 ug/mL |
| | | | | | | | Dimethyl phthalate | 2 ug/mL |
| | | | | | | | Diphenylamine | 3.42 ug/mL |
| | | | | | | | Fluoranthene | 2 ug/mL |
| | | | | | | | Fluorene | 2 ug/mL |
| | | | | | | | Hexachlorobenzene | 2 ug/mL |
| | | | | | | | Hexachlorobutadiene | 2 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 2 ug/mL |
| | | | | | | | Hexachloroethane | 2 ug/mL |
| | | | | | | | Hexadecane | 2 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 2 ug/mL |
| | | | | | | | Isophorone | 2 ug/mL |
| | | | | | | | n-Decane | 2 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 2 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 2 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 4 ug/mL |
| | | | | | | | n-Octadecane | 2 ug/mL |
| | | | | | | | Naphthalene | 2 ug/mL |
| | | | | | | | Nitrobenzene | 2 ug/mL |
| | | | | | | | Pentachlorophenol | 4 ug/mL |
| | | | | | | | Phenanthrene | 2 ug/mL |
| | | | | | | | Phenol | 2 ug/mL |
| | | | | | | | Pyrene | 2 ug/mL |
| | | | | | | | Pyridine | 2 ug/mL |
| | | | | | | | Benzoic acid | 2 ug/mL |
| | | | | | | | Indene | 2 ug/mL |
| | | | | | | | Atrazine | 2 ug/mL |
| | | | | | | | Benzaldehyde | 2 ug/mL |
| | | | | | | | Caprolactam | 2 ug/mL |
| | | | | | | | 3,3'-Dichlorobenzidine | 2 ug/mL |
| | | | | | | | Benzidine | 2 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 2 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 2 ug/mL |
| | | | | | | | 2-Fluorophenol | 2 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 2 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 2 ug/mL |
| | | | | | | | Phenol-d5 | 2 ug/mL |
| .MB_List1_INT_00021 | 07/31/16 | 09/21/15 | Methylene Chloride, Lot 118685 | 10 mL | MB_LIS1_STK_00023 | 2000 uL | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 1,2-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 200 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |
| | | | | | | | Dibenz[a,h]anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_L1S10_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |
| | | | | | MB_L1S11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_L1S9_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_L1S1_STK_00023 | 12/31/16 | | Restek, Lot A0111934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| ..MB_L1S10_STK_00002 | 08/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_L1S11_STK_00002 | 08/31/16 | | Rektek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_L1S9_STK_00002 | 07/31/16 | | Restek, Lot A0110231 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SUPR_STK_00042 | 01/12/18 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| **MB_L1LVI_WRK_00112** | 03/21/16 | 09/22/15 | Methylene Chloride, Lot 116685 | 10 mL | MB_List1_INT_00021 | 400 uL | 1,1'-Biphenyl | 8 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 8 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 8 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 8 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 8 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 8 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 1,3-Dinitrobenzene | 8 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 8 ug/mL |
| | | | | | | | 1,4-Dioxane | 8 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 8 ug/mL |
| | | | | | | | 2,2'-oxybis(1-chloropropane) | 8 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 8 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 8 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 8 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 8 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 8 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 16 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 8 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 8 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 8 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 8 ug/mL |
| | | | | | | | 2-Chlorophenol | 8 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 8 ug/mL |
| | | | | | | | 2-Methylphenol | 8 ug/mL |
| | | | | | | | 2-Nitroaniline | 8 ug/mL |
| | | | | | | | 2-Nitrophenol | 8 ug/mL |
| | | | | | | | 3-Nitroaniline | 8 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 16 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 8 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 8 ug/mL |
| | | | | | | | 4-Chloroaniline | 8 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 8 ug/mL |
| | | | | | | | 4-Methylphenol | 8 ug/mL |
| | | | | | | | 4-Nitroaniline | 8 ug/mL |
| | | | | | | | 4-Nitrophenol | 16 ug/mL |
| | | | | | | | Acenaphthene | 8 ug/mL |
| | | | | | | | Acenaphthylene | 8 ug/mL |
| | | | | | | | Acetophenone | 8 ug/mL |
| | | | | | | | Aniline | 8 ug/mL |
| | | | | | | | Anthracene | 8 ug/mL |
| | | | | | | | Azobenzene | 8 ug/mL |
| | | | | | | | Benzo[a]anthracene | 8 ug/mL |
| | | | | | | | Benzo[a]pyrene | 8 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 8 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 8 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 8 ug/mL |
| | | | | | | | Benzyl alcohol | 8 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 8 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 8 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 8 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 8 ug/mL |
| | | | | | | | Carbazole | 8 ug/mL |
| | | | | | | | Chrysene | 8 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 8 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Di-n-octyl phthalate | 8 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 8 ug/mL |
| | | | | | | | Dibenzofuran | 8 ug/mL |
| | | | | | | | Diethyl phthalate | 8 ug/mL |
| | | | | | | | Dimethyl phthalate | 8 ug/mL |
| | | | | | | | Diphenylamine | 13.68 ug/mL |
| | | | | | | | Fluoranthene | 8 ug/mL |
| | | | | | | | Fluorene | 8 ug/mL |
| | | | | | | | Hexachlorobenzene | 8 ug/mL |
| | | | | | | | Hexachlorobutadiene | 8 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 8 ug/mL |
| | | | | | | | Hexachloroethane | 8 ug/mL |
| | | | | | | | Hexadecane | 8 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 8 ug/mL |
| | | | | | | | Isophorone | 8 ug/mL |
| | | | | | | | n-Decane | 8 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 8 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 8 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 16 ug/mL |
| | | | | | | | n-Octadecane | 8 ug/mL |
| | | | | | | | Naphthalene | 8 ug/mL |
| | | | | | | | Nitrobenzene | 8 ug/mL |
| | | | | | | | Pentachlorophenol | 16 ug/mL |
| | | | | | | | Phenanthrene | 8 ug/mL |
| | | | | | | | Phenol | 8 ug/mL |
| | | | | | | | Pyrene | 8 ug/mL |
| | | | | | | | Pyridine | 8 ug/mL |
| | | | | | | | Benzoic acid | 8 ug/mL |
| | | | | | | | Indene | 8 ug/mL |
| | | | | | | | Atrazine | 8 ug/mL |
| | | | | | | | Benzaldehyde | 8 ug/mL |
| | | | | | | | Caprolactam | 8 ug/mL |
| | | | | | | | 3,3'-Dichlorobenzidine | 8 ug/mL |
| | | | | | | | Benzidine | 8 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 8 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 8 ug/mL |
| | | | | | | | 2-Fluorophenol | 8 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 8 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 8 ug/mL |
| | | | | | | | Phenol-d5 | 8 ug/mL |
| .MB_List1_INT_00021 | 07/31/15 | 09/21/15 | Methylene Chloride, Lot 118685 | 10 mL | MB_LIST_STK_00023 | 2000 uL | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis(1-chloropropane) | 200 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |
| | | | | | | | Indeno(1,2,3-cd)pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_L1S10_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |
| | | | | | MB_L1S11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_L1S9_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_L1S1_STK_00023 | 12/31/16 | | Restek, Lot A0111934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| ..MB_L1S10_STK_00002 | 08/31/16 | | Restek, Lot A0108986 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_L1S11_STK_00002 | 08/31/16 | | Restek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_L1S9_STK_00002 | 07/31/16 | | Restek, Lot A0110231 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SURR_STK_00042 | 01/12/18 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| **MB_L1LVI_WRK_00113** | 03/22/16 | 09/22/15 | Methylene Chloride, Lot 118685 | 10 mL | MB_List1_INT_00021 | 500 uL | 1,1'-Biphenyl | 10 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 10 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 10 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 10 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 10 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 10 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 10 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 10 ug/mL |
| | | | | | | | 1,4-Dioxane | 10 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 10 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 10 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 10 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 10 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 10 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 10 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 10 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 20 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 10 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 10 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 10 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 10 ug/mL |
| | | | | | | | 2-Chlorophenol | 10 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 10 ug/mL |
| | | | | | | | 2-Methylphenol | 10 ug/mL |
| | | | | | | | 2-Nitroaniline | 10 ug/mL |
| | | | | | | | 2-Nitrophenol | 10 ug/mL |
| | | | | | | | 3-Nitroaniline | 10 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 20 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 10 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 10 ug/mL |
| | | | | | | | 4-Chloroaniline | 10 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 10 ug/mL |
| | | | | | | | 4-Methylphenol | 10 ug/mL |
| | | | | | | | 4-Nitroaniline | 10 ug/mL |
| | | | | | | | 4-Nitrophenol | 20 ug/mL |
| | | | | | | | Acenaphthene | 10 ug/mL |
| | | | | | | | Acenaphthylene | 10 ug/mL |
| | | | | | | | Acetophenone | 10 ug/mL |
| | | | | | | | Aniline | 10 ug/mL |
| | | | | | | | Anthracene | 10 ug/mL |
| | | | | | | | Azobenzene | 10 ug/mL |
| | | | | | | | Benzo[a]anthracene | 10 ug/mL |
| | | | | | | | Benzo[a]pyrene | 10 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 10 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 10 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 10 ug/mL |
| | | | | | | | Benzyl alcohol | 10 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 10 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 10 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 10 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 10 ug/mL |
| | | | | | | | Carbazole | 10 ug/mL |
| | | | | | | | Chrysene | 10 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 10 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 10 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 10 ug/mL |
| | | | | | | | Dibenzofuran | 10 ug/mL |
| | | | | | | | Diethyl phthalate | 10 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Dimethyl phthalate | 10 ug/mL |
| | | | | | | | Diphenylamine | 17.1 ug/mL |
| | | | | | | | Fluoranthene | 10 ug/mL |
| | | | | | | | Fluorene | 10 ug/mL |
| | | | | | | | Hexachlorobenzene | 10 ug/mL |
| | | | | | | | Hexachlorobutadiene | 10 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 10 ug/mL |
| | | | | | | | Hexachloroethane | 10 ug/mL |
| | | | | | | | Hexadecane | 10 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 10 ug/mL |
| | | | | | | | Isophorone | 10 ug/mL |
| | | | | | | | n-Decane | 10 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 10 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 10 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 20 ug/mL |
| | | | | | | | n-Octadecane | 10 ug/mL |
| | | | | | | | Naphthalene | 10 ug/mL |
| | | | | | | | Nitrobenzene | 10 ug/mL |
| | | | | | | | Pentachlorophenol | 20 ug/mL |
| | | | | | | | Phenanthrene | 10 ug/mL |
| | | | | | | | Phenol | 10 ug/mL |
| | | | | | | | Pyrene | 10 ug/mL |
| | | | | | | | Pyridine | 10 ug/mL |
| | | | | | | | Benzoic acid | 10 ug/mL |
| | | | | | | | Indene | 10 ug/mL |
| | | | | | | | Atrazine | 10 ug/mL |
| | | | | | | | Benzaldehyde | 10 ug/mL |
| | | | | | | | Caprolactam | 10 ug/mL |
| | | | | | | | 3,3'-Dichlorobenzidine | 10 ug/mL |
| | | | | | | | Benzidine | 10 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 10 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 10 ug/mL |
| | | | | | | | 2-Fluorophenol | 10 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 10 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 10 ug/mL |
| | | | | | | | Phenol-d5 | 10 ug/mL |
| .MB_List1_INT_00021 | 07/31/15 | 09/21/15 | Methylene Chloride, Lot 118685 | 10 mL | MP_LIS1_STK_00023 | 2000 uL | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_L1S10_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |
| | | | | | MB_L1S11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_L1S9_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_L1S1_STK_00023 | 12/31/16 | | Restek, Lot A0111934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| ..MB_LIS10_STK_00002 | 08/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_LIS11_STK_00002 | 08/31/16 | | Rektek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_LIS9_STK_00002 | 07/31/16 | | Restek, Lot A0110231 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SURR_STK_00042 | 01/12/18 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| **MB_L1LVI_WRK_00114** | 03/21/16 | 09/22/15 | Methylene Chloride, Lot 118685 | 10 mL | MB_List1_INT_00021 | 600 uL | 1,1'-Biphenyl | 12 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 12 ug/mL |
| | | | | | | | 1,3,4-Trichlorobenzene | 12 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 12 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 12 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 12 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 12 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 12 ug/mL |
| | | | | | | | 1,4-Dioxane | 12 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 12 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 12 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 12 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 12 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 12 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2,4-Dichlorophenol | 12 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 12 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 24 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 12 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 12 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 12 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 12 ug/mL |
| | | | | | | | 2-Chlorophenol | 12 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 12 ug/mL |
| | | | | | | | 2-Methylphenol | 12 ug/mL |
| | | | | | | | 2-Nitroaniline | 12 ug/mL |
| | | | | | | | 2-Nitrophenol | 12 ug/mL |
| | | | | | | | 3-Nitroaniline | 12 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 24 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 12 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 12 ug/mL |
| | | | | | | | 4-Chloroaniline | 12 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 12 ug/mL |
| | | | | | | | 4-Methylphenol | 12 ug/mL |
| | | | | | | | 4-Nitroaniline | 12 ug/mL |
| | | | | | | | 4-Nitrophenol | 24 ug/mL |
| | | | | | | | Acenaphthene | 12 ug/mL |
| | | | | | | | Acenaphthylene | 12 ug/mL |
| | | | | | | | Acetophenone | 12 ug/mL |
| | | | | | | | Aniline | 12 ug/mL |
| | | | | | | | Anthracene | 12 ug/mL |
| | | | | | | | Azobenzene | 12 ug/mL |
| | | | | | | | Benzo[a]anthracene | 12 ug/mL |
| | | | | | | | Benzo[a]pyrene | 12 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 12 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 12 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 12 ug/mL |
| | | | | | | | Benzyl alcohol | 12 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 12 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 12 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 12 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 12 ug/mL |
| | | | | | | | Carbazole | 12 ug/mL |
| | | | | | | | Chrysene | 12 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 12 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 12 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 12 ug/mL |
| | | | | | | | Dibenzofuran | 12 ug/mL |
| | | | | | | | Diethyl phthalate | 12 ug/mL |
| | | | | | | | Dimethyl phthalate | 12 ug/mL |
| | | | | | | | Diphenylamine | 20.52 ug/mL |
| | | | | | | | Fluoranthene | 12 ug/mL |
| | | | | | | | Fluorene | 12 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Hexachlorobenzene | 12 ug/mL |
| | | | | | | | Hexachlorobutadiene | 12 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 12 ug/mL |
| | | | | | | | Hexachloroethane | 12 ug/mL |
| | | | | | | | Hexadecane | 12 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 12 ug/mL |
| | | | | | | | Isophorone | 12 ug/mL |
| | | | | | | | n-Decane | 12 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 12 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 12 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 24 ug/mL |
| | | | | | | | n-Octadecane | 12 ug/mL |
| | | | | | | | Naphthalene | 12 ug/mL |
| | | | | | | | Nitrobenzene | 12 ug/mL |
| | | | | | | | Pentachlorophenol | 24 ug/mL |
| | | | | | | | Phenanthrene | 12 ug/mL |
| | | | | | | | Phenol | 12 ug/mL |
| | | | | | | | Pyrene | 12 ug/mL |
| | | | | | | | Pyridine | 12 ug/mL |
| | | | | | | | Benzoic acid | 12 ug/mL |
| | | | | | | | Indene | 12 ug/mL |
| | | | | | | | Atrazine | 12 ug/mL |
| | | | | | | | Benzaldehyde | 12 ug/mL |
| | | | | | | | Caprolactam | 12 ug/mL |
| | | | | | | | 3,3'-Dichlorobenzidine | 12 ug/mL |
| | | | | | | | Benzidine | 12 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 12 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 12 ug/mL |
| | | | | | | | 2-Fluorophenol | 12 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 12 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 12 ug/mL |
| | | | | | | | Phenol-d5 | 12 ug/mL |
| MB_List1_INT_00021 | 07/31/16 | 09/21/15 | Methylene Chloride, Lot 118685 | 10 mL | MB_LIS1_STK_00023 | 2000 uL | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 200 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |

500

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_L1S10_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |
| | | | | | MB_L1S11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_L1S9_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_L1S1_STK_00023 | 12/31/14 | | Restek, Lot A0111934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| ..MB_L1S10_STK_00002 | 08/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_L1S11_STK_00002 | 08/31/16 | | Rektek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_L1S9_STK_00002 | 07/31/16 | | Restek, Lot A0110231 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SURR_STK_00042 | 01/12/18 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| **MB_L1LVI_WRK_00115** | 03/21/16 | 10/07/15 | Methylene Chloride, Lot 118685 | 10 mL | MB_List1_INT_00021 | 200 uL | 1,1'-Biphenyl | 4 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 4 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 4 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 4 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 4 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 4 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 4 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 4 ug/mL |
| | | | | | | | 1,4-Dioxane | 4 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 4 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 4 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 4 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 4 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 4 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 4 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 4 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 8 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 4 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2,6-Dichlorophenol | 4 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 4 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 4 ug/mL |
| | | | | | | | 2-Chlorophenol | 4 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 4 ug/mL |
| | | | | | | | 2-Methylphenol | 4 ug/mL |
| | | | | | | | 2-Nitroaniline | 4 ug/mL |
| | | | | | | | 2-Nitrophenol | 4 ug/mL |
| | | | | | | | 3-Nitroaniline | 4 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 8 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 4 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 4 ug/mL |
| | | | | | | | 4-Chloroaniline | 4 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 4 ug/mL |
| | | | | | | | 4-Methylphenol | 4 ug/mL |
| | | | | | | | 4-Nitroaniline | 4 ug/mL |
| | | | | | | | 4-Nitrophenol | 8 ug/mL |
| | | | | | | | Acenaphthene | 4 ug/mL |
| | | | | | | | Acenaphthylene | 4 ug/mL |
| | | | | | | | Acetophenone | 4 ug/mL |
| | | | | | | | Aniline | 4 ug/mL |
| | | | | | | | Anthracene | 4 ug/mL |
| | | | | | | | Azobenzene | 4 ug/mL |
| | | | | | | | Benzo[a]anthracene | 4 ug/mL |
| | | | | | | | Benzo[a]pyrene | 4 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 4 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 4 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 4 ug/mL |
| | | | | | | | Benzyl alcohol | 4 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 4 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 4 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 4 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 4 ug/mL |
| | | | | | | | Carbazole | 4 ug/mL |
| | | | | | | | Chrysene | 4 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 4 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 4 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 4 ug/mL |
| | | | | | | | Dibenzofuran | 4 ug/mL |
| | | | | | | | Diethyl phthalate | 4 ug/mL |
| | | | | | | | Dimethyl phthalate | 4 ug/mL |
| | | | | | | | Diphenylamine | 6.84 ug/mL |
| | | | | | | | Fluoranthene | 4 ug/mL |
| | | | | | | | Fluorene | 4 ug/mL |
| | | | | | | | Hexachlorobenzene | 4 ug/mL |
| | | | | | | | Hexachlorobutadiene | 4 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 4 ug/mL |
| | | | | | | | Hexachloroethane | 4 ug/mL |

505

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Hexadecane | 4 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 4 ug/mL |
| | | | | | | | Isophorone | 4 ug/mL |
| | | | | | | | n-Decane | 4 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 4 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 4 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 8 ug/mL |
| | | | | | | | n-Octadecane | 4 ug/mL |
| | | | | | | | Naphthalene | 4 ug/mL |
| | | | | | | | Nitrobenzene | 4 ug/mL |
| | | | | | | | Pentachlorophenol | 8 ug/mL |
| | | | | | | | Phenanthrene | 4 ug/mL |
| | | | | | | | Phenol | 4 ug/mL |
| | | | | | | | Pyrene | 4 ug/mL |
| | | | | | | | Pyridine | 4 ug/mL |
| | | | | | | | Benzoic acid | 4 ug/mL |
| | | | | | | | Indene | 4 ug/mL |
| | | | | | | | Atrazine | 4 ug/mL |
| | | | | | | | Benzaldehyde | 4 ug/mL |
| | | | | | | | Caprolactam | 4 ug/mL |
| | | | | | | | 3,3'-Dichlorobenzidine | 4 ug/mL |
| | | | | | | | Benzidine | 4 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 4 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 4 ug/mL |
| | | | | | | | 2-Fluorophenol | 4 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 4 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 4 ug/mL |
| | | | | | | | Phenol-d5 | 4 ug/mL |
| .MB_List2_INT_00021 | 07/31/15 | 09/21/15 | Methylene Chloride, Lot 118685 | 10 mL | MB_LIS1_STK_00023 | 2000 uL | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 200 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_LIS1C_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |
| | | | | | MB_LIS11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_LIS9_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_LIS1_STK_00023 | 12/31/16 | | Restek, Lot A0111934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis[2-chloroethoxy]methane | 1000 ug/mL |
| | | | | | | | Bis[2-chloroethyl]ether | 1000 ug/mL |
| | | | | | | | Bis[2-ethylhexyl] phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz[a,h]anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| ..MB_L1S10_STK_00002 | 08/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_L1S11_STK_00002 | 08/31/16 | | Restek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_L1S9_STK_00002 | 07/31/16 | | Restek, Lot A0110281 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SURR_STK_00042 | 01/12/18 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| **MB_L1LVI_WRK_00116** | 07/31/16 | 10/08/15 | Methylene Chloride, Lot 121470 | 10 mL | MB_List1_INT_00021 | 50 uL | 1,1'-Biphenyl | 1 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1 ug/mL |
| | | | | | | | 1,4-Dioxane | 1 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1 ug/mL |
| | | | | | | | 2-Chlorophenol | 1 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2-Methylnaphthalene | 1 ug/mL |
| | | | | | | | 2-Methylphenol | 1 ug/mL |
| | | | | | | | 2-Nitroaniline | 1 ug/mL |
| | | | | | | | 2-Nitrophenol | 1 ug/mL |
| | | | | | | | 3-Nitroaniline | 1 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1 ug/mL |
| | | | | | | | 4-Chloroaniline | 1 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1 ug/mL |
| | | | | | | | 4-Methylphenol | 1 ug/mL |
| | | | | | | | 4-Nitroaniline | 1 ug/mL |
| | | | | | | | 4-Nitrophenol | 2 ug/mL |
| | | | | | | | Acenaphthene | 1 ug/mL |
| | | | | | | | Acenaphthylene | 1 ug/mL |
| | | | | | | | Acetophenone | 1 ug/mL |
| | | | | | | | Aniline | 1 ug/mL |
| | | | | | | | Anthracene | 1 ug/mL |
| | | | | | | | Azobenzene | 1 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1 ug/mL |
| | | | | | | | Benzyl alcohol | 1 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1 ug/mL |
| | | | | | | | Carbazole | 1 ug/mL |
| | | | | | | | Chrysene | 1 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1 ug/mL |
| | | | | | | | Dibenzofuran | 1 ug/mL |
| | | | | | | | Diethyl phthalate | 1 ug/mL |
| | | | | | | | Dimethyl phthalate | 1 ug/mL |
| | | | | | | | Diphenylamine | 1.71 ug/mL |
| | | | | | | | Fluoranthene | 1 ug/mL |
| | | | | | | | Fluorene | 1 ug/mL |
| | | | | | | | Hexachlorobenzene | 1 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1 ug/mL |
| | | | | | | | Hexachloroethane | 1 ug/mL |
| | | | | | | | Hexadecane | 1 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1 ug/mL |
| | | | | | | | Isophorone | 1 ug/mL |
| | | | | | | | n-Decane | 1 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | N-Nitrosodi-n-propylamine | 1 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2 ug/mL |
| | | | | | | | n-Octadecane | 1 ug/mL |
| | | | | | | | Naphthalene | 1 ug/mL |
| | | | | | | | Nitrobenzene | 1 ug/mL |
| | | | | | | | Pentachlorophenol | 2 ug/mL |
| | | | | | | | Phenanthrene | 1 ug/mL |
| | | | | | | | Phenol | 1 ug/mL |
| | | | | | | | Pyrene | 1 ug/mL |
| | | | | | | | Pyridine | 1 ug/mL |
| | | | | | | | Benzoic acid | 1 ug/mL |
| | | | | | | | Indene | 1 ug/mL |
| | | | | | | | Atrazine | 1 ug/mL |
| | | | | | | | Benzaldehyde | 1 ug/mL |
| | | | | | | | Caprolactam | 1 ug/mL |
| | | | | | | | 3,3'-Dichlorobenzidine | 1 ug/mL |
| | | | | | | | Benzidine | 1 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 1 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 1 ug/mL |
| | | | | | | | 2-Fluorophenol | 1 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 1 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 1 ug/mL |
| | | | | | | | Phenol-d5 | 1 ug/mL |
| MB_L181_INT_00021 | 07/31/15 | 09/21/15 | Methylene Chloride, Lot 118685 | 10 mL | MB_L181_STK_00023 | 2000 uL | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 200 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_L1S10_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |
| | | | | | MB_L1S11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_L1S9_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_L1S1_STK_00023 | 12/31/16 | | Restek, Lot A0311988 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| ..MB_LIS10_STK_00002 | 08/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_LIS11_STK_00002 | 08/31/16 | | Rektek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_LIS9_STK_00002 | 07/31/16 | | Restek, Lot A0110231 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SURR_STK_00042 | 01/12/18 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| **MB_LIST1_WRK_00215** | 07/31/16 | 10/21/15 | Methylene Chloride, Lot 121470 | 1 mL | MB_List1_INT_00022 | 25 uL | 1,1'-Biphenyl | 5 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 5 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 5 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 5 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 5 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 5 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 5 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 5 ug/mL |
| | | | | | | | 1,4-Dioxane | 5 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 5 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 5 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 5 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 5 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 5 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 5 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 5 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 10 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 5 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 5 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 5 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 5 ug/mL |
| | | | | | | | 2-Chlorophenol | 5 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 5 ug/mL |
| | | | | | | | 2-Methylphenol | 5 ug/mL |
| | | | | | | | 2-Nitroaniline | 5 ug/mL |
| | | | | | | | 2-Nitrophenol | 5 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 3-Nitroaniline | 5 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 10 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 5 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 5 ug/mL |
| | | | | | | | 4-Chloroaniline | 5 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 5 ug/mL |
| | | | | | | | 4-Methylphenol | 5 ug/mL |
| | | | | | | | 4-Nitroaniline | 5 ug/mL |
| | | | | | | | 4-Nitrophenol | 10 ug/mL |
| | | | | | | | Acenaphthene | 5 ug/mL |
| | | | | | | | Acenaphthylene | 5 ug/mL |
| | | | | | | | Acetophenone | 5 ug/mL |
| | | | | | | | Aniline | 5 ug/mL |
| | | | | | | | Anthracene | 5 ug/mL |
| | | | | | | | Azobenzene | 5 ug/mL |
| | | | | | | | Benzo[a]anthracene | 5 ug/mL |
| | | | | | | | Benzo[a]pyrene | 5 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 5 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 5 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 5 ug/mL |
| | | | | | | | Benzyl alcohol | 5 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 5 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 5 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 5 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 5 ug/mL |
| | | | | | | | Carbazole | 5 ug/mL |
| | | | | | | | Chrysene | 5 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 5 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 5 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 5 ug/mL |
| | | | | | | | Dibenzofuran | 5 ug/mL |
| | | | | | | | Diethyl phthalate | 5 ug/mL |
| | | | | | | | Dimethyl phthalate | 5 ug/mL |
| | | | | | | | Diphenylamine | 8.55 ug/mL |
| | | | | | | | Fluoranthene | 5 ug/mL |
| | | | | | | | Fluorene | 5 ug/mL |
| | | | | | | | Hexachlorobenzene | 5 ug/mL |
| | | | | | | | Hexachlorobutadiene | 5 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 5 ug/mL |
| | | | | | | | Hexachloroethane | 5 ug/mL |
| | | | | | | | Hexadecane | 5 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 5 ug/mL |
| | | | | | | | Isophorone | 5 ug/mL |
| | | | | | | | n-Decane | 5 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 5 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 5 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 10 ug/mL |
| | | | | | | | n-Octadecane | 5 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Naphthalene | 5 ug/mL |
| | | | | | | | Nitrobenzene | 5 ug/mL |
| | | | | | | | Pentachlorophenol | 10 ug/mL |
| | | | | | | | Phenanthrene | 5 ug/mL |
| | | | | | | | Phenol | 5 ug/mL |
| | | | | | | | Pyrene | 5 ug/mL |
| | | | | | | | Pyridine | 5 ug/mL |
| | | | | | | | Benzoic acid | 5 ug/mL |
| | | | | | | | Indene | 5 ug/mL |
| | | | | | | | Atrazine | 5 ug/mL |
| | | | | | | | Benzaldehyde | 5 ug/mL |
| | | | | | | | Caprolactam | 5 ug/mL |
| | | | | | | | 3,3'-Dichlorobenzidine | 5 ug/mL |
| | | | | | | | Benzidine | 5 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 5 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5 ug/mL |
| | | | | | | | 2-Fluorophenol | 5 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5 ug/mL |
| | | | | | | | Phenol-d5 | 5 ug/mL |
| MB_LIST1_INT_00022 | 07/31/16 | 10/09/15 | Methylene Chloride, Lot 121470 | 10 mL | MB_LIST_STK_00023 | 2000 uL | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 200 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_L1S10_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |
| | | | | | MB_L1S11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_L1S9_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_L1S1_STK_00023 | 12/31/16 | | Restek, Lot A0111934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis(1-chloropropane) | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| ..MB_LIS10_STK_00002 | 08/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_LIS11_STK_00002 | 08/31/16 | | Reltek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_LIS9_STK_00002 | 07/31/16 | | Restek, Lot A0110231 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SURR_STK_00042 | 01/12/18 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| **MB_LIST1_WRK_00216** | 07/31/16 | 10/21/15 | Methylene Chloride, Lot 121470 | 1 mL | MB_List1_INT_00022 | 100 uL | 1,1'-Biphenyl | 20 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 20 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 20 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 20 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 20 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 20 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 20 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 20 ug/mL |
| | | | | | | | 1,4-Dioxane | 20 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 20 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 20 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 20 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 20 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 20 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 20 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 20 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 40 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 20 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 20 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 20 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 20 ug/mL |
| | | | | | | | 2-Chlorophenol | 20 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 20 ug/mL |
| | | | | | | | 2-Methylphenol | 20 ug/mL |
| | | | | | | | 2-Nitroaniline | 20 ug/mL |
| | | | | | | | 2-Nitrophenol | 20 ug/mL |
| | | | | | | | 3-Nitroaniline | 20 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 40 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 20 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 20 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 4-Chloroaniline | 20 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 20 ug/mL |
| | | | | | | | 4-Methylphenol | 20 ug/mL |
| | | | | | | | 4-Nitroaniline | 20 ug/mL |
| | | | | | | | 4-Nitrophenol | 40 ug/mL |
| | | | | | | | Acenaphthene | 20 ug/mL |
| | | | | | | | Acenaphthylene | 20 ug/mL |
| | | | | | | | Acetophenone | 20 ug/mL |
| | | | | | | | Aniline | 20 ug/mL |
| | | | | | | | Anthracene | 20 ug/mL |
| | | | | | | | Azobenzene | 20 ug/mL |
| | | | | | | | Benzo[a]anthracene | 20 ug/mL |
| | | | | | | | Benzo[a]pyrene | 20 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 20 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 20 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 20 ug/mL |
| | | | | | | | Benzyl alcohol | 20 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 20 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 20 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 20 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 20 ug/mL |
| | | | | | | | Carbazole | 20 ug/mL |
| | | | | | | | Chrysene | 20 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 20 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 20 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 20 ug/mL |
| | | | | | | | Dibenzofuran | 20 ug/mL |
| | | | | | | | Diethyl phthalate | 20 ug/mL |
| | | | | | | | Dimethyl phthalate | 20 ug/mL |
| | | | | | | | Diphenylamine | 34.2 ug/mL |
| | | | | | | | Fluoranthene | 20 ug/mL |
| | | | | | | | Fluorene | 20 ug/mL |
| | | | | | | | Hexachlorobenzene | 20 ug/mL |
| | | | | | | | Hexachlorobutadiene | 20 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 20 ug/mL |
| | | | | | | | Hexachloroethane | 20 ug/mL |
| | | | | | | | Hexadecane | 20 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 20 ug/mL |
| | | | | | | | Isophorone | 20 ug/mL |
| | | | | | | | n-Decane | 20 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 20 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 20 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 40 ug/mL |
| | | | | | | | n-Octadecane | 20 ug/mL |
| | | | | | | | Naphthalene | 20 ug/mL |
| | | | | | | | Nitrobenzene | 20 ug/mL |
| | | | | | | | Pentachlorophenol | 40 ug/mL |
| | | | | | | | Phenanthrene | 20 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Phenol | 20 ug/mL |
| | | | | | | | Pyrene | 20 ug/mL |
| | | | | | | | Pyridine | 20 ug/mL |
| | | | | | | | Benzoic acid | 20 ug/mL |
| | | | | | | | Indene | 20 ug/mL |
| | | | | | | | Atrazine | 20 ug/mL |
| | | | | | | | Benzaldehyde | 20 ug/mL |
| | | | | | | | Caprolactam | 20 ug/mL |
| | | | | | | | 3,3'-Dichlorobenzidine | 20 ug/mL |
| | | | | | | | Benzidine | 20 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 20 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 20 ug/mL |
| | | | | | | | 2-Fluorophenol | 20 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 20 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 20 ug/mL |
| | | | | | | | Phenol-d5 | 20 ug/mL |
| MB_List1_INT_00022 | 07/31/16 | 10/09/15 | Methylene Chloride, Lot 121470 | 10 mL | MB_LIS1_STK_00023 | 2000 uL | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 200 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_L1S10_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |
| | | | | | MB_L1S11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_L1S9_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_L1S1_STK_00023 | 12/31/16 | | Restek, Lot A0111934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| ..MB_L1S10_STK_00002 | 08/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_L1S11_STK_00002 | 09/31/16 | | Restek, Lot A0109989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_L1S9_STK_00002 | 07/31/16 | | Restek, Lot A0110231 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SURR_STK_00042 | 01/12/18 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| **MB_LIST1_WRK_00217** | 07/31/16 | 10/21/15 | Methylene Chloride, Lot 121470 | 1 mL | MB_List1_INT_00022 | 250 uL | 1,1'-Biphenyl | 50 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 50 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 50 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 50 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 50 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 50 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 50 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 50 ug/mL |
| | | | | | | | 1,4-Dioxane | 50 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 50 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 50 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 50 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 50 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 50 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 50 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 50 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 100 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 50 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 50 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 50 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 50 ug/mL |
| | | | | | | | 2-Chlorophenol | 50 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 50 ug/mL |
| | | | | | | | 2-Methylphenol | 50 ug/mL |
| | | | | | | | 2-Nitroaniline | 50 ug/mL |
| | | | | | | | 2-Nitrophenol | 50 ug/mL |
| | | | | | | | 3-Nitroaniline | 50 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 100 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 50 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 50 ug/mL |
| | | | | | | | 4-Chloroaniline | 50 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 50 ug/mL |
| | | | | | | | 4-Methylphenol | 50 ug/mL |
| | | | | | | | 4-Nitroaniline | 50 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 4-Nitrophenol | 100 ug/mL |
| | | | | | | | Acenaphthene | 50 ug/mL |
| | | | | | | | Acenaphthylene | 50 ug/mL |
| | | | | | | | Acetophenone | 50 ug/mL |
| | | | | | | | Aniline | 50 ug/mL |
| | | | | | | | Anthracene | 50 ug/mL |
| | | | | | | | Azobenzene | 50 ug/mL |
| | | | | | | | Benzo[a]anthracene | 50 ug/mL |
| | | | | | | | Benzo[a]pyrene | 50 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 50 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 50 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 50 ug/mL |
| | | | | | | | Benzyl alcohol | 50 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 50 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 50 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 50 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 50 ug/mL |
| | | | | | | | Carbazole | 50 ug/mL |
| | | | | | | | Chrysene | 50 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 50 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 50 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 50 ug/mL |
| | | | | | | | Dibenzofuran | 50 ug/mL |
| | | | | | | | Diethyl phthalate | 50 ug/mL |
| | | | | | | | Dimethyl phthalate | 50 ug/mL |
| | | | | | | | Diphenylamine | 85.5 ug/mL |
| | | | | | | | Fluoranthene | 50 ug/mL |
| | | | | | | | Fluorene | 50 ug/mL |
| | | | | | | | Hexachlorobenzene | 50 ug/mL |
| | | | | | | | Hexachlorobutadiene | 50 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 50 ug/mL |
| | | | | | | | Hexachloroethane | 50 ug/mL |
| | | | | | | | Hexadecane | 50 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 50 ug/mL |
| | | | | | | | Isophorone | 50 ug/mL |
| | | | | | | | n-Decane | 50 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 50 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 50 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 100 ug/mL |
| | | | | | | | n-Octadecane | 50 ug/mL |
| | | | | | | | Naphthalene | 50 ug/mL |
| | | | | | | | Nitrobenzene | 50 ug/mL |
| | | | | | | | Pentachlorophenol | 100 ug/mL |
| | | | | | | | Phenanthrene | 50 ug/mL |
| | | | | | | | Phenol | 50 ug/mL |
| | | | | | | | Pyrene | 50 ug/mL |
| | | | | | | | Pyridine | 50 ug/mL |
| | | | | | | | Benzoic acid | 50 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Indene | 50 ug/mL |
| | | | | | | | Atrazine | 50 ug/mL |
| | | | | | | | Benzaldehyde | 50 ug/mL |
| | | | | | | | Caprolactam | 50 ug/mL |
| | | | | | | | 3,3'-Dichlorobenzidine | 50 ug/mL |
| | | | | | | | Benzidine | 50 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 50 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 50 ug/mL |
| | | | | | | | 2-Fluorophenol | 50 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 50 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 50 ug/mL |
| | | | | | | | Phenol-d5 | 50 ug/mL |
| .MB_List1_INT_00022 | 07/31/16 | 10/09/15 | Methylene Chloride, Lot 121470 | 10 mL | MB_LIS1_STK_00023 | 2000 uL | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 200 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_L1S10_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | MB_LIS11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_LIS8_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_LIS1_STK_00023 | 12/31/16 | | ResteX, Lot A0211934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis(1-chloropropane) | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| ..MB_L1S10_STK_00002 | 08/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_L1S11_STK_00002 | 08/31/16 | | Restek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_LIS9_STK_00002 | 07/31/16 | | Restek, Lot A0110231 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SURR_STK_00042 | 01/12/18 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| **MB_LIST1_WRK_00218** | 07/31/16 | 10/21/15 | Methylene Chloride, Lot 121470 | 1 mL | MB_List1_INT_00022 | 400 uL | 1,1'-Biphenyl | 80 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 80 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 80 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 80 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 80 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 80 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 80 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 80 ug/mL |
| | | | | | | | 1,4-Dioxane | 80 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 80 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 80 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 80 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 80 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 80 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 80 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 80 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 160 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 80 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 80 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 80 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 80 ug/mL |
| | | | | | | | 2-Chlorophenol | 80 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 80 ug/mL |
| | | | | | | | 2-Methylphenol | 80 ug/mL |
| | | | | | | | 2-Nitroaniline | 80 ug/mL |
| | | | | | | | 2-Nitrophenol | 80 ug/mL |
| | | | | | | | 3-Nitroaniline | 80 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 160 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 80 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 80 ug/mL |
| | | | | | | | 4-Chloroaniline | 80 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 80 ug/mL |
| | | | | | | | 4-Methylphenol | 80 ug/mL |
| | | | | | | | 4-Nitroaniline | 80 ug/mL |
| | | | | | | | 4-Nitrophenol | 160 ug/mL |
| | | | | | | | Acenaphthene | 80 ug/mL |
| | | | | | | | Acenaphthylene | 80 ug/mL |
| | | | | | | | Acetophenone | 80 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Aniline | 80 ug/mL |
| | | | | | | | Anthracene | 80 ug/mL |
| | | | | | | | Azobenzene | 80 ug/mL |
| | | | | | | | Benzo[a]anthracene | 80 ug/mL |
| | | | | | | | Benzo[a]pyrene | 80 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 80 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 80 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 80 ug/mL |
| | | | | | | | Benzyl alcohol | 80 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 80 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 80 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 80 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 80 ug/mL |
| | | | | | | | Carbazole | 80 ug/mL |
| | | | | | | | Chrysene | 80 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 80 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 80 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 80 ug/mL |
| | | | | | | | Dibenzofuran | 80 ug/mL |
| | | | | | | | Diethyl phthalate | 80 ug/mL |
| | | | | | | | Dimethyl phthalate | 80 ug/mL |
| | | | | | | | Diphenylamine | 136.8 ug/mL |
| | | | | | | | Fluoranthene | 80 ug/mL |
| | | | | | | | Fluorene | 80 ug/mL |
| | | | | | | | Hexachlorobenzene | 80 ug/mL |
| | | | | | | | Hexachlorobutadiene | 80 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 80 ug/mL |
| | | | | | | | Hexachloroethane | 80 ug/mL |
| | | | | | | | Hexadecane | 80 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 80 ug/mL |
| | | | | | | | Isophorone | 80 ug/mL |
| | | | | | | | n-Decane | 80 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 80 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 80 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 160 ug/mL |
| | | | | | | | n-Octadecane | 80 ug/mL |
| | | | | | | | Naphthalene | 80 ug/mL |
| | | | | | | | Nitrobenzene | 80 ug/mL |
| | | | | | | | Pentachlorophenol | 160 ug/mL |
| | | | | | | | Phenanthrene | 80 ug/mL |
| | | | | | | | Phenol | 80 ug/mL |
| | | | | | | | Pyrene | 80 ug/mL |
| | | | | | | | Pyridine | 80 ug/mL |
| | | | | | | | Benzoic acid | 80 ug/mL |
| | | | | | | | Indene | 80 ug/mL |
| | | | | | | | Atrazine | 80 ug/mL |
| | | | | | | | Benzaldehyde | 80 ug/mL |
| | | | | | | | Caprolactam | 80 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 3,3'-Dichlorobenzidine | 80 ug/mL |
| | | | | | | | Benzidine | 80 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 80 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 80 ug/mL |
| | | | | | | | 2-Fluorophenol | 80 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 80 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 80 ug/mL |
| | | | | | | | Phenol-d5 | 80 ug/mL |
| .MB_List1_INT_00022 | 07/31/16 | 10/09/18 | Methylene Chloride, Lot 121470 | 10 mL | MB_LIS1_STK_00023 | 2000 uL | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 200 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_L1S10_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |
| | | | | | MB_L1S11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_L1S9_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_LIST_STK_00023 | 12/31/14 | | Restek, Lot A0111934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| ..MB_LIS10_STK_00002 | 08/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_LIS11_STK_00002 | 08/31/16 | | Restek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_LIS9_STK_00002 | 07/31/16 | | Restek, Lot A0110231 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SURR_STK_00042 | 01/12/18 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| MB_LIST1_WRK_00219 | 07/31/16 | 10/21/15 | Methylene Chloride, Lot 121470 | 1 mL | MB_List1_INT_00027 | 500 uL | 1,1'-Biphenyl | 100 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 100 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 100 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 100 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 100 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 100 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 100 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 100 ug/mL |
| | | | | | | | 1,4-Dioxane | 100 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 100 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 100 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 100 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 100 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 100 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 100 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 100 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 100 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 100 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 100 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 100 ug/mL |
| | | | | | | | 2-Chlorophenol | 100 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 100 ug/mL |
| | | | | | | | 2-Methylphenol | 100 ug/mL |
| | | | | | | | 2-Nitroaniline | 100 ug/mL |
| | | | | | | | 2-Nitrophenol | 100 ug/mL |
| | | | | | | | 3-Nitroaniline | 100 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 200 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 100 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 100 ug/mL |
| | | | | | | | 4-Chloroaniline | 100 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 100 ug/mL |
| | | | | | | | 4-Methylphenol | 100 ug/mL |
| | | | | | | | 4-Nitroaniline | 100 ug/mL |
| | | | | | | | 4-Nitrophenol | 200 ug/mL |
| | | | | | | | Acenaphthene | 100 ug/mL |
| | | | | | | | Acenaphthylene | 100 ug/mL |
| | | | | | | | Acetophenone | 100 ug/mL |
| | | | | | | | Aniline | 100 ug/mL |
| | | | | | | | Anthracene | 100 ug/mL |
| | | | | | | | Azobenzene | 100 ug/mL |
| | | | | | | | Benzo[a]anthracene | 100 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Benzo[a]pyrene | 100 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 100 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 100 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 100 ug/mL |
| | | | | | | | Benzyl alcohol | 100 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 100 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 100 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 100 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 100 ug/mL |
| | | | | | | | Carbazole | 100 ug/mL |
| | | | | | | | Chrysene | 100 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 100 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 100 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 100 ug/mL |
| | | | | | | | Dibenzofuran | 100 ug/mL |
| | | | | | | | Diethyl phthalate | 100 ug/mL |
| | | | | | | | Dimethyl phthalate | 100 ug/mL |
| | | | | | | | Diphenylamine | 171 ug/mL |
| | | | | | | | Fluoranthene | 100 ug/mL |
| | | | | | | | Fluorene | 100 ug/mL |
| | | | | | | | Hexachlorobenzene | 100 ug/mL |
| | | | | | | | Hexachlorobutadiene | 100 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 100 ug/mL |
| | | | | | | | Hexachloroethane | 100 ug/mL |
| | | | | | | | Hexadecane | 100 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 100 ug/mL |
| | | | | | | | Isophotone | 100 ug/mL |
| | | | | | | | n-Decane | 100 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 100 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 100 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 200 ug/mL |
| | | | | | | | n-Octadecane | 100 ug/mL |
| | | | | | | | Naphthalene | 100 ug/mL |
| | | | | | | | Nitrobenzene | 100 ug/mL |
| | | | | | | | Pentachlorophenol | 200 ug/mL |
| | | | | | | | Phenanthrene | 100 ug/mL |
| | | | | | | | Phenol | 100 ug/mL |
| | | | | | | | Pyrene | 100 ug/mL |
| | | | | | | | Pyridine | 100 ug/mL |
| | | | | | | | Benzoic acid | 100 ug/mL |
| | | | | | | | Indene | 100 ug/mL |
| | | | | | | | Atrazine | 100 ug/mL |
| | | | | | | | Benzaldehyde | 100 ug/mL |
| | | | | | | | Caprolactam | 100 ug/mL |
| | | | | | | | 3,3'-Dichlorobenzidine | 100 ug/mL |
| | | | | | | | Benzidine | 100 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 100 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 100 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2-Fluorophenol | 100 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 100 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 100 ug/mL |
| | | | | | | | Phenol-d5 | 100 ug/mL |
| MB_List1_INT_00022 | 07/31/16 | 10/09/15 | Methylene Chloride, Lot 121470 | 10 mL | MB_LIS1_STK_00023 | 2000 uL | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 200 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_L1S10_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |
| | | | | | MB_L1S11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_L1S9_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_LIS1_STK_00023 | 12/31/16 | | Restek, Lot A0III934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| ..MB_L1S10_STK_00002 | 09/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_L1S11_STK_00002 | 08/31/16 | | Rektek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_L1S9_STK_00002 | 07/31/16 | | Restek, Lot A0110231 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SURR_STK_00042 | 01/12/18 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| MB_LIST1_WRK_00220 | 07/31/15 | 10/21/15 | Methylene Chloride, Lot 121470 | 1 mL | MB_List1_INT_00022 | 600 uL | 1,1'-Biphenyl | 120 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 120 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 120 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 120 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 120 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 120 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 120 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 120 ug/mL |
| | | | | | | | 1,4-Dioxane | 120 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 120 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 120 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 120 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 120 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 120 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 120 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 120 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 240 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 120 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 120 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 120 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 120 ug/mL |
| | | | | | | | 2-Chlorophenol | 120 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 120 ug/mL |
| | | | | | | | 2-Methylphenol | 120 ug/mL |
| | | | | | | | 2-Nitroaniline | 120 ug/mL |
| | | | | | | | 2-Nitrophenol | 120 ug/mL |
| | | | | | | | 3-Nitroaniline | 120 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 240 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 120 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 120 ug/mL |
| | | | | | | | 4-Chloroaniline | 120 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 120 ug/mL |
| | | | | | | | 4-Methylphenol | 120 ug/mL |
| | | | | | | | 4-Nitroaniline | 120 ug/mL |
| | | | | | | | 4-Nitrophenol | 240 ug/mL |
| | | | | | | | Acenaphthene | 120 ug/mL |
| | | | | | | | Acenaphthylene | 120 ug/mL |
| | | | | | | | Acetophenone | 120 ug/mL |
| | | | | | | | Aniline | 120 ug/mL |
| | | | | | | | Anthracene | 120 ug/mL |
| | | | | | | | Azobenzene | 120 ug/mL |
| | | | | | | | Benzo[a]anthracene | 120 ug/mL |
| | | | | | | | Benzo[a]pyrene | 120 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 120 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 120 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 120 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Benzyl alcohol | 120 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 120 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 120 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 120 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 120 ug/mL |
| | | | | | | | Carbazole | 120 ug/mL |
| | | | | | | | Chrysene | 120 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 120 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 120 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 120 ug/mL |
| | | | | | | | Dibenzofuran | 120 ug/mL |
| | | | | | | | Diethyl phthalate | 120 ug/mL |
| | | | | | | | Dimethyl phthalate | 120 ug/mL |
| | | | | | | | Diphenylamine | 205.2 ug/mL |
| | | | | | | | Fluoranthene | 120 ug/mL |
| | | | | | | | Fluorene | 120 ug/mL |
| | | | | | | | Hexachlorobenzene | 120 ug/mL |
| | | | | | | | Hexachlorobutadiene | 120 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 120 ug/mL |
| | | | | | | | Hexachloroethane | 120 ug/mL |
| | | | | | | | Hexadecane | 120 ug/mL |
| | | | | | | | Indeno(1,2,3-cd)pyrene | 120 ug/mL |
| | | | | | | | Isophorone | 120 ug/mL |
| | | | | | | | n-Decane | 120 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 120 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 120 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 240 ug/mL |
| | | | | | | | n-Octadecane | 120 ug/mL |
| | | | | | | | Naphthalene | 120 ug/mL |
| | | | | | | | Nitrobenzene | 120 ug/mL |
| | | | | | | | Pentachlorophenol | 240 ug/mL |
| | | | | | | | Phenanthrene | 120 ug/mL |
| | | | | | | | Phenol | 120 ug/mL |
| | | | | | | | Pyrene | 120 ug/mL |
| | | | | | | | Pyridine | 120 ug/mL |
| | | | | | | | Benzoic acid | 120 ug/mL |
| | | | | | | | Indene | 120 ug/mL |
| | | | | | | | Atrazine | 120 ug/mL |
| | | | | | | | Benzaldehyde | 120 ug/mL |
| | | | | | | | Caprolactam | 120 ug/mL |
| | | | | | | | 3,3'-Dichlorobenzidine | 120 ug/mL |
| | | | | | | | Benzidine | 120 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 120 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 120 ug/mL |
| | | | | | | | 2-Fluorophenol | 120 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 120 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 120 ug/mL |
| | | | | | | | Phenol-d5 | 120 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| .MB_List1_INT_00022 | 07/31/16 | 10/09/15 | Methylene Chloride, Lot 121470 | 10 mL | MB_LIS1_STK_00023 | 2000 uL | 1,1'-Biphenyl | 200 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 200 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 200 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 200 ug/mL |
| | | | | | | | 1,4-Dioxane | 200 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 200 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 200 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 200 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 400 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 200 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 200 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 200 ug/mL |
| | | | | | | | 2-Chlorophenol | 200 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 200 ug/mL |
| | | | | | | | 2-Methylphenol | 200 ug/mL |
| | | | | | | | 2-Nitroaniline | 200 ug/mL |
| | | | | | | | 2-Nitrophenol | 200 ug/mL |
| | | | | | | | 3-Nitroaniline | 200 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 400 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 200 ug/mL |
| | | | | | | | 4-Chloroaniline | 200 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 200 ug/mL |
| | | | | | | | 4-Methylphenol | 200 ug/mL |
| | | | | | | | 4-Nitroaniline | 200 ug/mL |
| | | | | | | | 4-Nitrophenol | 400 ug/mL |
| | | | | | | | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Acetophenone | 200 ug/mL |
| | | | | | | | Aniline | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Azobenzene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Benzyl alcohol | 200 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Bis(2-chloroethoxy)methane | 200 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 200 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 200 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 200 ug/mL |
| | | | | | | | Carbazole | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 200 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 200 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Dibenzofuran | 200 ug/mL |
| | | | | | | | Diethyl phthalate | 200 ug/mL |
| | | | | | | | Dimethyl phthalate | 200 ug/mL |
| | | | | | | | Diphenylamine | 342 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Hexachlorobenzene | 200 ug/mL |
| | | | | | | | Hexachlorobutadiene | 200 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 200 ug/mL |
| | | | | | | | Hexachloroethane | 200 ug/mL |
| | | | | | | | Hexadecane | 200 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Isophorone | 200 ug/mL |
| | | | | | | | n-Decane | 200 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 200 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 400 ug/mL |
| | | | | | | | n-Octadecane | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Nitrobenzene | 200 ug/mL |
| | | | | | | | Pentachlorophenol | 400 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Phenol | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | | | Pyridine | 200 ug/mL |
| | | | | | MB_LIS10_STK_00002 | 1000 uL | Benzoic acid | 200 ug/mL |
| | | | | | | | Indene | 200 ug/mL |
| | | | | | MB_LIS11_STK_00002 | 1000 uL | Atrazine | 200 ug/mL |
| | | | | | | | Benzaldehyde | 200 ug/mL |
| | | | | | | | Caprolactam | 200 ug/mL |
| | | | | | MB_LIS9_STK_00002 | 1000 uL | 3,3'-Dichlorobenzidine | 200 ug/mL |
| | | | | | | | Benzidine | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_LIS1_STK_00023 | 12/31/14 | | Restek, Lot A0111934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Diphenylhydrazine | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| ..MB_L1S10_STK_00002 | 08/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..MB_L1S11_STK_00002 | 08/31/16 | | Rektek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..MB_L1S9_STK_00002 | 07/31/16 | | Restek, Lot A0110231 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..MB_SURR_STK_00042 | 01/13/16 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| **MB_LIST1_WRK_00221** | 07/31/16 | 10/26/15 | Methylene Chloride, Lot 118685 | 5 mL | MB_List1_INT_00022 | 1250 uL | Acenaphthene | 50 ug/mL |
| | | | | | | | Acenaphthylene | 50 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Anthracene | 50 ug/mL |
| | | | | | | | Benzo[a]anthracene | 50 ug/mL |
| | | | | | | | Benzo[a]pyrene | 50 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 50 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 50 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 50 ug/mL |
| | | | | | | | Chrysene | 50 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 50 ug/mL |
| | | | | | | | Fluoranthene | 50 ug/mL |
| | | | | | | | Fluorene | 50 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 50 ug/mL |
| | | | | | | | Naphthalene | 50 ug/mL |
| | | | | | | | Phenanthrene | 50 ug/mL |
| | | | | | | | Pyrene | 50 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 50 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 50 ug/mL |
| | | | | | | | 2-Fluorophenol | 50 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 50 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 50 ug/mL |
| | | | | | | | Phenol-d5 | 50 ug/mL |
| .MB_LIST1_INT_00022 | 07/31/16 | 10/09/15 | Methylene Chloride, Lot 121470 | 10 mL | MB_LIS1_STK_00023 | 2000 uL | Acenaphthene | 200 ug/mL |
| | | | | | | | Acenaphthylene | 200 ug/mL |
| | | | | | | | Anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]anthracene | 200 ug/mL |
| | | | | | | | Benzo[a]pyrene | 200 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 200 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 200 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 200 ug/mL |
| | | | | | | | Chrysene | 200 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 200 ug/mL |
| | | | | | | | Fluoranthene | 200 ug/mL |
| | | | | | | | Fluorene | 200 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 200 ug/mL |
| | | | | | | | Naphthalene | 200 ug/mL |
| | | | | | | | Phenanthrene | 200 ug/mL |
| | | | | | | | Pyrene | 200 ug/mL |
| | | | | | MB_SURR_STK_00042 | 400 uL | 2,4,6-Tribromophenol | 200 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 200 ug/mL |
| | | | | | | | 2-Fluorophenol | 200 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 200 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 200 ug/mL |
| | | | | | | | Phenol-d5 | 200 ug/mL |
| ..MB_LIS1_STK_00023 | 12/31/16 | | Restek, Lot A0111934 | | (Purchased Reagent) | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89467-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| ..MB_SURR_STK_00042 | 01/12/18 | | Restek, Lot A092712 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| **MB_LLIS_WRK_00095** | 06/01/16 | 10/07/15 | Methylene Chloride, Lot I18685 | 10 mL | MB_INTSTD_STK_00013 | 1 mL | 1,4-Dichlorobenzene-d4 | 200 ng/uL |
| | | | | | | | Acenaphthene-d10 | 200 ng/uL |
| | | | | | | | Chrysene-d12 | 200 ng/uL |
| | | | | | | | Naphthalene-d8 | 200 ng/uL |
| | | | | | | | Perylene-d12 | 200 ng/uL |
| | | | | | | | Phenanthrene-d10 | 200 ng/uL |
| .MB_INTSTD_STK_00013 | 02/29/20 | | Restek, Lot A0109360 | | (Purchased Reagent) | | 1,4-Dichlorobenzene-d4 | 2000 ug/mL |
| | | | | | | | Acenaphthene-d10 | 2000 ug/mL |
| | | | | | | | Chrysene-d12 | 2000 ug/mL |
| | | | | | | | Naphthalene-d8 | 2000 ug/mL |
| | | | | | | | Perylene-d12 | 2000 ug/mL |
| | | | | | | | Phenanthrene-d10 | 2000 ug/mL |
| **O_8270/625LCS_00048** | 04/28/16 | 10/28/15 | ACETONE, Lot 3032536 | 100 mL | 8270 List 1/S_00006 | 5 mL | 3,3'-Dichlorobenzidine | 100 ug/mL |
| | | | | | | | Benzidine | 100 ug/mL |
| | | | | | 8270 List1/10_00005 | 5 mL | Benzoic acid | 100 ug/mL |
| | | | | | | | Indene | 100 ug/mL |
| | | | | | 8270 list1/11_00006 | 5 mL | Atrazine | 100 ug/mL |
| | | | | | | | Benzaldehyde | 100 ug/mL |
| | | | | | | | Caprolactam | 100 ug/mL |
| | | | | | O_8270MegaMix_00028 | 5 mL | 1,1'-Biphenyl | 50 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 50 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 50 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 50 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 50 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 50 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 50 ug/mL |
| | | | | | | | 1,4-Dioxane | 50 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 50 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 50 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 50 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 50 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 50 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 50 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 50 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 100 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 50 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 50 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 50 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 50 ug/mL |
| | | | | | | | 2-Chlorophenol | 50 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 50 ug/mL |
| | | | | | | | 2-Methylphenol | 50 ug/mL |
| | | | | | | | 2-Nitroaniline | 50 ug/mL |
| | | | | | | | 2-Nitrophenol | 50 ug/mL |
| | | | | | | | 3-Methylphenol | 50 ug/mL |
| | | | | | | | 3-Nitroaniline | 50 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 100 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 50 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 50 ug/mL |
| | | | | | | | 4-Chloroaniline | 50 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 50 ug/mL |
| | | | | | | | 4-Methylphenol | 50 ug/mL |
| | | | | | | | 4-Nitroaniline | 50 ug/mL |
| | | | | | | | 4-Nitrophenol | 100 ug/mL |
| | | | | | | | Acenaphthene | 50 ug/mL |
| | | | | | | | Acenaphthylene | 50 ug/mL |
| | | | | | | | Acetophenone | 50 ug/mL |
| | | | | | | | Aniline | 50 ug/mL |
| | | | | | | | Anthracene | 50 ug/mL |
| | | | | | | | Azobenzene | 50 ug/mL |
| | | | | | | | Benzo[a]anthracene | 50 ug/mL |
| | | | | | | | Benzo[a]pyrene | 50 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 50 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 50 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 50 ug/mL |
| | | | | | | | Benzyl alcohol | 50 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 50 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 50 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 50 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 50 ug/mL |
| | | | | | | | Carbazole | 50 ug/mL |
| | | | | | | | Chrysene | 50 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 50 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 50 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 50 ug/mL |
| | | | | | | | Dibenzofuran | 50 ug/mL |
| | | | | | | | Diethyl phthalate | 50 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Dimethyl phthalate | 50 ug/mL |
| | | | | | | | Diphenylamine | 85.5 ug/mL |
| | | | | | | | Fluoranthene | 50 ug/mL |
| | | | | | | | Fluorene | 50 ug/mL |
| | | | | | | | Hexachlorobenzene | 50 ug/mL |
| | | | | | | | Hexachlorobutadiene | 50 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 50 ug/mL |
| | | | | | | | Hexachloroethane | 50 ug/mL |
| | | | | | | | Hexadecane | 50 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 50 ug/mL |
| | | | | | | | Isophorone | 50 ug/mL |
| | | | | | | | n-Decane | 50 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 50 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 100 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 100 ug/mL |
| | | | | | | | n-Octadecane | 50 ug/mL |
| | | | | | | | Naphthalene | 50 ug/mL |
| | | | | | | | Nitrobenzene | 50 ug/mL |
| | | | | | | | Pentachlorophenol | 100 ug/mL |
| | | | | | | | Phenanthrene | 50 ug/mL |
| | | | | | | | Phenol | 50 ug/mL |
| | | | | | | | Pyrene | 50 ug/mL |
| | | | | | | | Pyridine | 50 ug/mL |
| .8270 List 1/S_00006 | 01/31/17 | | Restek, Lot A0112567 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| .8270 List1/10_00005 | 09/31/16 | | Restek, Lot A0108988 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| .8270 list1/11_00006 | 01/31/17 | | Restek, Lot A0112321 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| .O_8270MegaMix_00028 | 12/31/16 | | Restek, Lot A0111934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Methylphenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 2000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| **O_8270LL LCS_00032** | 04/09/16 | 10/27/15 | ACETONE, Lot 3032536 | 100 mL | O_8270/625LCS_00047 | 8 mL | 3,3'-Dichlorobenzidine | 8 ug/mL |
| | | | | | | | Benzidine | 8 ug/mL |
| | | | | | | | Benzoic acid | 8 ug/mL |
| | | | | | | | Indene | 8 ug/mL |
| | | | | | | | Atrazine | 8 ug/mL |
| | | | | | | | Benzaldehyde | 8 ug/mL |
| | | | | | | | Caprolactam | 8 ug/mL |
| | | | | | | | 1,1'-Biphenyl | 4 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 4 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 4 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 4 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 4 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 4 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 4 ug/mL |
| | | | | | | | 1,4-Dioxane | 4 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 4 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 4 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 4 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 4 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 4 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 4 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 4 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 8 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 4 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 4 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 4 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 4 ug/mL |
| | | | | | | | 2-Chlorophenol | 4 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 4 ug/mL |
| | | | | | | | 2-Methylphenol | 4 ug/mL |
| | | | | | | | 2-Nitroaniline | 4 ug/mL |
| | | | | | | | 2-Nitrophenol | 4 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 3-Methylphenol | 4 ug/mL |
| | | | | | | | 3-Nitroaniline | 4 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 8 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 4 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 4 ug/mL |
| | | | | | | | 4-Chloroaniline | 4 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 4 ug/mL |
| | | | | | | | 4-Methylphenol | 4 ug/mL |
| | | | | | | | 4-Nitroaniline | 4 ug/mL |
| | | | | | | | 4-Nitrophenol | 8 ug/mL |
| | | | | | | | Acenaphthene | 4 ug/mL |
| | | | | | | | Acenaphthylene | 4 ug/mL |
| | | | | | | | Acetophenone | 4 ug/mL |
| | | | | | | | Aniline | 4 ug/mL |
| | | | | | | | Anthracene | 4 ug/mL |
| | | | | | | | Azobenzene | 4 ug/mL |
| | | | | | | | Benzo[a]anthracene | 4 ug/mL |
| | | | | | | | Benzo[a]pyrene | 4 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 4 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 4 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 4 ug/mL |
| | | | | | | | Benzyl alcohol | 4 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 4 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 4 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 4 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 4 ug/mL |
| | | | | | | | Carbazole | 4 ug/mL |
| | | | | | | | Chrysene | 4 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 4 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 4 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 4 ug/mL |
| | | | | | | | Dibenzofuran | 4 ug/mL |
| | | | | | | | Diethyl phthalate | 4 ug/mL |
| | | | | | | | Dimethyl phthalate | 4 ug/mL |
| | | | | | | | Diphenylamine | 6.84 ug/mL |
| | | | | | | | Fluoranthene | 4 ug/mL |
| | | | | | | | Fluorene | 4 ug/mL |
| | | | | | | | Hexachlorobenzene | 4 ug/mL |
| | | | | | | | Hexachlorobutadiene | 4 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 4 ug/mL |
| | | | | | | | Hexachloroethane | 4 ug/mL |
| | | | | | | | Hexadecane | 4 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 4 ug/mL |
| | | | | | | | Isophorone | 4 ug/mL |
| | | | | | | | n-Decane | 4 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 4 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 8 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 8 ug/mL |

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | n-Octadecane | 4 ug/mL |
| | | | | | | | Naphthalene | 4 ug/mL |
| | | | | | | | Nitrobenzene | 4 ug/mL |
| | | | | | | | Pentachlorophenol | 8 ug/mL |
| | | | | | | | Phenanthrene | 4 ug/mL |
| | | | | | | | Phenol | 4 ug/mL |
| | | | | | | | Pyrene | 4 ug/mL |
| | | | | | | | Pyridine | 4 ug/mL |
| .O_8270/625LCS_00047 | 04/09/16 | 10/09/15 | ACETONE, Lot 2929878 | 100 mL | 8270 List 1/S_00005 | 5 mL | 3,3'-Dichlorobenzidine | 100 ug/mL |
| | | | | | | | Benzidine | 100 ug/mL |
| | | | | | 8270 List1/10_00004 | 5 mL | Benzoic acid | 100 ug/mL |
| | | | | | | | Indene | 100 ug/mL |
| | | | | | 8270 list1/11_00005 | 5 mL | Atrazine | 100 ug/mL |
| | | | | | | | Benzaldehyde | 100 ug/mL |
| | | | | | | | Caprolactam | 100 ug/mL |
| | | | | | O_8270MegaMix_00027 | 5 mL | 1,1'-Biphenyl | 50 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 50 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 50 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 50 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 50 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 50 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 50 ug/mL |
| | | | | | | | 1,4-Dioxane | 50 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 50 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 50 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 50 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 50 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 50 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 50 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 50 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 100 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 50 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 50 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 50 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 50 ug/mL |
| | | | | | | | 2-Chlorophenol | 50 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 50 ug/mL |
| | | | | | | | 2-Methylphenol | 50 ug/mL |
| | | | | | | | 2-Nitroaniline | 50 ug/mL |
| | | | | | | | 2-Nitrophenol | 50 ug/mL |
| | | | | | | | 3-Methylphenol | 50 ug/mL |
| | | | | | | | 3-Nitroaniline | 50 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 100 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 50 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 50 ug/mL |
| | | | | | | | 4-Chloroaniline | 50 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 50 ug/mL |
| | | | | | | | 4-Methylphenol | 50 ug/mL |

559

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | 4-Nitroaniline | 50 ug/mL |
| | | | | | | | 4-Nitrophenol | 100 ug/mL |
| | | | | | | | Acenaphthene | 50 ug/mL |
| | | | | | | | Acenaphthylene | 50 ug/mL |
| | | | | | | | Acetophenone | 50 ug/mL |
| | | | | | | | Aniline | 50 ug/mL |
| | | | | | | | Anthracene | 50 ug/mL |
| | | | | | | | Azobenzene | 50 ug/mL |
| | | | | | | | Benzo[a]anthracene | 50 ug/mL |
| | | | | | | | Benzo[a]pyrene | 50 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 50 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 50 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 50 ug/mL |
| | | | | | | | Benzyl alcohol | 50 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 50 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 50 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 50 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 50 ug/mL |
| | | | | | | | Carbazole | 50 ug/mL |
| | | | | | | | Chrysene | 50 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 50 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 50 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 50 ug/mL |
| | | | | | | | Dibenzofuran | 50 ug/mL |
| | | | | | | | Diethyl phthalate | 50 ug/mL |
| | | | | | | | Dimethyl phthalate | 50 ug/mL |
| | | | | | | | Diphenylamine | 85.5 ug/mL |
| | | | | | | | Fluoranthene | 50 ug/mL |
| | | | | | | | Fluorene | 50 ug/mL |
| | | | | | | | Hexachlorobenzene | 50 ug/mL |
| | | | | | | | Hexachlorobutadiene | 50 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 50 ug/mL |
| | | | | | | | Hexachloroethane | 50 ug/mL |
| | | | | | | | Hexadecane | 50 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 50 ug/mL |
| | | | | | | | Isophorone | 50 ug/mL |
| | | | | | | | n-Decane | 50 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 50 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 100 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 100 ug/mL |
| | | | | | | | n-Octadecane | 50 ug/mL |
| | | | | | | | Naphthalene | 50 ug/mL |
| | | | | | | | Nitrobenzene | 50 ug/mL |
| | | | | | | | Pentachlorophenol | 100 ug/mL |
| | | | | | | | Phenanthrene | 50 ug/mL |
| | | | | | | | Phenol | 50 ug/mL |
| | | | | | | | Pyrene | 50 ug/mL |
| | | | | | | | Pyridine | 50 ug/mL |

560

REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| ..8270 List 1/8_00005 | 01/27/17 | | Restek, Lot A0112567 | | (Purchased Reagent) | | 3,3'-Dichlorobenzidine | 2000 ug/mL |
| | | | | | | | Benzidine | 2000 ug/mL |
| ..8270 List1/10_00004 | 08/31/16 | | Restek, Lot A0108989 | | (Purchased Reagent) | | Benzoic acid | 2000 ug/mL |
| | | | | | | | Indene | 2000 ug/mL |
| ..8270 list1/11_00005 | 08/31/16 | | Restek, Lot A0108989 | | (Purchased Reagent) | | Atrazine | 2000 ug/mL |
| | | | | | | | Benzaldehyde | 2000 ug/mL |
| | | | | | | | Caprolactam | 2000 ug/mL |
| ..O_8270MegaMix_00027 | 12/27/16 | | Restek, Lot A0111934 | | (Purchased Reagent) | | 1,1'-Biphenyl | 1000 ug/mL |
| | | | | | | | 1,2,4,5-Tetrachlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2,4-Trichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,2-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,3-Dinitrobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dichlorobenzene | 1000 ug/mL |
| | | | | | | | 1,4-Dioxane | 1000 ug/mL |
| | | | | | | | 1-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2,2'-oxybis[1-chloropropane] | 1000 ug/mL |
| | | | | | | | 2,3,4,6-Tetrachlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,5-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4,6-Trichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,4-Dimethylphenol | 1000 ug/mL |
| | | | | | | | 2,4-Dinitrophenol | 2000 ug/mL |
| | | | | | | | 2,4-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2,6-Dichlorophenol | 1000 ug/mL |
| | | | | | | | 2,6-Dinitrotoluene | 1000 ug/mL |
| | | | | | | | 2-Chloronaphthalene | 1000 ug/mL |
| | | | | | | | 2-Chlorophenol | 1000 ug/mL |
| | | | | | | | 2-Methylnaphthalene | 1000 ug/mL |
| | | | | | | | 2-Methylphenol | 1000 ug/mL |
| | | | | | | | 2-Nitroaniline | 1000 ug/mL |
| | | | | | | | 2-Nitrophenol | 1000 ug/mL |
| | | | | | | | 3-Methylphenol | 1000 ug/mL |
| | | | | | | | 3-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4,6-Dinitro-2-methylphenol | 2000 ug/mL |
| | | | | | | | 4-Bromophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Chloro-3-methylphenol | 1000 ug/mL |
| | | | | | | | 4-Chloroaniline | 1000 ug/mL |
| | | | | | | | 4-Chlorophenyl phenyl ether | 1000 ug/mL |
| | | | | | | | 4-Methylphenol | 1000 ug/mL |
| | | | | | | | 4-Nitroaniline | 1000 ug/mL |
| | | | | | | | 4-Nitrophenol | 2000 ug/mL |
| | | | | | | | Acenaphthene | 1000 ug/mL |
| | | | | | | | Acenaphthylene | 1000 ug/mL |
| | | | | | | | Acetophenone | 1000 ug/mL |
| | | | | | | | Aniline | 1000 ug/mL |
| | | | | | | | Anthracene | 1000 ug/mL |
| | | | | | | | Azobenzene | 1000 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89967-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Benzo[a]anthracene | 1000 ug/mL |
| | | | | | | | Benzo[a]pyrene | 1000 ug/mL |
| | | | | | | | Benzo[b]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzo[g,h,i]perylene | 1000 ug/mL |
| | | | | | | | Benzo[k]fluoranthene | 1000 ug/mL |
| | | | | | | | Benzyl alcohol | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethoxy)methane | 1000 ug/mL |
| | | | | | | | Bis(2-chloroethyl)ether | 1000 ug/mL |
| | | | | | | | Bis(2-ethylhexyl) phthalate | 1000 ug/mL |
| | | | | | | | Butyl benzyl phthalate | 1000 ug/mL |
| | | | | | | | Carbazole | 1000 ug/mL |
| | | | | | | | Chrysene | 1000 ug/mL |
| | | | | | | | Di-n-butyl phthalate | 1000 ug/mL |
| | | | | | | | Di-n-octyl phthalate | 1000 ug/mL |
| | | | | | | | Dibenz(a,h)anthracene | 1000 ug/mL |
| | | | | | | | Dibenzofuran | 1000 ug/mL |
| | | | | | | | Diethyl phthalate | 1000 ug/mL |
| | | | | | | | Dimethyl phthalate | 1000 ug/mL |
| | | | | | | | Diphenylamine | 1710 ug/mL |
| | | | | | | | Fluoranthene | 1000 ug/mL |
| | | | | | | | Fluorene | 1000 ug/mL |
| | | | | | | | Hexachlorobenzene | 1000 ug/mL |
| | | | | | | | Hexachlorobutadiene | 1000 ug/mL |
| | | | | | | | Hexachlorocyclopentadiene | 1000 ug/mL |
| | | | | | | | Hexachloroethane | 1000 ug/mL |
| | | | | | | | Hexadecane | 1000 ug/mL |
| | | | | | | | Indeno[1,2,3-cd]pyrene | 1000 ug/mL |
| | | | | | | | Isophorone | 1000 ug/mL |
| | | | | | | | n-Decane | 1000 ug/mL |
| | | | | | | | N-Nitrosodi-n-propylamine | 1000 ug/mL |
| | | | | | | | N-Nitrosodimethylamine | 2000 ug/mL |
| | | | | | | | N-Nitrosodiphenylamine | 2000 ug/mL |
| | | | | | | | n-Octadecane | 1000 ug/mL |
| | | | | | | | Naphthalene | 1000 ug/mL |
| | | | | | | | Nitrobenzene | 1000 ug/mL |
| | | | | | | | Pentachlorophenol | 2000 ug/mL |
| | | | | | | | Phenanthrene | 1000 ug/mL |
| | | | | | | | Phenol | 1000 ug/mL |
| | | | | | | | Pyrene | 1000 ug/mL |
| | | | | | | | Pyridine | 1000 ug/mL |
| **O_8270LLsurr_00034** | 04/26/16 | 10/26/15 | Methanol, Lot 2976711 | 1000 mL | O_8270surr_st_00001 | 1.6 mL | 2,4,6 - Tribromophenol | 8 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 8 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 8 ug/mL |
| | | | | | | | 2-Fluorophenol | 8 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 8 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 8 ug/mL |
| | | | | | | | Phenol-d5 | 8 ug/mL |

# REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Buffalo  Job No.: 480-89867-1

SDG No.:

| Reagent ID | Exp Date | Prep Date | Dilutant Used | Reagent Final Volume | Parent Reagent | | Analyte | Concentration |
|---|---|---|---|---|---|---|---|---|
| | | | | | Reagent ID | Volume Added | | |
| | | | | | | | Terphenyl-d14 | 8 ug/mL |
| .O_8270surr_st_00001 | 02/26/18 | | Restek, Lot A0933638 | | (Purchased Reagent) | | 2,4,6 - Tribromophenol | 5000 ug/mL |
| | | | | | | | 2,4,6-Tribromophenol | 5000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 5000 ug/mL |
| | | | | | | | 2-Fluorophenol | 5000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 5000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 5000 ug/mL |
| | | | | | | | Phenol-d5 | 5000 ug/mL |
| | | | | | | | Terphenyl-d14 | 5000 ug/mL |
| **O_8270surr_00036** | 04/30/16 | 10/30/15 | ACETONE, Lot 3032536 | 1000 mL | O_8270sur_stk_00004 | 10 mL | 2,4,6-Tribromophenol | 40 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 40 ug/mL |
| | | | | | | | 2-Fluorophenol | 40 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 40 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 40 ug/mL |
| | | | | | | | Phenol-d5 | 40 ug/mL |
| .O_8270sur_stk_00004 | 09/30/16 | | Ultra, Lot CM-4519 | | (Purchased Reagent) | | 2,4,6-Tribromophenol | 4000 ug/mL |
| | | | | | | | 2-Fluorobiphenyl | 4000 ug/mL |
| | | | | | | | 2-Fluorophenol | 4000 ug/mL |
| | | | | | | | Nitrobenzene-d5 (Surr) | 4000 ug/mL |
| | | | | | | | p-Terphenyl-d14 (Surr) | 4000 ug/mL |
| | | | | | | | Phenol-d5 | 4000 ug/mL |

563

# Certification Summary

Client: U.S. Army Construction Engineering Resea
Project/Site: Cerl Gasifier - Research Project

TestAmerica Job ID: 480-89467-1

| Laboratory | Authority | Program | EPA Region | Certification ID |
|---|---|---|---|---|
| TestAmerica Buffalo | California | State Program | 9 | 1169CA |
| TestAmerica Buffalo | Connecticut | State Program | 1 | PH-0568 |
| TestAmerica Buffalo | Florida | NELAP | 4 | E87672 |
| TestAmerica Buffalo | Georgia | State Program | 4 | 956 |
| TestAmerica Buffalo | Georgia | State Program | 4 | N/A |
| TestAmerica Buffalo | Illinois | NELAP | 5 | 200003 |
| TestAmerica Buffalo | Iowa | State Program | 7 | 374 |
| TestAmerica Buffalo | Kansas | NELAP | 7 | E-10187 |
| TestAmerica Buffalo | Kentucky (DW) | State Program | 4 | 90029 |
| TestAmerica Buffalo | Kentucky (UST) | State Program | 4 | 30 |
| TestAmerica Buffalo | Kentucky (WW) | State Program | 4 | 90029 |
| TestAmerica Buffalo | Louisiana | NELAP | 6 | 02031 |
| TestAmerica Buffalo | Maine | State Program | 1 | NY00044 |
| TestAmerica Buffalo | Maryland | State Program | 3 | 294 |
| TestAmerica Buffalo | Massachusetts | State Program | 1 | M-NY044 |
| TestAmerica Buffalo | Michigan | State Program | 5 | 9937 |
| TestAmerica Buffalo | Minnesota | NELAP | 5 | 036-999-337 |
| TestAmerica Buffalo | New Hampshire | NELAP Primary AB | 1 | 2973 |
| TestAmerica Buffalo | New Hampshire | NELAP Secondary AB | 1 | 2337 |
| TestAmerica Buffalo | New Jersey | NELAP | 2 | NY455 |
| TestAmerica Buffalo | New York | NELAP | 2 | 10026 |
| TestAmerica Buffalo | North Dakota | State Program | 8 | R-176 |
| TestAmerica Buffalo | Oklahoma | State Program | 6 | 9421 |
| TestAmerica Buffalo | Oregon | NELAP | 10 | NY200003 |
| TestAmerica Buffalo | Pennsylvania | NELAP | 3 | 68-00281 |
| TestAmerica Buffalo | Rhode Island | State Program | 1 | LAO00328 |
| TestAmerica Buffalo | Tennessee | State Program | 4 | TN02970 |
| TestAmerica Buffalo | Texas | NELAP | 6 | T104704412-15-6 |
| TestAmerica Buffalo | USDA | Federal | | P330-11-00386 |
| TestAmerica Buffalo | Virginia | NELAP | 3 | 460185 |
| TestAmerica Buffalo | Washington | State Program | 10 | C784 |
| TestAmerica Buffalo | West Virginia DEP | State Program | 3 | 252 |
| TestAmerica Buffalo | Wisconsin | State Program | 5 | 998310390 |

Accreditation may not be offered or required for all methods and analytes reported in this package. Please contact your project manager for the laboratory's current list of certified methods and analytes.

# Method 8270D

## Semivolatile Organic Compounds (GC/MS) by Method 8270D

FORM II
GC/MS SEMI VOA SURROGATE RECOVERY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Matrix: Waste Level: Low

GC Column (1): RXI-5Sil MS ID: 0.25(mm)

| Client Sample ID | Lab Sample ID | NBZ # | FBP # | TPH # |
|---|---|---|---|---|
| OS-01-031815-1530 | 480-89467-14 | 65 | 94 | 94 |
| OS-01-042415-1600 | 480-89467-15 | 88 | 102 | 101 |
| OS-01-042815-1600 | 480-89467-16 | 0 X | 83 | 81 |
| OS-01-050715-1630 | 480-89467-17 | 94 | 97 | 103 |
| OS-01-101514-0910 | 480-89467-22 | 0 X | 73 | 78 |
| | MB 480-273073/1-A | 86 | 98 | 99 |
| | LCS 480-273073/2-A | 79 | 93 | 102 |
| | LCSD 480-273073/3-A | 82 | 93 | 96 |

| | QC LIMITS |
|---|---|
| NBZ = Nitrobenzene-d5 (Surr) | 34-132 |
| FBP = 2-Fluorobiphenyl | 37-120 |
| TPH = p-Terphenyl-d14 (Surr) | 65-153 |

# Column to be used to flag recovery values

FORM II 8270D

FORM II
GC/MS SEMI VOA SURROGATE RECOVERY

Lab Name: TestAmerica Buffalo  Job No.: 480-89467-1

SDG No.:

Matrix: Water  Level: Low

GC Column (1): RXI-5Sil MS  ID: 0.25(mm)

| Client Sample ID | Lab Sample ID | NBZ | # | FBP | # | TPH | # |
|---|---|---|---|---|---|---|---|
| WW-02-030515-1557 | 480-89467-2 | 152 | X | 101 | | 76 | |
| WW-01-030515-1352 | 480-89467-5 | 76 | | 91 | | 73 | |
| WW-01-042815-1600 | 480-89467-6 | 106 | | 106 | | 85 | |
| WW-01-042815-1600 DL | 480-89467-6 DL | 0 | X | 99 | | 104 | |
| WW-01-050715-1600 | 480-89467-8 | 0 | X | 98 | | 72 | |
| WW-01-050715-1600 DL | 480-89467-8 DL | 0 | X | 87 | | 76 | |
| P-01-030515-1557 | 480-89467-10 | 0 | X | 81 | | 67 | |
| P-01-051315-1530 | 480-89467-13 | 0 | X | 95 | | 83 | |
| P-01-101514-0910 | 480-89467-18 | 0 | X | 93 | | 74 | |
| P-01-100814-1120 | 480-89467-19 | 0 | X | 94 | | 98 | |
| P-01-013015-0915 | 480-89467-20 | 0 | X | 118 | | 65 | X |
| P-01-013015-0915 DL | 480-89467-20 DL | 0 | X | 89 | | 72 | |
| | MB 480-273586/1-A | 82 | | 86 | | 99 | |
| | LCS 480-273586/2-A | 83 | | 83 | | 98 | |

| | QC LIMITS |
|---|---|
| NBZ = Nitrobenzene-d5 (Surr) | 46-120 |
| FBP = 2-Fluorobiphenyl | 48-120 |
| TPH = p-Terphenyl-d14 (Surr) | 67-150 |

# Column to be used to flag recovery values

FORM II 8270D

FORM III
GC/MS SEMI VOA LAB CONTROL SAMPLE RECOVERY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Matrix: Waste Level: Low Lab File ID: X009014106.D

Lab ID: LCS 480-273073/2-A Client ID:

| COMPOUND | SPIKE ADDED (ug/Kg) | LCS CONCENTRATION (ug/Kg) | LCS % REC | QC LIMITS REC | # |
|---|---|---|---|---|---|
| Acenaphthene | 500000 | 460000 | 92 | 53-120 | |
| Acenaphthylene | 500000 | 453000 | 91 | 58-121 | |
| Anthracene | 500000 | 517000 | 103 | 62-129 | |
| Benzo[a]anthracene | 500000 | 502000 | 100 | 65-133 | |
| Benzo[a]pyrene | 500000 | 497000 | 99 | 64-127 | |
| Benzo[b]fluoranthene | 500000 | 488000 | 98 | 64-135 | |
| Benzo[g,h,i]perylene | 500000 | 508000 | 102 | 50-152 | |
| Benzo[k]fluoranthene | 500000 | 514000 | 103 | 58-138 | |
| Chrysene | 500000 | 492000 | 98 | 64-131 | |
| Dibenz(a,h)anthracene | 500000 | 506000 | 101 | 54-148 | |
| Fluoranthene | 500000 | 503000 | 101 | 62-131 | |
| Fluorene | 500000 | 483000 | 97 | 63-126 | |
| Indeno[1,2,3-cd]pyrene | 500000 | 505000 | 101 | 56-149 | |
| Naphthalene | 500000 | 438000 | 88 | 46-120 | |
| Phenanthrene | 500000 | 518000 | 104 | 60-130 | |
| Pyrene | 500000 | 516000 | 103 | 51-133 | |

# Column to be used to flag recovery and RPD values

FORM III 8270D

FORM III
GC/MS SEMI VOA LAB CONTROL SAMPLE RECOVERY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Matrix: Water Level: Low Lab File ID: V54276.D

Lab ID: LCS 480-273586/2-A Client ID:

| COMPOUND | SPIKE ADDED (ug/L) | LCS CONCENTRATION (ug/L) | LCS % REC | QC LIMITS REC | # |
|---|---|---|---|---|---|
| Acenaphthene | 16.0 | 14.5 | 91 | 60-120 | |
| Acenaphthylene | 16.0 | 14.7 | 92 | 63-120 | |
| Anthracene | 16.0 | 14.8 | 92 | 58-148 | |
| Benzo[a]anthracene | 16.0 | 15.0 | 94 | 55-151 | |
| Benzo[a]pyrene | 16.0 | 14.5 | 90 | 60-145 | |
| Benzo[b]fluoranthene | 16.0 | 14.5 | 91 | 54-140 | |
| Benzo[g,h,i]perylene | 16.0 | 17.1 | 107 | 66-152 | |
| Benzo[k]fluoranthene | 16.0 | 14.4 | 90 | 51-153 | |
| Chrysene | 16.0 | 15.0 | 93 | 69-140 | |
| Dibenz(a,h)anthracene | 16.0 | 15.9 | 99 | 57-148 | |
| Fluoranthene | 16.0 | 15.4 | 96 | 55-147 | |
| Fluorene | 16.0 | 15.0 | 94 | 55-143 | |
| Indeno[1,2,3-cd]pyrene | 16.0 | 15.8 | 99 | 69-146 | |
| Naphthalene | 16.0 | 12.8 | 80 | 35-130 | |
| Phenanthrene | 16.0 | 14.9 | 93 | 57-147 | |
| Pyrene | 16.0 | 15.5 | 97 | 58-136 | |

# Column to be used to flag recovery and RPD values

FORM III 8270D

FORM III
GC/MS SEMI VOA LAB CONTROL SAMPLE DUPLICATE RECOVERY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Matrix: Waste Level: Low Lab File ID: X009014107.D

Lab ID: LCSD 480-273073/3-A Client ID:

| COMPOUND | SPIKE ADDED (ug/Kg) | LCSD CONCENTRATION (ug/Kg) | LCSD % REC | % RPD | QC LIMITS RPD | QC LIMITS REC | # |
|---|---|---|---|---|---|---|---|
| Acenaphthene | 500000 | 455000 | 91 | 1 | 35 | 53-120 | |
| Acenaphthylene | 500000 | 452000 | 90 | 0 | 18 | 58-121 | |
| Anthracene | 500000 | 492000 | 98 | 5 | 15 | 62-129 | |
| Benzo[a]anthracene | 500000 | 469000 | 94 | 7 | 15 | 65-133 | |
| Benzo[a]pyrene | 500000 | 471000 | 94 | 5 | 15 | 64-127 | |
| Benzo[b]fluoranthene | 500000 | 466000 | 93 | 5 | 15 | 64-135 | |
| Benzo[g,h,i]perylene | 500000 | 482000 | 96 | 5 | 15 | 50-152 | |
| Benzo[k]fluoranthene | 500000 | 491000 | 98 | 5 | 22 | 58-138 | |
| Chrysene | 500000 | 467000 | 93 | 5 | 15 | 64-131 | |
| Dibenz(a,h)anthracene | 500000 | 481000 | 96 | 5 | 15 | 54-148 | |
| Fluoranthene | 500000 | 486000 | 97 | 3 | 15 | 62-131 | |
| Fluorene | 500000 | 469000 | 94 | 3 | 15 | 63-126 | |
| Indeno[1,2,3-cd]pyrene | 500000 | 474000 | 95 | 6 | 15 | 56-149 | |
| Naphthalene | 500000 | 428000 | 86 | 2 | 29 | 46-120 | |
| Phenanthrene | 500000 | 495000 | 99 | 5 | 15 | 60-130 | |
| Pyrene | 500000 | 478000 | 96 | 8 | 35 | 51-133 | |

# Column to be used to flag recovery and RPD values

FORM III 8270D

FORM IV
GC/MS SEMI VOA METHOD BLANK SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab File ID: X009014105.D Lab Sample ID: MB 480-273073/1-A

Matrix: Waste Date Extracted: 11/04/2015 13:45

Instrument ID: HP5973X Date Analyzed: 11/05/2015 15:13

Level: (Low/Med) Low

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES:

| CLIENT SAMPLE ID | LAB SAMPLE ID | LAB FILE ID | DATE ANALYZED |
|---|---|---|---|
| | LCS 480-273073/2-A | X009014106.D | 11/05/2015 15:40 |
| | LCSD 480-273073/3-A | X009014107.D | 11/05/2015 16:07 |
| OS-01-031815-1530 | 480-89467-14 | X009014108.D | 11/05/2015 16:34 |
| OS-01-042415-1600 | 480-89467-15 | X009014109.D | 11/05/2015 17:01 |
| OS-01-042815-1600 | 480-89467-16 | X009014110.D | 11/05/2015 17:28 |
| OS-01-050715-1630 | 480-89467-17 | X009014111.D | 11/05/2015 17:55 |
| OS-01-101514-0910 | 480-89467-22 | X009014112.D | 11/05/2015 18:21 |

FORM IV
GC/MS SEMI VOA METHOD BLANK SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab File ID: V54275.D Lab Sample ID: MB 480-273586/1-A

Matrix: Water Date Extracted: 11/06/2015 12:33

Instrument ID: HP5973V Date Analyzed: 11/09/2015 14:26

Level: (Low/Med) Low

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES:

| CLIENT SAMPLE ID | LAB SAMPLE ID | LAB FILE ID | DATE ANALYZED |
|---|---|---|---|
| | LCS 480-273586/2-A | V54276.D | 11/09/2015 14:56 |
| WW-02-030515-1557 | 480-89467-2 | V60015.D | 11/10/2015 17:23 |
| WW-01-030515-1352 | 480-89467-5 | V60016.D | 11/10/2015 17:52 |
| WW-01-042815-1600 | 480-89467-6 | V60017.D | 11/10/2015 18:21 |
| WW-01-050715-1600 | 480-89467-8 | V60018.D | 11/10/2015 18:50 |
| P-01-030515-1557 | 480-89467-10 | V60019.D | 11/10/2015 19:19 |
| P-01-051315-1530 | 480-89467-13 | V60020.D | 11/10/2015 19:48 |
| P-01-101514-0910 | 480-89467-18 | V60021.D | 11/10/2015 20:17 |
| P-01-100814-1120 | 480-89467-19 | V60022.D | 11/10/2015 20:46 |
| P-01-013015-0915 | 480-89467-20 | V60023.D | 11/10/2015 21:15 |
| WW-01-042815-1600 DL | 480-89467-6 DL | V60046.D | 11/11/2015 13:47 |
| WW-01-050715-1600 DL | 480-89467-8 DL | V60047.D | 11/11/2015 14:16 |
| P-01-013015-0915 DL | 480-89467-20 DL | V60048.D | 11/11/2015 14:45 |

FORM V
GC/MS SEMI VOA INSTRUMENT PERFORMANCE CHECK
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab File ID: V53779.D DFTPP Injection Date: 10/26/2015

Instrument ID: HP5973V DFTPP Injection Time: 19:07

Analysis Batch No.: 271208

| M/E | ION ABUNDANCE CRITERIA | % RELATIVE ABUNDANCE | |
|---|---|---|---|
| 51 | 10-80% of Base Peak | 47.1 | |
| 68 | Less than 2% of mass 69 | 0.1 | (0.3)1 |
| 69 | Mass 69 Relative abundance | 38.5 | |
| 70 | Less than 2% of mass 69 | 0.2 | (0.6)1 |
| 127 | 10-80% of Base Peak | 50.8 | |
| 197 | Less than 2% of mass 198 | 0.0 | |
| 198 | Base peak | 100.0 | |
| 199 | 5-9% of mass 198 | 6.8 | |
| 275 | 10-60% of Base Peak | 29.9 | |
| 365 | Greater than 1% of mass 198 | 4.4 | |
| 441 | present but less than 24% of mass 442 | 21.9 | (15.0)2 |
| 442 | Greater than 50% of mass 198 | 145.7 | |
| 443 | 15-24% of mass 442 | 29.3 | (20.1)2 |

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS AND STANDARDS:

| CLIENT SAMPLE ID | LAB SAMPLE ID | LAB FILE ID | DATE ANALYZED | TIME ANALYZED |
|---|---|---|---|---|
| | IC 480-271208/3 | V53780.D | 10/26/2015 | 19:36 |
| | IC 480-271208/4 | V53781.D | 10/26/2015 | 20:05 |
| | IC 480-271208/5 | V53782.D | 10/26/2015 | 20:35 |
| | ICIS 480-271208/6 | V53783.D | 10/26/2015 | 21:04 |
| | IC 480-271208/7 | V53784.D | 10/26/2015 | 21:33 |
| | IC 480-271208/8 | V53785.D | 10/26/2015 | 22:02 |
| | IC 480-271208/9 | V53786.D | 10/26/2015 | 22:31 |

FORM V
GC/MS SEMI VOA INSTRUMENT PERFORMANCE CHECK
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab File ID: V54271.D DFTPP Injection Date: 11/09/2015

Instrument ID: HP5973V DFTPP Injection Time: 12:27

Analysis Batch No.: 273910

| M/E | ION ABUNDANCE CRITERIA | % RELATIVE ABUNDANCE | |
|---|---|---|---|
| 51 | 10-80% of Base Peak | 54.9 | |
| 68 | Less than 2% of mass 69 | 0.8 | (1.9)1 |
| 69 | Mass 69 Relative abundance | 41.4 | |
| 70 | Less than 2% of mass 69 | 0.1 | (0.3)1 |
| 127 | 10-80% of Base Peak | 49.8 | |
| 197 | Less than 2% of mass 198 | 0.0 | |
| 198 | Base peak | 100.0 | |
| 199 | 5-9% of mass 198 | 6.9 | |
| 275 | 10-60% of Base Peak | 32.2 | |
| 365 | Greater than 1% of mass 198 | 5.7 | |
| 441 | present but less than 24% of mass 442 | 26.7 | (15.2)2 |
| 442 | Greater than 50% of mass 198 | 176.1 | |
| 443 | 15-24% of mass 442 | 34.3 | (19.5)2 |

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS AND STANDARDS:

| CLIENT SAMPLE ID | LAB SAMPLE ID | LAB FILE ID | DATE ANALYZED | TIME ANALYZED |
|---|---|---|---|---|
| | CCVIS 480-273910/3 | V54272.D | 11/09/2015 | 12:57 |
| | MB 480-273586/1-A | V54275.D | 11/09/2015 | 14:26 |
| | LCS 480-273586/2-A | V54276.D | 11/09/2015 | 14:56 |

FORM V
GC/MS SEMI VOA INSTRUMENT PERFORMANCE CHECK
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab File ID: V60001.D DFTPP Injection Date: 11/10/2015

Instrument ID: HP5973V DFTPP Injection Time: 10:38

Analysis Batch No.: 273999

| M/E | ION ABUNDANCE CRITERIA | % RELATIVE ABUNDANCE | |
|---|---|---|---|
| 51 | 10-80% of Base Peak | 58.4 | |
| 68 | Less than 2% of mass 69 | 0.2 | (0.4)1 |
| 69 | Mass 69 Relative abundance | 44.4 | |
| 70 | Less than 2% of mass 69 | 0.1 | (0.3)1 |
| 127 | 10-80% of Base Peak | 53.4 | |
| 197 | Less than 2% of mass 198 | 0.0 | |
| 198 | Base peak | 100.0 | |
| 199 | 5-9% of mass 198 | 6.5 | |
| 275 | 10-60% of Base Peak | 33.1 | |
| 365 | Greater than 1% of mass 198 | 5.4 | |
| 441 | present but less than 24% of mass 442 | 24.4 | (15.0)2 |
| 442 | Greater than 50% of mass 198 | 162.5 | |
| 443 | 15-24% of mass 442 | 31.6 | (19.4)2 |

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS AND STANDARDS:

| CLIENT SAMPLE ID | LAB SAMPLE ID | LAB FILE ID | DATE ANALYZED | TIME ANALYZED |
|---|---|---|---|---|
| | CCVIS 480-273999/3 | V60002.D | 11/10/2015 | 11:07 |
| WW-02-030515-1557 | 480-89467-2 | V60015.D | 11/10/2015 | 17:23 |
| WW-01-030515-1352 | 480-89467-5 | V60016.D | 11/10/2015 | 17:52 |
| WW-01-042815-1600 | 480-89467-6 | V60017.D | 11/10/2015 | 18:21 |
| WW-01-050715-1600 | 480-89467-8 | V60018.D | 11/10/2015 | 18:50 |
| P-01-030515-1557 | 480-89467-10 | V60019.D | 11/10/2015 | 19:19 |
| P-01-051315-1530 | 480-89467-13 | V60020.D | 11/10/2015 | 19:48 |
| P-01-101514-0910 | 480-89467-18 | V60021.D | 11/10/2015 | 20:17 |
| P-01-100814-1120 | 480-89467-19 | V60022.D | 11/10/2015 | 20:46 |
| P-01-013015-0915 | 480-89467-20 | V60023.D | 11/10/2015 | 21:15 |

FORM V
GC/MS SEMI VOA INSTRUMENT PERFORMANCE CHECK
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab File ID: V60043.D DFTPP Injection Date: 11/11/2015

Instrument ID: HP5973V DFTPP Injection Time: 12:20

Analysis Batch No.: 274392

| M/E | ION ABUNDANCE CRITERIA | % RELATIVE ABUNDANCE | |
|---|---|---|---|
| 51 | 10-80% of Base Peak | 60.4 | |
| 68 | Less than 2% of mass 69 | 0.0 | (0.0)1 |
| 69 | Mass 69 Relative abundance | 47.7 | |
| 70 | Less than 2% of mass 69 | 0.4 | (0.9)1 |
| 127 | 10-80% of Base Peak | 54.1 | |
| 197 | Less than 2% of mass 198 | 0.4 | |
| 198 | Base peak | 100.0 | |
| 199 | 5-9% of mass 198 | 6.3 | |
| 275 | 10-60% of Base Peak | 30.3 | |
| 365 | Greater than 1% of mass 198 | 5.6 | |
| 441 | present but less than 24% of mass 442 | 23.1 | (15.6)2 |
| 442 | Greater than 50% of mass 198 | 148.1 | |
| 443 | 15-24% of mass 442 | 30.0 | (20.3)2 |

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS AND STANDARDS:

| CLIENT SAMPLE ID | LAB SAMPLE ID | LAB FILE ID | DATE ANALYZED | TIME ANALYZED |
|---|---|---|---|---|
| | CCVIS 480-274392/3 | V60044.D | 11/11/2015 | 12:49 |
| WW-01-042815-1600 DL | 480-89467-6 DL | V60046.D | 11/11/2015 | 13:47 |
| WW-01-050715-1600 DL | 480-89467-8 DL | V60047.D | 11/11/2015 | 14:16 |
| P-01-013015-0915 DL | 480-89467-20 DL | V60048.D | 11/11/2015 | 14:45 |

FORM V
GC/MS SEMI VOA INSTRUMENT PERFORMANCE CHECK
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab File ID: X009013898.D DFTPP Injection Date: 10/23/2015

Instrument ID: HP5973X DFTPP Injection Time: 08:06

Analysis Batch No.: 270613

| M/E | ION ABUNDANCE CRITERIA | % RELATIVE ABUNDANCE | |
|---|---|---|---|
| 51 | 10-80% of Base Peak | 39.9 | |
| 68 | Less than 2% of mass 69 | 0.0 | (0.0)1 |
| 69 | Mass 69 Relative abundance | 38.7 | |
| 70 | Less than 2% of mass 69 | 0.1 | (0.3)1 |
| 127 | 10-80% of Base Peak | 47.6 | |
| 197 | Less than 2% of mass 198 | 0.0 | |
| 198 | Base peak | 100.0 | |
| 199 | 5-9% of mass 198 | 6.6 | |
| 275 | 10-60% of Base Peak | 24.2 | |
| 365 | Greater than 1% of mass 198 | 3.1 | |
| 441 | present but less than 24% of mass 442 | 11.3 | (15.1)2 |
| 442 | Greater than 50% of mass 198 | 74.7 | |
| 443 | 15-24% of mass 442 | 15.1 | (20.2)2 |

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS AND STANDARDS:

| CLIENT SAMPLE ID | LAB SAMPLE ID | LAB FILE ID | DATE ANALYZED | TIME ANALYZED |
|---|---|---|---|---|
| | IC 480-270613/3 | X009013899.D | 10/23/2015 | 08:33 |
| | IC 480-270613/4 | X009013900.D | 10/23/2015 | 09:00 |
| | ICIS 480-270613/5 | X009013901.D | 10/23/2015 | 09:27 |
| | IC 480-270613/6 | X009013902.D | 10/23/2015 | 09:54 |
| | IC 480-270613/7 | X009013903.D | 10/23/2015 | 10:21 |
| | IC 480-270613/8 | X009013904.D | 10/23/2015 | 10:48 |

FORM V
GC/MS SEMI VOA INSTRUMENT PERFORMANCE CHECK
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab File ID: X009014094.D DFTPP Injection Date: 11/05/2015

Instrument ID: HP5973X DFTPP Injection Time: 10:14

Analysis Batch No.: 273506

| M/E | ION ABUNDANCE CRITERIA | % RELATIVE ABUNDANCE | |
|---|---|---|---|
| 51 | 10-80% of Base Peak | 35.8 | |
| 68 | Less than 2% of mass 69 | 0.0 | (0.0)1 |
| 69 | Mass 69 Relative abundance | 38.1 | |
| 70 | Less than 2% of mass 69 | 0.1 | (0.2)1 |
| 127 | 10-80% of Base Peak | 48.6 | |
| 197 | Less than 2% of mass 198 | 0.3 | |
| 198 | Base peak | 100.0 | |
| 199 | 5-9% of mass 198 | 7.3 | |
| 275 | 10-60% of Base Peak | 26.9 | |
| 365 | Greater than 1% of mass 198 | 2.6 | |
| 441 | present but less than 24% of mass 442 | 13.4 | (15.9)2 |
| 442 | Greater than 50% of mass 198 | 84.2 | |
| 443 | 15-24% of mass 442 | 16.0 | (19.0)2 |

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS AND STANDARDS:

| CLIENT SAMPLE ID | LAB SAMPLE ID | LAB FILE ID | DATE ANALYZED | TIME ANALYZED |
|---|---|---|---|---|
| | CCVIS 480-273506/3 | X009014095.D | 11/05/2015 | 10:42 |
| | MB 480-273073/1-A | X009014105.D | 11/05/2015 | 15:13 |
| | LCS 480-273073/2-A | X009014106.D | 11/05/2015 | 15:40 |
| | LCSD 480-273073/3-A | X009014107.D | 11/05/2015 | 16:07 |
| OS-01-031815-1530 | 480-89467-14 | X009014108.D | 11/05/2015 | 16:34 |
| OS-01-042415-1600 | 480-89467-15 | X009014109.D | 11/05/2015 | 17:01 |
| OS-01-042815-1600 | 480-89467-16 | X009014110.D | 11/05/2015 | 17:28 |
| OS-01-050715-1630 | 480-89467-17 | X009014111.D | 11/05/2015 | 17:55 |
| OS-01-101514-0910 | 480-89467-22 | X009014112.D | 11/05/2015 | 18:21 |

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Sample No.: ICIS 480-271208/6 Date Analyzed: 10/26/2015 21:04

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm)

Lab File ID (Standard): V53783.D Heated Purge: (Y/N) N

Calibration ID: 25393

| | | DCB | | NPT | | ANT | |
|---|---|---|---|---|---|---|---|
| | | AREA # | RT # | AREA # | RT # | AREA # | RT # |
| INITIAL CALIBRATION MID-POINT | | 149442 | 6.91 | 570099 | 7.99 | 309653 | 9.49 |
| UPPER LIMIT | | 298884 | 7.41 | 1140198 | 8.49 | 619306 | 9.99 |
| LOWER LIMIT | | 74721 | 6.41 | 285050 | 7.49 | 154827 | 8.99 |
| LAB SAMPLE ID | CLIENT SAMPLE ID | | | | | | |
| CCVIS 480-273910/3 | | 95271 | 6.84 | 329442 | 7.93 | 188477 | 9.42 |
| CCVIS 480-273999/3 | | 93344 | 6.84 | 341975 | 7.93 | 195367 | 9.42 |
| CCVIS 480-274392/3 | | 119802 | 6.83 | 433077 | 7.91 | 241390 | 9.41 |

DCB = 1,4-Dichlorobenzene-d4
NPT = Naphthalene-d8
ANT = Acenaphthene-d10

Area Limit = 50%-200% of internal standard area
RT Limit = ± 0.5 minutes of internal standard RT

# Column used to flag values outside QC limits

FORM VIII 8270D

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Sample No.: ICIS 480-271208/6 Date Analyzed: 10/26/2015 21:04

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm)

Lab File ID (Standard): V53783.D Heated Purge: (Y/N) N

Calibration ID: 25393

| | | PHN | | CRY | | PRY | |
|---|---|---|---|---|---|---|---|
| | | AREA # | RT # | AREA # | RT # | AREA # | RT # |
| INITIAL CALIBRATION MID-POINT | | 529481 | 10.76 | 529691 | 13.71 | 568302 | 16.09 |
| UPPER LIMIT | | 1058962 | 11.26 | 1059382 | 14.21 | 1136604 | 16.59 |
| LOWER LIMIT | | 264741 | 10.26 | 264846 | 13.21 | 284151 | 15.59 |
| LAB SAMPLE ID | CLIENT SAMPLE ID | | | | | | |
| CCVIS 480-273910/3 | | 341426 | 10.69 | 355683 | 13.60 | 404913 | 15.95 |
| CCVIS 480-273999/3 | | 351985 | 10.69 | 378577 | 13.60 | 408130 | 15.96 |
| CCVIS 480-274392/3 | | 432245 | 10.68 | 455083 | 13.59 | 514291 | 15.94 |

PHN = Phenanthrene-d10
CRY = Chrysene-d12
PRY = Perylene-d12

Area Limit = 50%-200% of internal standard area
RT Limit = ± 0.5 minutes of internal standard RT

# Column used to flag values outside QC limits

FORM VIII 8270D

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Sample No.: CCVIS 480-273910/3 Date Analyzed: 11/09/2015 12:57

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm)

Lab File ID (Standard): V54272.D Heated Purge: (Y/N) N

Calibration ID: 25512

| | | DCB | | NPT | | ANT | |
|---|---|---|---|---|---|---|---|
| | | AREA # | RT # | AREA # | RT # | AREA # | RT # |
| 12/24 HOUR STD | | 95271 | 6.84 | 329442 | 7.93 | 188477 | 9.42 |
| UPPER LIMIT | | 190542 | 7.34 | 658884 | 8.43 | 376954 | 9.92 |
| LOWER LIMIT | | 47636 | 6.34 | 164721 | 7.43 | 94239 | 8.92 |
| LAB SAMPLE ID | CLIENT SAMPLE ID | | | | | | |
| MB 480-273586/1-A | | 102514 | 6.84 | 376927 | 7.93 | 196758 | 9.42 |
| LCS 480-273586/2-A | | 90277 | 6.85 | 309625 | 7.93 | 184829 | 9.42 |

DCB = 1,4-Dichlorobenzene-d4
NPT = Naphthalene-d8
ANT = Acenaphthene-d10

Area Limit = 50%-200% of internal standard area
RT Limit = ± 0.5 minutes of internal standard RT

# Column used to flag values outside QC limits

FORM VIII 8270D

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Sample No.: CCVIS 480-273910/3 Date Analyzed: 11/09/2015 12:57

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm)

Lab File ID (Standard): V54272.D Heated Purge: (Y/N) N

Calibration ID: 25512

| | | PHN | | CRY | | PRY | |
|---|---|---|---|---|---|---|---|
| | | AREA # | RT # | AREA # | RT # | AREA # | RT # |
| 12/24 HOUR STD | | 341426 | 10.69 | 355683 | 13.60 | 404913 | 15.95 |
| UPPER LIMIT | | 682852 | 11.19 | 711366 | 14.10 | 809826 | 16.45 |
| LOWER LIMIT | | 170713 | 10.19 | 177842 | 13.10 | 202457 | 15.45 |
| LAB SAMPLE ID | CLIENT SAMPLE ID | | | | | | |
| MB 480-273586/1-A | | 362667 | 10.69 | 352629 | 13.60 | 398914 | 15.95 |
| LCS 480-273586/2-A | | 331204 | 10.69 | 334690 | 13.60 | 382997 | 15.95 |

PHN = Phenanthrene-d10
CRY = Chrysene-d12
PRY = Perylene-d12

Area Limit = 50%-200% of internal standard area
RT Limit = ± 0.5 minutes of internal standard RT

# Column used to flag values outside QC limits

FORM VIII 8270D

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Sample No.: CCVIS 480-273999/3 Date Analyzed: 11/10/2015 11:07

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm)

Lab File ID (Standard): V60002.D Heated Purge: (Y/N) N

Calibration ID: 25512

| | | DCB | | NPT | | ANT | |
|---|---|---|---|---|---|---|---|
| | | AREA # | RT # | AREA # | RT # | AREA # | RT # |
| 12/24 HOUR STD | | 93344 | 6.84 | 341975 | 7.93 | 195367 | 9.42 |
| UPPER LIMIT | | 186688 | 7.34 | 683950 | 8.43 | 390734 | 9.92 |
| LOWER LIMIT | | 46672 | 6.34 | 170988 | 7.43 | 97684 | 8.92 |
| LAB SAMPLE ID | CLIENT SAMPLE ID | | | | | | |
| 480-89467-2 | WW-02-030515-1557 | 67835 | 6.84 | 198714 | 7.93 | 138050 | 9.42 |
| 480-89467-5 | WW-01-030515-1352 | 63659 | 6.84 | 232589 | 7.93 | 117656 | 9.42 |
| 480-89467-6 | WW-01-042815-1600 | 66998 | 6.84 | 262688 | 7.93 | 138840 | 9.42 |
| 480-89467-8 | WW-01-050715-1600 | 66266 | 6.84 | 228704 | 7.93 | 118105 | 9.42 |
| 480-89467-10 | P-01-030515-1557 | 58403 | 6.84 | 201130 | 7.93 | 119172 | 9.42 |
| 480-89467-13 | P-01-051315-1530 | 62927 | 6.84 | 171577 | 7.93 | 106344 | 9.42 |
| 480-89467-18 | P-01-101514-0910 | 68965 | 6.84 | 265411 | 7.93 | 144724 | 9.42 |
| 480-89467-19 | P-01-100814-1120 | 69294 | 6.84 | 263891 | 7.93 | 143234 | 9.42 |
| 480-89467-20 | P-01-013015-0915 | 66386 | 6.84 | 283096 | 7.93 | 126756 | 9.42 |

DCB = 1,4-Dichlorobenzene-d4
NPT = Naphthalene-d8
ANT = Acenaphthene-d10

Area Limit = 50%-200% of internal standard area
RT Limit = ± 0.5 minutes of internal standard RT

# Column used to flag values outside QC limits

FORM VIII 8270D

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Sample No.: CCVIS 480-273999/3 Date Analyzed: 11/10/2015 11:07

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm)

Lab File ID (Standard): V60002.D Heated Purge: (Y/N) N

Calibration ID: 25512

| | | PHN | | CRY | | PRY | |
|---|---|---|---|---|---|---|---|
| | | AREA # | RT # | AREA # | RT # | AREA # | RT # |
| 12/24 HOUR STD | | 351985 | 10.69 | 378577 | 13.60 | 408130 | 15.96 |
| UPPER LIMIT | | 703970 | 11.19 | 757154 | 14.10 | 816260 | 16.46 |
| LOWER LIMIT | | 175993 | 10.19 | 189289 | 13.10 | 204065 | 15.46 |
| LAB SAMPLE ID | CLIENT SAMPLE ID | | | | | | |
| 480-89467-2 | WW-02-030515-1557 | 212495 | 10.69 | 219345 | 13.59 | 249628 | 15.95 |
| 480-89467-5 | WW-01-030515-1352 | 231232 | 10.69 | 235769 | 13.59 | 279373 | 15.95 |
| 480-89467-6 | WW-01-042815-1600 | 217134 | 10.69 | 224964 | 13.59 | 269946 | 15.95 |
| 480-89467-8 | WW-01-050715-1600 | 211369 | 10.69 | 224229 | 13.59 | 257928 | 15.95 |
| 480-89467-10 | P-01-030515-1557 | 204798 | 10.69 | 273051 | 13.59 | 241148 | 15.95 |
| 480-89467-13 | P-01-051315-1530 | 200064 | 10.69 | 210839 | 13.59 | 237649 | 15.95 |
| 480-89467-18 | P-01-101514-0910 | 252292 | 10.69 | 214554 | 13.59 | 252800 | 15.95 |
| 480-89467-19 | P-01-100814-1120 | 261845 | 10.69 | 207719 | 13.59 | 243850 | 15.95 |
| 480-89467-20 | P-01-013015-0915 | 189600 | 10.69 | 201516 | 13.60 | 227966 | 15.95 |

PHN = Phenanthrene-d10
CRY = Chrysene-d12
PRY = Perylene-d12

Area Limit = 50%-200% of internal standard area
RT Limit = ± 0.5 minutes of internal standard RT

# Column used to flag values outside QC limits

FORM VIII 8270D

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Sample No.: CCVIS 480-274392/3 Date Analyzed: 11/11/2015 12:49

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm)

Lab File ID (Standard): V60044.D Heated Purge: (Y/N) N

Calibration ID: 25512

| | | DCB | | NPT | | ANT | |
|---|---|---|---|---|---|---|---|
| | | AREA # | RT # | AREA # | RT # | AREA # | RT # |
| 12/24 HOUR STD | | 119802 | 6.83 | 433077 | 7.91 | 241390 | 9.41 |
| UPPER LIMIT | | 239604 | 7.33 | 866154 | 8.41 | 482780 | 9.91 |
| LOWER LIMIT | | 59901 | 6.33 | 216539 | 7.41 | 120695 | 8.91 |
| LAB SAMPLE ID | CLIENT SAMPLE ID | | | | | | |
| 480-89467-6 DL | WW-01-042815-1600 DL | 103932 | 6.83 | 389223 | 7.91 | 214727 | 9.41 |
| 480-89467-8 DL | WW-01-050715-1600 DL | 98085 | 6.83 | 386503 | 7.91 | 212212 | 9.41 |
| 480-89467-20 DL | F-01-013015-0915 DL | 106085 | 6.83 | 404412 | 7.91 | 219086 | 9.41 |

DCB = 1,4-Dichlorobenzene-d4
NPT = Naphthalene-d8
ANT = Acenaphthene-d10

Area Limit = 50%-200% of internal standard area
RT Limit = ± 0.5 minutes of internal standard RT

# Column used to flag values outside QC limits

FORM VIII 8270D

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Sample No.: CCVIS 480-274392/3 Date Analyzed: 11/11/2015 12:49

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm)

Lab File ID (Standard): V60044.D Heated Purge: (Y/N) N

Calibration ID: 25512

| | | PHN | | CRY | | PRY | |
|---|---|---|---|---|---|---|---|
| | | AREA # | RT # | AREA # | RT # | AREA # | RT # |
| 12/24 HOUR STD | | 432245 | 10.68 | 455083 | 13.59 | 514291 | 15.94 |
| UPPER LIMIT | | 864490 | 11.18 | 910166 | 14.09 | 1028582 | 16.44 |
| LOWER LIMIT | | 216123 | 10.18 | 227542 | 13.09 | 257146 | 15.44 |
| LAB SAMPLE ID | CLIENT SAMPLE ID | | | | | | |
| 480-89467-6 DL | WW-01-042815-1600 DL | 391748 | 10.68 | 356754 | 13.58 | 406441 | 15.94 |
| 480-89467-8 DL | WW-01-050715-1600 DL | 357711 | 10.68 | 400746 | 13.58 | 449730 | 15.94 |
| 480-89467-20 DL | F-01-013015-0915 DL | 393977 | 10.68 | 393209 | 13.58 | 388570 | 15.94 |

PHN = Phenanthrene-d10
CRY = Chrysene-d12
PRY = Perylene-d12

Area Limit = 50%-200% of internal standard area
RT Limit = ± 0.5 minutes of internal standard RT

# Column used to flag values outside QC limits

FORM VIII 8270D

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Sample No.: ICIS 480-270613/5 Date Analyzed: 10/23/2015 09:27

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm)

Lab File ID (Standard): X009013901.D Heated Purge: (Y/N) N

Calibration ID: 25373

| | | DCB | | NPT | | ANT | |
|---|---|---|---|---|---|---|---|
| | | AREA # | RT # | AREA # | RT # | AREA # | RT # |
| INITIAL CALIBRATION MID-POINT | | 424857 | 6.75 | 1528120 | 8.29 | 835698 | 10.38 |
| UPPER LIMIT | | 849714 | 7.25 | 3056240 | 8.79 | 1671796 | 10.88 |
| LOWER LIMIT | | 212429 | 6.25 | 764060 | 7.79 | 417949 | 9.88 |
| LAB SAMPLE ID | CLIENT SAMPLE ID | | | | | | |
| CCVIS 480-273506/3 | | 490767 | 6.83 | 1759373 | 8.35 | 944559 | 10.42 |

DCB = 1,4-Dichlorobenzene-d4
NPT = Naphthalene-d8
ANT = Acenaphthene-d10

Area Limit = 50%-200% of internal standard area
RT Limit = ± 0.5 minutes of internal standard RT

# Column used to flag values outside QC limits

FORM VIII 8270D

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Sample No.: ICIS 480-270613/5 Date Analyzed: 10/23/2015 09:27

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm)

Lab File ID (Standard): X009013901.D Heated Purge: (Y/N) N

Calibration ID: 25373

| | | PHN | | CRY | | PRY | |
|---|---|---|---|---|---|---|---|
| | | AREA # | RT # | AREA # | RT # | AREA # | RT # |
| INITIAL CALIBRATION MID-POINT | | 1333564 | 11.90 | 1449085 | 14.30 | 1412179 | 15.85 |
| UPPER LIMIT | | 2667128 | 12.40 | 2898170 | 14.80 | 2824358 | 16.35 |
| LOWER LIMIT | | 666782 | 11.40 | 724543 | 13.80 | 706090 | 15.35 |
| LAB SAMPLE ID | CLIENT SAMPLE ID | | | | | | |
| CCVIS 480-273506/3 | | 1453807 | 11.94 | 1556266 | 14.34 | 1527454 | 15.91 |

PHN = Phenanthrene-d10
CRY = Chrysene-d12
PRY = Perylene-d12

Area Limit = 50%-200% of internal standard area
RT Limit = ± 0.5 minutes of internal standard RT

# Column used to flag values outside QC limits

FORM VIII 8270D

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Sample No.: CCVIS 480-273506/3 Date Analyzed: 11/05/2015 10:42

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm)

Lab File ID (Standard): X009014095.D Heated Purge: (Y/N) N

Calibration ID: 25463

| | | DCB | | NPT | | ANT | |
|---|---|---|---|---|---|---|---|
| | | AREA # | RT # | AREA # | RT # | AREA # | RT # |
| 12/24 HOUR STD | | 490767 | 6.83 | 1759373 | 8.35 | 944559 | 10.42 |
| UPPER LIMIT | | 981534 | 7.33 | 3518746 | 8.85 | 1889118 | 10.92 |
| LOWER LIMIT | | 245384 | 6.33 | 879687 | 7.85 | 472280 | 9.92 |
| LAB SAMPLE ID | CLIENT SAMPLE ID | | | | | | |
| MB 480-273073/1-A | | 483013 | 6.83 | 1807441 | 8.35 | 973874 | 10.42 |
| LCS 480-273073/2-A | | 417834 | 6.83 | 1510910 | 8.35 | 835337 | 10.42 |
| LCSD 480-273073/3-A | | 451521 | 6.83 | 1633837 | 8.35 | 881871 | 10.42 |
| 480-89467-14 | OS-01-031815-1530 | 385044 | 6.83 | 1415167 | 8.35 | 764597 | 10.42 |
| 480-89467-15 | OS-01-042415-1600 | 355867 | 6.82 | 1295102 | 8.35 | 704107 | 10.42 |
| 480-89467-16 | OS-01-042815-1600 | 393020 | 6.83 | 1443122 | 8.35 | 804100 | 10.42 |
| 480-89467-17 | OS-01-050715-1630 | 428352 | 6.83 | 1553680 | 8.35 | 826628 | 10.41 |
| 480-89467-22 | OS-01-101514-0910 | 387991 | 6.83 | 1402278 | 8.35 | 757710 | 10.42 |

DCB = 1,4-Dichlorobenzene-d4
NPT = Naphthalene-d8
ANT = Acenaphthene-d10

Area Limit = 50%-200% of internal standard area
RT Limit = ± 0.5 minutes of internal standard RT

# Column used to flag values outside QC limits

FORM VIII 8270D

FORM VIII
GC/MS SEMI VOA INTERNAL STANDARD AREA AND RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Sample No.: CCVIS 480-273506/3 | Date Analyzed: 11/05/2015 10:42

Instrument ID: HP5973X | GC Column: RXI-5Sil MS | ID: 0.25(mm)

Lab File ID (Standard): X009014095.D | Heated Purge: (Y/N) N

Calibration ID: 25463

| | | PHN | | CRY | | PRY | |
|---|---|---|---|---|---|---|---|
| | | AREA # | RT # | AREA # | RT # | AREA # | RT # |
| 12/24 HOUR STD | | 1453807 | 11.94 | 1556266 | 14.34 | 1527454 | 15.91 |
| UPPER LIMIT | | 2907614 | 12.44 | 3112532 | 14.84 | 3054908 | 16.41 |
| LOWER LIMIT | | 726904 | 11.44 | 778133 | 13.84 | 763727 | 15.41 |
| LAB SAMPLE ID | CLIENT SAMPLE ID | | | | | | |
| MB 480-273073/1-A | | 1460083 | 11.94 | 1454885 | 14.33 | 1397326 | 15.91 |
| LCS 480-273073/2-A | | 1348050 | 11.94 | 1395791 | 14.34 | 1348683 | 15.91 |
| LCSD 480-273073/3-A | | 1422851 | 11.94 | 1521934 | 14.34 | 1448479 | 15.91 |
| 480-89467-14 | OS-01-031815-1530 | 1237156 | 11.94 | 1365371 | 14.33 | 1358690 | 15.90 |
| 480-89467-15 | OS-01-042415-1600 | 1132128 | 11.94 | 1193478 | 14.34 | 1195008 | 15.91 |
| 480-89467-16 | OS-01-042815-1600 | 1303747 | 11.94 | 1363959 | 14.33 | 1363965 | 15.91 |
| 480-89467-17 | OS-01-050715-1630 | 1336982 | 11.94 | 1424420 | 14.33 | 1371149 | 15.90 |
| 480-89467-22 | OS-01-101514-0910 | 1215806 | 11.94 | 1307001 | 14.33 | 1299277 | 15.91 |

PHN = Phenanthrene-d10
CRY = Chrysene-d12
PRY = Perylene-d12

Area Limit = 50%-200% of internal standard area
RT Limit = ± 0.5 minutes of internal standard RT

# Column used to flag values outside QC limits

FORM VIII 8270D

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-02-030515-1557 | Lab Sample ID: 480-89467-2

Matrix: Water | Lab File ID: V60015.D

Analysis Method: 8270D | Date Collected: 03/05/2015 15:57

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 258(mL) | Date Analyzed: 11/10/2015 17:23

Con. Extract Vol.: 1(mL) | Dilution Factor: 20

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273999 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | ND | H | 97 | 7.9 |
| 208-96-8 | Acenaphthylene | ND | H | 97 | 7.4 |
| 120-12-7 | Anthracene | ND | H | 97 | 5.4 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 97 | 7.0 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 97 | 9.1 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 97 | 6.6 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 97 | 6.8 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 97 | 14 |
| 218-01-9 | Chrysene | ND | H | 97 | 6.4 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 97 | 8.1 |
| 206-44-0 | Fluoranthene | ND | H | 97 | 7.8 |
| 86-73-7 | Fluorene | ND | H | 97 | 7.0 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 97 | 9.1 |
| 91-20-3 | Naphthalene | 34 | J H | 97 | 15 |
| 85-01-8 | Phenanthrene | ND | H | 97 | 8.5 |
| 129-00-0 | Pyrene | ND | H | 97 | 6.6 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 101 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 152 | X | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 76 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-030515-1352 | Lab Sample ID: 480-89467-5

Matrix: Water | Lab File ID: V60016.D

Analysis Method: 8270D | Date Collected: 03/05/2015 13:52

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 258.9(mL) | Date Analyzed: 11/10/2015 17:52

Con. Extract Vol.: 1(mL) | Dilution Factor: 20

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273999 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | ND | H | 97 | 7.9 |
| 208-96-8 | Acenaphthylene | ND | H | 97 | 7.3 |
| 120-12-7 | Anthracene | ND | H | 97 | 5.4 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 97 | 7.0 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 97 | 9.1 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 97 | 6.6 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 97 | 6.8 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 97 | 14 |
| 218-01-9 | Chrysene | ND | H | 97 | 6.4 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 97 | 8.1 |
| 206-44-0 | Fluoranthene | ND | H | 97 | 7.7 |
| 86-73-7 | Fluorene | ND | H | 97 | 7.0 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 97 | 9.1 |
| 91-20-3 | Naphthalene | 15 | J H | 97 | 15 |
| 85-01-8 | Phenanthrene | ND | H | 97 | 8.5 |
| 129-00-0 | Pyrene | ND | H | 97 | 6.6 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 91 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 76 | | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 73 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-042815-1600 | Lab Sample ID: 480-89467-6

Matrix: Water | Lab File ID: V60017.D

Analysis Method: 8270D | Date Collected: 04/28/2015 16:00

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 259.7(mL) | Date Analyzed: 11/10/2015 18:21

Con. Extract Vol.: 1(mL) | Dilution Factor: 20

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273999 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 30 | J H | 96 | 7.9 |
| 208-96-8 | Acenaphthylene | 130 | H | 96 | 7.3 |
| 120-12-7 | Anthracene | 7.4 | J H | 96 | 5.4 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 96 | 6.9 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 96 | 9.0 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 96 | 6.5 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 96 | 6.7 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 96 | 14 |
| 218-01-9 | Chrysene | ND | H | 96 | 6.4 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 96 | 8.1 |
| 206-44-0 | Fluoranthene | ND | H | 96 | 7.7 |
| 86-73-7 | Fluorene | 26 | J H | 96 | 6.9 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 96 | 9.0 |
| *91-20-3* | *Naphthalene* | *1500* | *E H* | *96* | *15* |
| 85-01-8 | Phenanthrene | 24 | J H | 96 | 8.5 |
| 129-00-0 | Pyrene | ND | H | 96 | 6.5 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 106 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 106 | | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 85 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-042815-1600 DL | Lab Sample ID: 480-89467-6 DL

Matrix: Water | Lab File ID: V60046.D

Analysis Method: 8270D | Date Collected: 04/28/2015 16:00

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 259.7(mL) | Date Analyzed: 11/11/2015 13:47

Con. Extract Vol.: 1(mL) | Dilution Factor: 100

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 274392 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 41 | J H | 480 | 39 |
| 208-96-8 | Acenaphthylene | 140 | J H | 480 | 37 |
| 120-12-7 | Anthracene | ND | H | 480 | 27 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 480 | 35 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 480 | 45 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 480 | 33 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 480 | 34 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 480 | 70 |
| 218-01-9 | Chrysene | ND | H | 480 | 32 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 480 | 40 |
| 206-44-0 | Fluoranthene | ND | H | 480 | 39 |
| 86-73-7 | Fluorene | ND | H | 480 | 35 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 480 | 45 |
| 91-20-3 | Naphthalene | 1700 | H | 480 | 73 |
| 85-01-8 | Phenanthrene | ND | H | 480 | 42 |
| 129-00-0 | Pyrene | ND | H | 480 | 33 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 99 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 0 | X | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 104 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-050715-1600 | Lab Sample ID: 480-89467-8

Matrix: Water | Lab File ID: V60018.D

Analysis Method: 8270D | Date Collected: 05/07/2015 16:00

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 259.1(mL) | Date Analyzed: 11/10/2015 18:50

Con. Extract Vol.: 1(mL) | Dilution Factor: 20

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273999 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 64 | J H | 96 | 7.9 |
| 208-96-8 | Acenaphthylene | 210 | H | 96 | 7.3 |
| 120-12-7 | Anthracene | 15 | J H | 96 | 5.4 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 96 | 6.9 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 96 | 9.1 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 96 | 6.6 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 96 | 6.8 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 96 | 14 |
| 218-01-9 | Chrysene | ND | H | 96 | 6.4 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 96 | 8.1 |
| 206-44-0 | Fluoranthene | ND | H | 96 | 7.7 |
| 86-73-7 | Fluorene | 48 | J H | 96 | 6.9 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 96 | 9.1 |
| *91-20-3* | *Naphthalene* | *1700* | *E H* | *96* | *15* |
| 85-01-8 | Phenanthrene | 51 | J H | 96 | 8.5 |
| 129-00-0 | Pyrene | ND | H | 96 | 6.6 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 98 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 0 | X | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 72 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-050715-1600 DL | Lab Sample ID: 480-89467-8 DL

Matrix: Water | Lab File ID: V60047.D

Analysis Method: 8270D | Date Collected: 05/07/2015 16:00

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 259.1(mL) | Date Analyzed: 11/11/2015 14:16

Con. Extract Vol.: 1(mL) | Dilution Factor: 100

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 274392 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 52 | J H | 480 | 40 |
| 208-96-8 | Acenaphthylene | 210 | J H | 480 | 37 |
| 120-12-7 | Anthracene | ND | H | 480 | 27 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 480 | 35 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 480 | 45 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 480 | 33 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 480 | 34 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 480 | 70 |
| 218-01-9 | Chrysene | ND | H | 480 | 32 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 480 | 41 |
| 206-44-0 | Fluoranthene | ND | H | 480 | 39 |
| 86-73-7 | Fluorene | 47 | J H | 480 | 35 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 480 | 45 |
| 91-20-3 | Naphthalene | 1800 | H | 480 | 73 |
| 85-01-8 | Phenanthrene | 49 | J H | 480 | 42 |
| 129-00-0 | Pyrene | ND | H | 480 | 33 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 87 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 0 | X | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 76 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-030515-1557 | Lab Sample ID: 480-89467-10

Matrix: Water | Lab File ID: V60019.D

Analysis Method: 8270D | Date Collected: 03/05/2015 15:57

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 257.5(mL) | Date Analyzed: 11/10/2015 19:19

Con. Extract Vol.: 1(mL) | Dilution Factor: 20

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273999 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | ND | H | 97 | 8.0 |
| 208-96-8 | Acenaphthylene | ND | H | 97 | 7.4 |
| 120-12-7 | Anthracene | ND | H | 97 | 5.4 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 97 | 7.0 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 97 | 9.1 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 97 | 6.6 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 97 | 6.8 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 97 | 14 |
| 218-01-9 | Chrysene | ND | H | 97 | 6.4 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 97 | 8.2 |
| 206-44-0 | Fluoranthene | ND | H | 97 | 7.8 |
| 86-73-7 | Fluorene | ND | H | 97 | 7.0 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 97 | 9.1 |
| 91-20-3 | Naphthalene | 160 | H | 97 | 15 |
| 85-01-8 | Phenanthrene | ND | H | 97 | 8.5 |
| 129-00-0 | Pyrene | ND | H | 97 | 6.6 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 81 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 0 | X | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 67 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1
SDG No.:
Client Sample ID: P-01-051315-1530 | Lab Sample ID: 480-89467-13
Matrix: Water | Lab File ID: V60020.D
Analysis Method: 8270D | Date Collected: 05/13/2015 15:30
Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33
Sample wt/vol: 242.4(mL) | Date Analyzed: 11/10/2015 19:48
Con. Extract Vol.: 1(mL) | Dilution Factor: 20
Injection Volume: 2(uL) | Level: (low/med) Low
% Moisture: | GPC Cleanup:(Y/N) N
Analysis Batch No.: 273999 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | ND | H | 100 | 8.5 |
| 208-96-8 | Acenaphthylene | ND | H | 100 | 7.8 |
| 120-12-7 | Anthracene | ND | H | 100 | 5.8 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 100 | 7.4 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 100 | 9.7 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 100 | 7.0 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 100 | 7.2 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 100 | 15 |
| 218-01-9 | Chrysene | ND | H | 100 | 6.8 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 100 | 8.7 |
| 206-44-0 | Fluoranthene | ND | H | 100 | 8.3 |
| 86-73-7 | Fluorene | ND | H | 100 | 7.4 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 100 | 9.7 |
| 91-20-3 | Naphthalene | 28 | J H | 100 | 16 |
| 85-01-8 | Phenanthrene | ND | H | 100 | 9.1 |
| 129-00-0 | Pyrene | ND | H | 100 | 7.0 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 95 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 0 | X | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 83 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: OS-01-031815-1530 | Lab Sample ID: 480-89467-14

Matrix: Waste | Lab File ID: X009014108.D

Analysis Method: 8270D | Date Collected: 03/18/2015 15:30

Extract. Method: 3580A | Date Extracted: 11/04/2015 13:45

Sample wt/vol: +0.13(g) | Date Analyzed: 11/05/2015 16:34

Con. Extract Vol.: 1(mL) | Dilution Factor: 100

Injection Volume: 1(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273506 | Units: ug/Kg

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 430000 | H | 260000 | 3100 |
| 208-96-8 | Acenaphthylene | 930000 | H | 260000 | 2200 |
| 120-12-7 | Anthracene | ND | H | 260000 | 6600 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 260000 | 4500 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 260000 | 6300 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 260000 | 5100 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 260000 | 3100 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 260000 | 2900 |
| 218-01-9 | Chrysene | ND | H | 260000 | 2600 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 260000 | 3100 |
| 206-44-0 | Fluoranthene | 400000 | H | 260000 | 3700 |
| 86-73-7 | Fluorene | 770000 | H | 260000 | 6000 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 260000 | 7200 |
| 91-20-3 | Naphthalene | 2300000 | H | 260000 | 4300 |
| 85-01-8 | Phenanthrene | 270000 | H | 260000 | 5400 |
| 129-00-0 | Pyrene | 560000 | H | 260000 | 1700 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 94 | | 37-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 65 | | 34-132 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 94 | | 65-153 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1
SDG No.:
Client Sample ID: OS-01-042415-1600 | Lab Sample ID: 480-89467-15
Matrix: Waste | Lab File ID: X009014109.D
Analysis Method: 8270D | Date Collected: 04/24/2015 16:00
Extract. Method: 3580A | Date Extracted: 11/04/2015 13:45
Sample wt/vol: +0.11(g) | Date Analyzed: 11/05/2015 17:01
Con. Extract Vol.: 1(mL) | Dilution Factor: 10
Injection Volume: 1(uL) | Level: (low/med) Low
% Moisture: | GPC Cleanup:(Y/N) N
Analysis Batch No.: 273506 | Units: ug/Kg

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 390000 | H | 31000 | 360 |
| 208-96-8 | Acenaphthylene | 1400000 | H | 31000 | 250 |
| 120-12-7 | Anthracene | 230000 | H | 31000 | 780 |
| 56-55-3 | Benzo[a]anthracene | 150000 | H | 31000 | 530 |
| 50-32-8 | Benzo[a]pyrene | 96000 | H | 31000 | 750 |
| 205-99-2 | Benzo[b]fluoranthene | 34000 | H | 31000 | 600 |
| 191-24-2 | Benzo[g,h,i]perylene | 62000 | H | 31000 | 360 |
| 207-08-9 | Benzo[k]fluoranthene | 82000 | H | 31000 | 350 |
| 218-01-9 | Chrysene | 140000 | H | 31000 | 310 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 31000 | 360 |
| 206-44-0 | Fluoranthene | 410000 | H | 31000 | 440 |
| 86-73-7 | Fluorene | 590000 | H | 31000 | 710 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | 42000 | H | 31000 | 850 |
| 91-20-3 | Naphthalene | 3600000 | H | 31000 | 510 |
| 85-01-8 | Phenanthrene | 1200000 | H | 31000 | 640 |
| 129-00-0 | Pyrene | 580000 | H | 31000 | 200 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 102 | | 37-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 88 | | 34-132 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 101 | | 65-153 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: OS-01-042815-1600 | Lab Sample ID: 480-89467-16

Matrix: Waste | Lab File ID: X009014110.D

Analysis Method: 8270D | Date Collected: 04/28/2015 16:00

Extract. Method: 3580A | Date Extracted: 11/04/2015 13:45

Sample wt/vol: +0.12(g) | Date Analyzed: 11/05/2015 17:28

Con. Extract Vol.: 1(mL) | Dilution Factor: 200

Injection Volume: 1(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273506 | Units: ug/Kg

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 220000 | J H | 570000 | 6700 |
| 208-96-8 | Acenaphthylene | 610000 | H | 570000 | 4700 |
| 120-12-7 | Anthracene | ND | H | 570000 | 14000 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 570000 | 9700 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 570000 | 14000 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 570000 | 11000 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 570000 | 6700 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 570000 | 6300 |
| 218-01-9 | Chrysene | ND | H | 570000 | 5700 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 570000 | 6700 |
| 206-44-0 | Fluoranthene | 270000 | J H | 570000 | 8000 |
| 86-73-7 | Fluorene | 420000 | J H | 570000 | 13000 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 570000 | 16000 |
| 91-20-3 | Naphthalene | 1100000 | H | 570000 | 9300 |
| 85-01-8 | Phenanthrene | ND | H | 570000 | 12000 |
| 129-00-0 | Pyrene | 450000 | J H | 570000 | 3700 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 83 | | 37-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 0 | X | 34-132 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 81 | | 65-153 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: OS-01-050715-1630 | Lab Sample ID: 480-89467-17

Matrix: Waste | Lab File ID: X009014111.D

Analysis Method: 8270D | Date Collected: 05/07/2015 16:30

Extract. Method: 3580A | Date Extracted: 11/04/2015 13:45

Sample wt/vol: +0.12(g) | Date Analyzed: 11/05/2015 17:55

Con. Extract Vol.: 1(mL) | Dilution Factor: 100

Injection Volume: 1(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273506 | Units: ug/Kg

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | ND | H | 280000 | 3300 |
| 208-96-8 | Acenaphthylene | 980000 | H | 280000 | 2300 |
| 120-12-7 | Anthracene | ND | H | 280000 | 7200 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 280000 | 4800 |
| 50-32-8 | Benzo[a]pyrene | 120000 | J H | 280000 | 6800 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 280000 | 5500 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 280000 | 3300 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 280000 | 3200 |
| 218-01-9 | Chrysene | 170000 | J H | 280000 | 2800 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 280000 | 3300 |
| 206-44-0 | Fluoranthene | 610000 | H | 280000 | 4000 |
| 86-73-7 | Fluorene | 590000 | H | 280000 | 6500 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 280000 | 7800 |
| 91-20-3 | Naphthalene | 1200000 | H | 280000 | 4700 |
| 85-01-8 | Phenanthrene | 410000 | H | 280000 | 5800 |
| 129-00-0 | Pyrene | 750000 | H | 280000 | 1800 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 97 | | 37-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 94 | | 34-132 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 103 | | 65-153 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-101514-0910 | Lab Sample ID: 480-89467-18

Matrix: Water | Lab File ID: V60021.D

Analysis Method: 8270D | Date Collected: 10/15/2014 09:10

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 267(mL) | Date Analyzed: 11/10/2015 20:17

Con. Extract Vol.: 1(mL) | Dilution Factor: 20

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273999 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | ND | H | 94 | 7.7 |
| 208-96-8 | Acenaphthylene | ND | H | 94 | 7.1 |
| 120-12-7 | Anthracene | ND | H | 94 | 5.2 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 94 | 6.7 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 94 | 8.8 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 94 | 6.4 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 94 | 6.6 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 94 | 14 |
| 218-01-9 | Chrysene | ND | H | 94 | 6.2 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 94 | 7.9 |
| 206-44-0 | Fluoranthene | ND | H | 94 | 7.5 |
| 86-73-7 | Fluorene | ND | H | 94 | 6.7 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 94 | 8.8 |
| 91-20-3 | Naphthalene | 20 | J H | 94 | 14 |
| 85-01-8 | Phenanthrene | ND | H | 94 | 8.2 |
| 129-00-0 | Pyrene | ND | H | 94 | 6.4 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 93 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 0 | X | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 74 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-100814-1120 | Lab Sample ID: 480-89467-19

Matrix: Water | Lab File ID: V60022.D

Analysis Method: 8270D | Date Collected: 10/08/2014 11:20

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 257.5(mL) | Date Analyzed: 11/10/2015 20:46

Con. Extract Vol.: 1(mL) | Dilution Factor: 20

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273999 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | ND | H | 97 | 8.0 |
| 208-96-8 | Acenaphthylene | ND | H | 97 | 7.4 |
| 120-12-7 | Anthracene | ND | H | 97 | 5.4 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 97 | 7.0 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 97 | 9.1 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 97 | 6.6 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 97 | 6.8 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 97 | 14 |
| 218-01-9 | Chrysene | ND | H | 97 | 6.4 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 97 | 8.2 |
| 206-44-0 | Fluoranthene | ND | H | 97 | 7.8 |
| 86-73-7 | Fluorene | ND | H | 97 | 7.0 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 97 | 9.1 |
| 91-20-3 | Naphthalene | 18 | J H | 97 | 15 |
| 85-01-8 | Phenanthrene | ND | H | 97 | 8.5 |
| 129-00-0 | Pyrene | ND | H | 97 | 6.6 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 94 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 0 | X | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 98 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-013015-0915 | Lab Sample ID: 480-89467-20

Matrix: Water | Lab File ID: V60023.D

Analysis Method: 8270D | Date Collected: 01/30/2015 09:15

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 255.5(mL) | Date Analyzed: 11/10/2015 21:15

Con. Extract Vol.: 1(mL) | Dilution Factor: 20

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273999 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 17 | J H | 98 | 8.0 |
| 208-96-8 | Acenaphthylene | 140 | H | 98 | 7.4 |
| 120-12-7 | Anthracene | 11 | J H | 98 | 5.5 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 98 | 7.0 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 98 | 9.2 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 98 | 6.7 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 98 | 6.8 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 98 | 14 |
| 218-01-9 | Chrysene | ND | H | 98 | 6.5 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 98 | 8.2 |
| 206-44-0 | Fluoranthene | 9.7 | J H | 98 | 7.8 |
| 86-73-7 | Fluorene | 26 | J H | 98 | 7.0 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 98 | 9.2 |
| *91-20-3* | *Naphthalene* | *1400* | *E H* | *98* | *15* |
| 85-01-8 | Phenanthrene | 33 | J H | 98 | 8.6 |
| 129-00-0 | Pyrene | ND | H | 98 | 6.7 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 118 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 0 | X | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 65 | X | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-013015-0915 DL | Lab Sample ID: 480-89467-20 DL

Matrix: Water | Lab File ID: V60048.D

Analysis Method: 8270D | Date Collected: 01/30/2015 09:15

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 255.5(mL) | Date Analyzed: 11/11/2015 14:45

Con. Extract Vol.: 1(mL) | Dilution Factor: 100

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 274392 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | ND | H | 490 | 40 |
| 208-96-8 | Acenaphthylene | 140 | J H | 490 | 37 |
| 120-12-7 | Anthracene | ND | H | 490 | 27 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 490 | 35 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 490 | 46 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 490 | 33 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 490 | 34 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 490 | 71 |
| 218-01-9 | Chrysene | ND | H | 490 | 32 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 490 | 41 |
| 206-44-0 | Fluoranthene | ND | H | 490 | 39 |
| 86-73-7 | Fluorene | ND | H | 490 | 35 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 490 | 46 |
| 91-20-3 | Naphthalene | 1600 | H | 490 | 74 |
| 85-01-8 | Phenanthrene | ND | H | 490 | 43 |
| 129-00-0 | Pyrene | ND | H | 490 | 33 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 89 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 0 | X | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 72 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: OS-01-101514-0910 | Lab Sample ID: 480-89467-22

Matrix: Waste | Lab File ID: X009014112.D

Analysis Method: 8270D | Date Collected: 10/15/2014 09:10

Extract. Method: 3580A | Date Extracted: 11/04/2015 13:45

Sample wt/vol: +0.13(g) | Date Analyzed: 11/05/2015 18:21

Con. Extract Vol.: 1(mL) | Dilution Factor: 100

Injection Volume: 1(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273506 | Units: ug/Kg

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | ND | H | 260000 | 3100 |
| 208-96-8 | Acenaphthylene | 470000 | H | 260000 | 2200 |
| 120-12-7 | Anthracene | ND | H | 260000 | 6600 |
| 56-55-3 | Benzo[a]anthracene | ND | H | 260000 | 4500 |
| 50-32-8 | Benzo[a]pyrene | ND | H | 260000 | 6300 |
| 205-99-2 | Benzo[b]fluoranthene | ND | H | 260000 | 5100 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | H | 260000 | 3100 |
| 207-08-9 | Benzo[k]fluoranthene | ND | H | 260000 | 2900 |
| 218-01-9 | Chrysene | ND | H | 260000 | 2600 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | H | 260000 | 3100 |
| 206-44-0 | Fluoranthene | 190000 | J H | 260000 | 3700 |
| 86-73-7 | Fluorene | 300000 | H | 260000 | 6000 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | H | 260000 | 7200 |
| 91-20-3 | Naphthalene | 1200000 | H | 260000 | 4300 |
| 85-01-8 | Phenanthrene | ND | H | 260000 | 5400 |
| 129-00-0 | Pyrene | 200000 | J H | 260000 | 1700 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 73 | | 37-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 0 | X | 34-132 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 78 | | 65-153 |

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 271208

SDG No.:

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/26/2015 19:36 Calibration End Date: 10/26/2015 22:31 Calibration ID: 25393

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | IC 480-271208/3 | V53780.D |
| Level 2 | IC 480-271208/4 | V53781.D |
| Level 3 | IC 480-271208/5 | V53782.D |
| Level 4 | ICIS 480-271208/6 | V53783.D |
| Level 5 | IC 480-271208/7 | V53784.D |
| Level 6 | IC 480-271208/8 | V53785.D |
| Level 7 | IC 480-271208/9 | V53786.D |

| ANALYTE | RRF | | | | | CURVE TYPE | COEFFICIENT | | | # | MIN RRF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 | | B | M1 | M2 | | | | | | | | |
| 1,4-Dioxane | 0.3775<br>0.4763 | 0.4213<br>0.4634 | 0.4886 | 0.4715 | 0.4825 | Lin1 | -0.025 | 0.4762 | | | | | | | 0.9990 | | 0.9900 |
| N-Nitrosodimethylamine | 0.6628<br>0.7386 | 0.6936<br>0.7210 | 0.7798 | 0.7550 | 0.7559 | Lin1 | -0.014 | 0.7415 | | | | | | | 0.9990 | | 0.9900 |
| Pyridine | 1.2747<br>1.4101 | 1.3568<br>1.3999 | 1.4288 | 1.3944 | 1.4241 | Ave | | 1.3841 | | | | 3.9 | | 20.0 | | | |
| Benzaldehyde | 0.4532<br>0.7891 | 0.3607<br>0.7631 | 0.8670 | 0.3938 | 0.8068 | Lin1 | -0.146 | 0.7600 | | | 0.0100 | | | | 0.9630 | * | 0.9900 |
| Phenol | 1.4516<br>1.4833 | 1.4021<br>1.4417 | 1.5874 | 1.4960 | 1.5124 | Ave | | 1.4831 | | | 0.8000 | 4.0 | | 20.0 | | | |
| Aniline | 1.8918<br>1.8954 | 1.8214<br>1.8415 | 1.9675 | 1.9788 | 1.9356 | Ave | | 1.9046 | | | | 3.1 | | 20.0 | | | |
| Bis(2-chloroethyl)ether | 1.2152<br>1.2930 | 1.2554<br>1.3124 | 1.3652 | 1.2467 | 1.2937 | Ave | | 1.2831 | | | 0.7000 | 3.8 | | 20.0 | | | |
| 2-Chlorophenol | 1.1934<br>1.3193 | 1.2780<br>1.2875 | 1.3535 | 1.3206 | 1.3298 | Lin1 | -0.020 | 1.3152 | | | 0.8000 | | | | 1.0000 | | 0.9900 |
| n-Decane | 2.1071<br>1.9085 | 1.9483<br>1.8376 | 2.1006 | 2.0259 | 1.9726 | Ave | | 1.9858 | | | 0.0100 | 8.0 | | 20.0 | | | |
| 1,3-Dichlorobenzene | 1.4091<br>1.4477 | 1.4128<br>1.4500 | 1.5074 | 1.4749 | 1.4740 | Ave | | 1.4537 | | | | 2.4 | | 20.0 | | | |
| 1,4-Dichlorobenzene | 1.4798<br>1.5004 | 1.4688<br>1.4674 | 1.5513 | 1.5069 | 1.5195 | Ave | | 1.4991 | | | | 2.0 | | 20.0 | | | |
| Benzyl alcohol | 0.7999<br>0.8411 | 0.8058<br>0.8244 | 0.8989 | 0.8583 | 0.8769 | Ave | | 0.8436 | | | | 4.4 | | 20.0 | | | |
| 1,2-Dichlorobenzene | 1.4478<br>1.4053 | 1.3348<br>1.3835 | 1.4546 | 1.4102 | 1.4132 | Ave | | 1.4071 | | | | 2.9 | | 20.0 | | | |
| 2-Methylphenol | 1.0946<br>1.1616 | 1.0774<br>1.1509 | 1.2065 | 1.1840 | 1.2053 | Ave | | 1.1543 | | | 0.7000 | 4.4 | | 20.0 | | | |

Note: The m1 coefficient is the same as Ave RRF for an Ave curve type.

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 271208

SDG No.:

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/26/2015 19:36 Calibration End Date: 10/26/2015 22:31 Calibration ID: 25393

| ANALYTE | RRF | | | | | CURVE TYPE | COEFFICIENT | | | # | MIN RRF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 | | B | M1 | M2 | | | | | | | | |
| bis (2-chloroisopropyl) ether | 2.7527<br>2.4947 | 2.5470<br>2.4041 | 2.6990 | 2.6270 | 2.5671 | Ave | | 2.5845 | | | 0.0100 | 4.6 | | 20.0 | | | |
| Indene | 0.6186<br>0.6102 | 0.5902<br>0.6056 | 0.6272 | 0.6094 | 0.6159 | Ave | | 0.6110 | | | | 1.9 | | 20.0 | | | |
| 4-Methylphenol | 1.1285<br>1.1861 | 1.1487<br>1.1624 | 1.2658 | 1.2188 | 1.2325 | Ave | | 1.1918 | | | 0.6000 | 4.1 | | 20.0 | | | |
| N-Nitrosodi-n-propylamine | 0.7613<br>0.7851 | 0.8176<br>0.7913 | 0.8595 | 0.7998 | 0.7895 | Ave | | 0.8006 | | | 0.5000 | 3.9 | | 20.0 | | | |
| Acetophenone | 1.6644<br>1.6269 | 1.6427<br>1.5869 | 1.7893 | 1.7004 | 1.6851 | Ave | | 1.6708 | | | 0.0100 | 3.9 | | 20.0 | | | |
| Hexachloroethane | 0.5706<br>0.6062 | 0.5637<br>0.5926 | 0.6228 | 0.6072 | 0.6201 | Ave | | 0.5976 | | | 0.3000 | 3.9 | | 20.0 | | | |
| Nitrobenzene | 0.3310<br>0.3497 | 0.3125<br>0.3486 | 0.3484 | 0.3356 | 0.3493 | Ave | | 0.3393 | | | 0.2000 | 4.1 | | 20.0 | | | |
| Isophorone | 0.5929<br>0.6120 | 0.5302<br>0.6118 | 0.5603 | 0.5366 | 0.6011 | Ave | | 0.5778 | | | 0.4000 | 6.1 | | 20.0 | | | |
| 2,4-Dimethylphenol | 0.3193<br>0.3287 | 0.3144<br>0.3333 | 0.3507 | 0.3259 | 0.3328 | Ave | | 0.3293 | | | 0.2000 | 3.6 | | 20.0 | | | |
| 2-Nitrophenol | 0.1602<br>0.2035 | 0.1708<br>0.2008 | 0.2009 | 0.1948 | 0.2032 | Lin1 | -0.014 | 0.2030 | | | 0.1000 | | | | 1.0000 | | 0.9900 |
| Benzoic acid | +++++<br>0.2722 | 0.1617<br>0.2793 | 0.2117 | 0.2402 | 0.2655 | Lin1 | -0.138 | 0.2856 | | | | | | | 0.9990 | | 0.9900 |
| Bis(2-chloroethoxy)methane | 0.4034<br>0.3659 | 0.3682<br>0.3620 | 0.4032 | 0.3636 | 0.3745 | Ave | | 0.3772 | | | 0.3000 | 4.8 | | 20.0 | | | |
| 2,4-Dichlorophenol | 0.2717<br>0.2898 | 0.2693<br>0.2906 | 0.3030 | 0.2853 | 0.2901 | Ave | | 0.2857 | | | 0.2000 | 4.1 | | 20.0 | | | |
| 1,2,4-Trichlorobenzene | 0.3319<br>0.3350 | 0.3211<br>0.3324 | 0.3365 | 0.3252 | 0.3380 | Ave | | 0.3314 | | | | 1.9 | | 20.0 | | | |
| Naphthalene | 1.0739<br>0.9997 | 1.0099<br>0.9651 | 1.0661 | 1.0144 | 1.0173 | Ave | | 1.0209 | | | 0.7000 | 3.7 | | 20.0 | | | |
| 4-Chloroaniline | 0.5391<br>0.5673 | 0.5112<br>0.5679 | 0.5546 | 0.5350 | 0.5690 | Ave | | 0.5492 | | | 0.0100 | 4.0 | | 20.0 | | | |
| 2,6-Dichlorophenol | 0.2887<br>0.2860 | 0.2768<br>0.2898 | 0.2942 | 0.2864 | 0.2896 | Ave | | 0.2874 | | | | 1.9 | | 20.0 | | | |
| Hexachlorobutadiene | 0.1934<br>0.2012 | 0.1841<br>0.2021 | 0.1990 | 0.1926 | 0.2008 | Ave | | 0.1962 | | | 0.0100 | 3.3 | | 20.0 | | | |
| Caprolactam | 0.0718<br>0.1227 | 0.0902<br>0.1226 | 0.1073 | 0.1059 | 0.1208 | Lin1 | -0.018 | 0.1219 | | | 0.0100 | | | | 0.9980 | | 0.9900 |
| 4-Chloro-3-methylphenol | 0.2458<br>0.3012 | 0.2461<br>0.2987 | 0.2797 | 0.2823 | 0.2958 | Ave | | 0.2785 | | | 0.2000 | 8.5 | | 20.0 | | | |

Note: The m1 coefficient is the same as Ave RRF for an Ave curve type.



609

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 271208

SDG No.:

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/26/2015 19:36 Calibration End Date: 10/26/2015 22:31 Calibration ID: 25393

| ANALYTE | RRF | | | | | CURVE TYPE | COEFFICIENT | | | # | MIN RRF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 | | B | M1 | M2 | | | | | | | | |
| 2-Methylnaphthalene | 0.7080<br>0.6770 | 0.6594<br>0.6794 | 0.7230 | 0.6647 | 0.6908 | Ave | | 0.6860 | | | 0.4000 | 3.3 | | 20.0 | | | |
| 1-Methylnaphthalene | 0.6591<br>0.6268 | 0.6142<br>0.6266 | 0.6639 | 0.6112 | 0.6388 | Ave | | 0.6344 | | | 0.0100 | 3.3 | | 20.0 | | | |
| Hexachlorocyclopentadiene | 0.3763<br>0.4523 | 0.4230<br>0.4486 | 0.4599 | 0.4370 | 0.4466 | Lin1 | -0.018 | 0.4508 | | | 0.0500 | | | | 1.0000 | | 0.9900 |
| 1,2,4,5-Tetrachlorobenzene | 0.5750<br>0.5746 | 0.5591<br>0.5713 | 0.5804 | 0.5487 | 0.5547 | Ave | | 0.5662 | | | 0.0100 | 2.1 | | 20.0 | | | |
| 2,4,6-Trichlorophenol | 0.3404<br>0.4107 | 0.3497<br>0.4055 | 0.3730 | 0.3929 | 0.3933 | Ave | | 0.3808 | | | 0.2000 | 7.2 | | 20.0 | | | |
| 2,4,5-Trichlorophenol | 0.3778<br>0.4228 | 0.3521<br>0.4213 | 0.4163 | 0.4059 | 0.4135 | Ave | | 0.4014 | | | 0.2000 | 6.6 | | 20.0 | | | |
| Biphenyl | 1.5910<br>1.5121 | 1.5272<br>1.4696 | 1.5337 | 1.4864 | 1.4805 | Ave | | 1.5129 | | | 0.0100 | 2.9 | | 20.0 | | | |
| 2-Chloronaphthalene | 1.2530<br>1.1661 | 1.1469<br>1.1344 | 1.1903 | 1.1238 | 1.1262 | Ave | | 1.1630 | | | 0.8000 | 4.0 | | 20.0 | | | |
| 2-Nitroaniline | 0.2868<br>0.3853 | 0.3330<br>0.3807 | 0.3645 | 0.3591 | 0.3700 | Lin1 | -0.030 | 0.3802 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| Dimethyl phthalate | 1.2889<br>1.2964 | 1.3021<br>1.2763 | 1.3555 | 1.3127 | 1.2868 | Ave | | 1.3027 | | | 0.0100 | 2.0 | | 20.0 | | | |
| 1,3-Dinitrobenzene | 0.0958<br>0.1434 | 0.1077<br>0.1435 | 0.1273 | 0.1303 | 0.1402 | Lin1 | -0.018 | 0.1424 | | | | | | | 0.9980 | | 0.9900 |
| 2,6-Dinitrotoluene | 0.2482<br>0.3292 | 0.3023<br>0.3262 | 0.3110 | 0.3147 | 0.3128 | Lin1 | -0.021 | 0.3249 | | | | | | | 1.0000 | | 0.9900 |
| Acenaphthylene | 1.8555<br>1.8575 | 1.7911<br>1.7851 | 1.9428 | 1.9227 | 1.8372 | Ave | | 1.8560 | | | 0.9000 | 3.2 | | 20.0 | | | |
| 3-Nitroaniline | 0.3114<br>0.3828 | 0.3223<br>0.3744 | 0.3777 | 0.3623 | 0.3696 | Lin1 | -0.023 | 0.3770 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| 2,4-Dinitrophenol | 0.1173<br>0.2267 | 0.1520<br>0.2283 | 0.1837 | 0.1966 | 0.2115 | Lin1 | -0.082 | 0.2233 | | | 0.0100 | | | | 0.9960 | | 0.9900 |
| 4-Nitrophenol | 0.1430<br>0.1785 | 0.1667<br>0.1797 | 0.1705 | 0.1699 | 0.1755 | Lin1 | -0.021 | 0.1783 | | | 0.0100 | | | | 1.0000 | | 0.9900 |
| Acenaphthene | 1.2310<br>1.1733 | 1.1869<br>1.1508 | 1.2377 | 1.2086 | 1.1684 | Ave | | 1.1891 | | | 0.9000 | 3.0 | | 20.0 | | | |
| 2,4-Dinitrotoluene | 0.3165<br>0.4322 | 0.3763<br>0.4320 | 0.4204 | 0.4149 | 0.4179 | Lin1 | -0.034 | 0.4306 | | | 0.2000 | | | | 1.0000 | | 0.9900 |
| Dibenzofuran | 1.6437<br>1.6427 | 1.6900<br>1.5691 | 1.7801 | 1.6980 | 1.6229 | Ave | | 1.6638 | | | 0.8000 | 4.0 | | 20.0 | | | |
| 2,3,4,6-Tetrachlorophenol | 0.2718<br>0.3612 | 0.3012<br>0.3529 | 0.3312 | 0.3408 | 0.3443 | Lin1 | -0.029 | 0.3544 | | | 0.0100 | | | | 0.9990 | | 0.9900 |

Note: The m1 coefficient is the same as Ave RRF for an Ave curve type.

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 271208

SDG No.:

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/26/2015 19:36 Calibration End Date: 10/26/2015 22:31 Calibration ID: 25393

| ANALYTE | RRF | | | | | CURVE TYPE | COEFFICIENT | | | # | MIN RRF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 | | B | M1 | M2 | | | | | | | | |
| Hexadecane | 0.7009<br>0.6265 | 0.6560<br>0.6219 | 0.7002 | 0.6832 | 0.6552 | Ave | | 0.6634 | | | 0.0100 | 4.9 | | 20.0 | | | |
| Diethyl phthalate | 8.0204<br>1.5147 | 3.0531<br>1.4308 | 2.2545 | 1.7269 | 1.5136 | Lin1 | 1.7014 | 1.3152 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| 4-Chlorophenyl phenyl ether | 0.6548<br>0.6746 | 0.6608<br>0.6686 | 0.6971 | 0.6553 | 0.6608 | Ave | | 0.6674 | | | 0.4000 | 2.2 | | 20.0 | | | |
| 4-Nitroaniline | 0.2584<br>0.3756 | 0.3103<br>0.3677 | 0.3481 | 0.3537 | 0.3603 | Lin1 | -0.036 | 0.3701 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| Fluorene | 1.3728<br>1.3781 | 1.3818<br>1.3346 | 1.4635 | 1.3955 | 1.3618 | Ave | | 1.3840 | | | 0.9000 | 2.9 | | 20.0 | | | |
| 4,6-Dinitro-2-methylphenol | 0.0854<br>0.1543 | 0.1099<br>0.1604 | 0.1322 | 0.1413 | 0.1517 | Lin1 | -0.053 | 0.1565 | | | 0.0100 | | | | 0.9980 | | 0.9900 |
| Diphenylamine | 0.6598<br>0.6266 | 0.6540<br>0.6278 | 0.7036 | 0.6765 | 0.6502 | Ave | | 0.6569 | | | | 4.1 | | 20.0 | | | |
| N-Nitrosodiphenylamine | 0.5642<br>0.5357 | 0.5592<br>0.5368 | 0.6016 | 0.5784 | 0.5559 | Ave | | 0.5617 | | | 0.0100 | 4.1 | | 20.0 | | | |
| 1,2-Diphenylhydrazine | 0.6856<br>0.7027 | 0.6982<br>0.7060 | 0.7467 | 0.7108 | 0.7178 | Ave | | 0.7097 | | | | 2.7 | | 20.0 | | | |
| trans-Azobenzene | 0.6856<br>0.7027 | 0.6982<br>0.7060 | 0.7467 | 0.7108 | 0.7178 | Ave | | 0.7097 | | | | 2.7 | | 20.0 | | | |
| 4-Bromophenyl phenyl ether | 0.2432<br>0.2499 | 0.2367<br>0.2527 | 0.2507 | 0.2492 | 0.2506 | Ave | | 0.2476 | | | 0.1000 | 2.3 | | 20.0 | | | |
| Atrazine | 0.3153<br>0.3705 | 0.3613<br>0.3692 | 0.3862 | 0.3653 | 0.3722 | Lin1 | -0.011 | 0.3721 | | | 0.0100 | | | | 1.0000 | | 0.9900 |
| Hexachlorobenzene | 0.2911<br>0.2922 | 0.2739<br>0.2961 | 0.2891 | 0.2881 | 0.2914 | Ave | | 0.2903 | | | 0.1000 | 2.8 | | 20.0 | | | |
| n-Octadecane | 0.6521<br>0.6386 | 0.6556<br>0.6409 | 0.6844 | 0.6694 | 0.6545 | Ave | | 0.6565 | | | 0.0100 | 2.4 | | 20.0 | | | |
| Pentachlorophenol | 0.1192<br>0.1868 | 0.1489<br>0.1913 | 0.1735 | 0.1781 | 0.1864 | Lin1 | -0.047 | 0.1894 | | | 0.0500 | | | | 0.9990 | | 0.9900 |
| Phenanthrene | 1.1237<br>1.0419 | 1.0779<br>1.0530 | 1.1492 | 1.1057 | 1.0790 | Ave | | 1.0901 | | | 0.7000 | 3.5 | | 20.0 | | | |
| Anthracene | 1.0820<br>1.0428 | 1.0650<br>1.0478 | 1.1356 | 1.1089 | 1.0798 | Ave | | 1.0803 | | | 0.7000 | 3.1 | | 20.0 | | | |
| Carbazole | 1.0205<br>0.9974 | 1.0300<br>1.0016 | 1.0826 | 1.0514 | 1.0178 | Ave | | 1.0288 | | | 0.0100 | 2.9 | | 20.0 | | | |
| Di-n-butyl phthalate | 1.7833<br>1.2692 | 1.4141<br>1.2454 | 1.4880 | 1.4164 | 1.3896 | Lin1 | 0.1574 | 1.2818 | | | 0.0100 | | | | 0.9970 | | 0.9900 |
| Fluoranthene | 1.1776<br>1.1750 | 1.1727<br>1.1702 | 1.2620 | 1.2256 | 1.2134 | Ave | | 1.1995 | | | 0.6000 | 2.9 | | 20.0 | | | |

Note: The m1 coefficient is the same as Ave RRF for an Ave curve type.

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 271208

SDG No.:

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/26/2015 19:36 Calibration End Date: 10/26/2015 22:31 Calibration ID: 25393

| ANALYTE | RRF | | | | | CURVE TYPE | COEFFICIENT | | | # | MIN RRF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 | | B | M1 | M2 | | | | | | | | |
| Benzidine | 0.2319<br>0.6612 | 0.2730<br>0.6581 | 0.5785 | 0.3668 | 0.6659 | Lin1 | -0.179 | 0.6454 | | | | | | | 0.9750 | * | 0.9900 |
| Pyrene | 1.1991<br>1.2248 | 1.1917<br>1.1873 | 1.2868 | 1.2643 | 1.2285 | Ave | | 1.2261 | | | 0.6000 | 3.1 | | 20.0 | | | |
| Butyl benzyl phthalate | 0.5153<br>0.6192 | 0.5359<br>0.6136 | 0.6066 | 0.6148 | 0.6228 | Lin1 | -0.036 | 0.6208 | | | 0.0100 | | | | 1.0000 | | 0.9900 |
| Bis(2-ethylhexyl) phthalate | 0.7695<br>0.8746 | 0.7782<br>0.9600 | 0.8699 | 0.8760 | 0.8817 | Lin1 | -0.035 | 0.8746 | | | 0.0100 | | | | 1.0000 | | 0.9900 |
| 3,3'-Dichlorobenzidine | 0.3526<br>0.4643 | 0.3770<br>0.4638 | 0.4480 | 0.4110 | 0.4584 | Lin1 | -0.042 | 0.4610 | | | 0.0100 | | | | 0.9980 | | 0.9900 |
| Benzo[a]anthracene | 1.0802<br>1.1318 | 1.0831<br>1.1139 | 1.1611 | 1.1444 | 1.1442 | Ave | | 1.1227 | | | 0.8000 | 2.8 | | 20.0 | | | |
| Chrysene | 1.0492<br>1.0587 | 1.0277<br>1.0500 | 1.0946 | 1.0907 | 1.0697 | Ave | | 1.0629 | | | 0.7000 | 2.3 | | 20.0 | | | |
| Di-n-octyl phthalate | 1.1459<br>1.4826 | 1.2654<br>1.4382 | 1.4285 | 1.4829 | 1.4845 | Lin1 | -0.100 | 1.4766 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| Benzo[b]fluoranthene | 1.0161<br>1.1370 | 1.0528<br>1.1723 | 1.1270 | 1.1470 | 1.1369 | Lin1 | -0.049 | 1.1550 | | | 0.7000 | | | | 1.0000 | | 0.9900 |
| Benzo[k]fluoranthene | 1.0424<br>1.1629 | 1.0991<br>1.1240 | 1.1845 | 1.1570 | 1.1508 | Lin1 | -0.021 | 1.1497 | | | 0.7000 | | | | 1.0000 | | 0.9900 |
| Benzo[a]pyrene | 0.9285<br>1.0986 | 0.9895<br>1.1082 | 1.0841 | 1.0920 | 1.1019 | Lin1 | -0.058 | 1.1077 | | | 0.7000 | | | | 1.0000 | | 0.9900 |
| Indeno[1,2,3-cd]pyrene | 1.0883<br>1.2725 | 1.1741<br>1.2734 | 1.2423 | 1.2523 | 1.2688 | Lin1 | -0.059 | 1.2753 | | | 0.5000 | | | | 1.0000 | | 0.9900 |
| Dibenz(a,h)anthracene | 0.9076<br>1.0924 | 1.0050<br>1.0978 | 1.0746 | 1.0725 | 1.0861 | Lin1 | -0.056 | 1.0967 | | | | | | | 1.0000 | | 0.9900 |
| Benzo[g,h,i]perylene | 0.9193<br>0.9881 | 0.9893<br>0.9862 | 1.0241 | 0.9983 | 0.9909 | Ave | | 0.9852 | | | 0.5000 | 3.2 | | 20.0 | | | |
| 2-Fluorophenol (Surr) | 1.1461<br>1.1855 | 1.1065<br>1.1781 | 1.1727 | 1.1823 | 1.2020 | Ave | | 1.1676 | | | | 2.7 | | 20.0 | | | |
| Phenol-d5 (Surr) | 1.3953<br>1.4619 | 1.3587<br>1.4147 | 1.4986 | 1.4547 | 1.4647 | Ave | | 1.4355 | | | | 3.3 | | 20.0 | | | |
| Nitrobenzene-d5 (Surr) | 0.3386<br>0.3826 | 0.3418<br>0.3750 | 0.3791 | 0.3547 | 0.3827 | Ave | | 0.3649 | | | | 5.3 | | 20.0 | | | |
| 2-Fluorobiphenyl | 1.4555<br>1.3422 | 1.3643<br>1.3215 | 1.3923 | 1.3201 | 1.3188 | Ave | | 1.3593 | | | | 3.7 | | 20.0 | | | |
| 2,4,6-Tribromophenol (Surr) | 0.1377<br>0.1595 | 0.1382<br>0.1649 | 0.1565 | 0.1528 | 0.1578 | Ave | | 0.1525 | | | | 6.9 | | 20.0 | | | |
| p-Terphenyl-d14 (Surr) | 0.8816<br>0.9005 | 0.8471<br>0.8817 | 0.9188 | 0.9086 | 0.9018 | Ave | | 0.8914 | | | | 2.7 | | 20.0 | | | |

Note: The m1 coefficient is the same as Ave RRF for an Ave curve type.

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 271208

SDG No.:

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/26/2015 19:36 Calibration End Date: 10/26/2015 22:31 Calibration ID: 25393

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | IC 480-271208/3 | V53780.D |
| Level 2 | IC 480-271208/4 | V53781.D |
| Level 3 | IC 480-271208/5 | V53782.D |
| Level 4 | ICIS 480-271208/6 | V53783.D |
| Level 5 | IC 480-271208/7 | V53784.D |
| Level 6 | IC 480-271208/8 | V53785.D |
| Level 7 | IC 480-271208/9 | V53786.D |

| ANALYTE | IS REF | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (NG/UL) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 |
| 1,4-Dioxane | DCB | Linl | 3519<br>175039 | 16210<br>209008 | 36382 | 70463 | 142723 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| N-Nitrosodimethylamine | DCB | Linl | 6179<br>271405 | 26688<br>325230 | 58061 | 112822 | 223606 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Pyridine | DCB | Ave | 11883<br>518168 | 52209<br>631452 | 106382 | 208389 | 421273 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Benzaldehyde | DCB | Linl | 4225<br>289946 | 13878<br>344208 | 64556 | 58846 | 238662 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Phenol | DCB | Ave | 13532<br>545063 | 53981<br>650333 | 118195 | 223571 | 447393 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Aniline | DCB | Ave | 17636<br>696487 | 70088<br>830685 | 146496 | 295717 | 572570 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Bis(2-chloroethyl)ether | DCB | Ave | 11328<br>475127 | 48308<br>592012 | 101652 | 186303 | 382675 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2-Chlorophenol | DCB | Linl | 11125<br>484784 | 49179<br>580764 | 100778 | 197350 | 393372 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| n-Decane | DCB | Ave | 19643<br>701283 | 74971<br>828912 | 156408 | 302753 | 583523 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 1,3-Dichlorobenzene | DCB | Ave | 13136<br>531974 | 54366<br>654062 | 112239 | 220411 | 436015 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 1,4-Dichlorobenzene | DCB | Ave | 13795<br>551321 | 56518<br>661916 | 115507 | 225194 | 449478 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Benzyl alcohol | DCB | Ave | 7457<br>309066 | 31006<br>371866 | 66928 | 128262 | 259388 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 1,2-Dichlorobenzene | DCB | Ave | 13497<br>516375 | 51365<br>624082 | 108306 | 210748 | 418039 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2-Methylphenol | DCB | Ave | 10204<br>426831 | 41458<br>519138 | 89837 | 176936 | 356526 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| bis (2-chloroisopropyl) ether | DCB | Ave | 25661<br>916708 | 98010<br>1084446 | 200965 | 392586 | 759378 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 271208

SDG No.:

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/26/2015 19:36 Calibration End Date: 10/26/2015 22:31 Calibration ID: 25393

| ANALYTE | IS REF | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (NG/UL) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 |
| Indene | NPT | Ave | 21652<br>817979 | 85672<br>984151 | 174763 | 347395 | 674228 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 4-Methylphenol | DCB | Ave | 10520<br>435835 | 44201<br>524346 | 94247 | 182133 | 364579 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| N-Nitrosodi-n-propylamine | DCB | Ave | 7097<br>288480 | 31463<br>356933 | 83994 | 119530 | 238533 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Acetophenone | DCB | Ave | 15516<br>597821 | 63212<br>715809 | 133228 | 254117 | 498470 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Hexachloroethane | DCB | Ave | 5319<br>222760 | 21693<br>267290 | 46371 | 90745 | 183426 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Nitrobenzene | NPT | Ave | 11587<br>468737 | 45370<br>566501 | 97077 | 191304 | 382493 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Isophorone | NPT | Ave | 20754<br>820359 | 76966<br>994132 | 156114 | 305899 | 658113 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2,4-Dimethylphenol | NPT | Ave | 11178<br>440578 | 45646<br>541566 | 97727 | 185776 | 364377 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2-Nitrophenol | NPT | Lin1 | 5607<br>272753 | 24793<br>326378 | 55982 | 111071 | 222452 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Benzoic acid | NPT | Lin1 | +++++<br>364849 | 23477<br>453812 | 58995 | 136945 | 280622 | +++++<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Bis(2-chloroethoxy)methane | NPT | Ave | 14119<br>490442 | 53445<br>588297 | 112355 | 207286 | 409991 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2,4-Dichlorophenol | NPT | Ave | 9511<br>388481 | 39093<br>472308 | 84430 | 162670 | 317621 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 1,2,4-Trichlorobenzene | NPT | Ave | 11619<br>449119 | 46606<br>540148 | 93755 | 185385 | 369989 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Naphthalene | NPT | Ave | 37590<br>1340025 | 146597<br>1568285 | 297039 | 579289 | 1113754 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 4-Chloroaniline | NPT | Ave | 18872<br>760412 | 74214<br>922956 | 154520 | 305002 | 622899 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2,6-Dichlorophenol | NPT | Ave | 10107<br>383331 | 40187<br>470975 | 81972 | 163276 | 317064 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Hexachlorobutadiene | NPT | Ave | 6769<br>269648 | 26724<br>328484 | 55435 | 109813 | 219810 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Caprolactam | NPT | Lin1 | 2514<br>164462 | 13089<br>199188 | 29992 | 60365 | 132195 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 4-Chloro-3-methylphenol | NPT | Ave | 8604<br>403741 | 35727<br>485441 | 77919 | 160915 | 323820 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2-Methylnaphthalene | NPT | Ave | 24784<br>907449 | 95718<br>1104067 | 201453 | 378930 | 756269 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 1-Methylnaphthalene | NPT | Ave | 23070<br>840236 | 89167<br>1018241 | 184967 | 348435 | 699340 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 271208

SDG No.:

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/26/2015 19:36 Calibration End Date: 10/26/2015 22:31 Calibration ID: 25393

| ANALYTE | IS REF | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (NG/UL) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 |
| Hexachlorocyclopentadiene | ANT | Lin1 | 7029<br>335313 | 31985<br>407393 | 69581 | 135314 | 276421 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 1,2,4,5-Tetrachlorobenzene | ANT | Ave | 10741<br>426038 | 42272<br>518793 | 87802 | 169899 | 343345 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2,4,6-Trichlorophenol | ANT | Ave | 6359<br>304462 | 26445<br>368225 | 56430 | 121673 | 243474 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2,4,5-Trichlorophenol | ANT | Ave | 7057<br>313483 | 26627<br>382596 | 62975 | 125691 | 255986 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Biphenyl | ANT | Ave | 29720<br>1121102 | 115479<br>1325486 | 232029 | 460268 | 916430 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2-Chloronaphthalene | ANT | Ave | 23406<br>864545 | 86724<br>1030123 | 180087 | 347985 | 697141 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2-Nitroaniline | ANT | Lin1 | 5357<br>285666 | 28176<br>345725 | 55152 | 111185 | 229034 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Dimethyl phthalate | ANT | Ave | 24077<br>961139 | 98456<br>1159026 | 205069 | 406468 | 796546 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 1,3-Dinitrobenzene | NPT | Lin1 | 3352<br>192180 | 15631<br>233127 | 35456 | 74289 | 153529 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2,6-Dinitrotoluene | ANT | Lin1 | 4637<br>244074 | 22859<br>296209 | 47053 | 97445 | 193606 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Acenaphthylene | ANT | Ave | 54661<br>1377176 | 135435<br>1621020 | 293922 | 595362 | 1197227 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 3-Nitroaniline | ANT | Lin1 | 5817<br>283827 | 24369<br>340018 | 57145 | 112192 | 228803 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2,4-Dinitrophenol | ANT | Lin1 | 4381<br>336118 | 22986<br>414637 | 55593 | 121784 | 261871 | 0.500<br>20.0 | 2.00<br>24.0 | 4.00 | 8.00 | 16.0 |
| 4-Nitrophenol | ANT | Lin1 | 5342<br>264676 | 25205<br>326290 | 51602 | 105234 | 217266 | 0.500<br>20.0 | 2.00<br>24.0 | 4.00 | 8.00 | 16.0 |
| Acenaphthene | ANT | Ave | 22934<br>869877 | 87481<br>1045030 | 187251 | 373324 | 723219 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2,4-Dinitrotoluene | ANT | Lin1 | 5912<br>320440 | 28457<br>392263 | 63598 | 128470 | 258677 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Dibenzofuran | ANT | Ave | 30704<br>1217943 | 127787<br>1424883 | 269310 | 525786 | 1004593 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2,3,4,6-Tetrachlorophenol | ANT | Lin1 | 5078<br>267767 | 22773<br>320430 | 50112 | 105522 | 213136 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Hexadecane | PHN | Ave | 22102<br>819260 | 87235<br>964081 | 181848 | 361725 | 687547 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Diethyl phthalate | ANT | Lin1 | 149818<br>1123005 | 230856<br>1299342 | 341075 | 534743 | 936957 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 4-Chlorophenyl phenyl ether | ANT | Ave | 12231<br>500175 | 49964<br>607118 | 105468 | 202904 | 409050 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |

615

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 271208

SDG No.:

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/26/2015 19:36 Calibration End Date: 10/26/2015 22:31 Calibration ID: 25393

| ANALYTE | IS REF | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (NG/UL) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 |
| 4-Nitroaniline | ANT | Lin1 | 4827<br>278499 | 23461<br>333944 | 52660 | 109514 | 223001 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Fluorene | ANT | Ave | 25643<br>1021754 | 104481<br>1211948 | 221406 | 432116 | 842950 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 4,6-Dinitro-2-methylphenol | PHN | Lin1 | 5387<br>403631 | 29226<br>497360 | 68656 | 149592 | 318454 | 0.500<br>20.0 | 2.00<br>24.0 | 4.00 | 8.00 | 16.0 |
| Diphenylamine | PHN | Ave | 35583<br>1401028 | 148726<br>1664133 | 312474 | 612522 | 1166646 | 0.428<br>17.1 | 1.71<br>20.5 | 3.42 | 6.84 | 13.7 |
| N-Nitrosodiphenylamine | PHN | Ave | 35583<br>1401028 | 148726<br>1664133 | 312474 | 612522 | 1166646 | 0.500<br>20.0 | 2.00<br>24.0 | 4.00 | 8.00 | 16.0 |
| 1,2-Diphenylhydrazine | PHN | Ave | 21620<br>918846 | 92851<br>1094329 | 193937 | 376338 | 753229 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| trans-Azobenzene | PHN | Ave | 21620<br>918846 | 92851<br>1094329 | 193937 | 376338 | 753229 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 4-Bromophenyl phenyl ether | PHN | Ave | 7669<br>326758 | 31477<br>391736 | 65103 | 131924 | 262929 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Atrazine | ANT | Lin1 | 5890<br>274700 | 27317<br>335260 | 58430 | 113184 | 230396 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Hexachlorobenzene | PHN | Ave | 9179<br>382099 | 36428<br>458944 | 77671 | 152553 | 305771 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| n-Octadecane | PHN | Ave | 20565<br>835073 | 87187<br>993523 | 177759 | 354428 | 686780 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Pentachlorophenol | PHN | Lin1 | 7516<br>488521 | 39599<br>592861 | 90106 | 188588 | 391102 | 0.500<br>20.0 | 2.00<br>24.0 | 4.00 | 8.00 | 16.0 |
| Phenanthrene | PHN | Ave | 35436<br>1362452 | 143353<br>1632234 | 298464 | 585461 | 1132201 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Anthracene | PHN | Ave | 34122<br>1363636 | 141631<br>1624161 | 294928 | 587143 | 1133097 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Carbazole | PHN | Ave | 32183<br>1304211 | 136982<br>1552568 | 281163 | 556699 | 1068002 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Di-n-butyl phthalate | PHN | Lin1 | 55292<br>1659599 | 188064<br>1930561 | 386463 | 749932 | 1405764 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Fluoranthene | PHN | Ave | 37138<br>1536438 | 155951<br>1813892 | 327769 | 648909 | 1273327 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Benzidine | CRY | Lin1 | 7678<br>854280 | 37751<br>1034112 | 153353 | 194315 | 699403 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Pyrene | CRY | Ave | 39694<br>1582446 | 164768<br>1865674 | 341116 | 669809 | 1290343 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Butyl benzyl phthalate | CRY | Lin1 | 17059<br>799999 | 74093<br>964146 | 160802 | 325665 | 684124 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Bis(2-ethylhexyl) phthalate | CRY | Lin1 | 25473<br>1130009 | 107592<br>1381470 | 230617 | 463989 | 926049 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 271208

SDG No.:

Instrument ID: HP5973V GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/26/2015 19:36 Calibration End Date: 10/26/2015 22:31 Calibration ID: 25393

| ANALYTE | IS REF | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (NG/UL) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 | LVL 1<br>LVL 6 | LVL 2<br>LVL 7 | LVL 3 | LVL 4 | LVL 5 |
| 3,3'-Dichlorobenzidine | CRY | Lin1 | 11672<br>599929 | 52126<br>728767 | 118765 | 217694 | 481463 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Benzo[a]anthracene | CRY | Ave | 35757<br>1462365 | 149745<br>1750430 | 307795 | 606175 | 1201812 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Chrysene | CRY | Ave | 34732<br>1367840 | 142085<br>1650023 | 290181 | 577733 | 1123552 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Di-n-octyl phthalate | CRY | Lin1 | 37932<br>1915576 | 174952<br>2259968 | 378695 | 785504 | 1559275 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Benzo[b]fluoranthene | PRY | Lin1 | 35589<br>1565499 | 151754<br>1934133 | 317985 | 651856 | 1277411 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Benzo[k]fluoranthene | PRY | Lin1 | 36510<br>1601285 | 158427<br>1854508 | 334206 | 657532 | 1292985 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Benzo[a]pyrene | PRY | Lin1 | 32523<br>1512662 | 142626<br>1828411 | 305871 | 620563 | 1238011 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Indeno[1,2,3-cd]pyrene | PRY | Lin1 | 38119<br>1752128 | 169234<br>2100941 | 350520 | 711678 | 1425535 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Dibenz(a,h)anthracene | PRY | Lin1 | 31788<br>1504216 | 144859<br>1811235 | 303198 | 609524 | 1220253 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Benzo[g,h,i]perylene | PRY | Ave | 32199<br>1360511 | 142605<br>1627168 | 288960 | 567309 | 1113320 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2-Fluorophenol (Surr) | DCB | Ave | 10684<br>435630 | 42580<br>531437 | 87315 | 176661 | 355551 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Phenol-d5 (Surr) | DCB | Ave | 13007<br>537193 | 52283<br>638138 | 111583 | 217393 | 433281 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| Nitrobenzene-d5 (Surr) | NPT | Ave | 11851<br>512925 | 49618<br>609429 | 105631 | 202200 | 418958 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2-Fluorobiphenyl | ANT | Ave | 27189<br>995084 | 103160<br>1200096 | 210643 | 408771 | 816345 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| 2,4,6-Tribromophenol (Surr) | PHN | Ave | 4341<br>208616 | 18381<br>255605 | 40641 | 80918 | 165543 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |
| p-Terphenyl-d14 (Surr) | CRY | Ave | 29185<br>1163423 | 117120<br>1385466 | 243582 | 481262 | 947175 | 0.250<br>10.0 | 1.00<br>12.0 | 2.00 | 4.00 | 8.00 |

Curve Type Legend:
Ave = Average ISTD
Lin1 = Linear 1/conc ISTD

617

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 270613

SDG No.:

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/23/2015 08:33 Calibration End Date: 10/23/2015 10:48 Calibration ID: 25373

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | IC 480-270613/3 | X009013899.D |
| Level 2 | IC 480-270613/4 | X009013900.D |
| Level 3 | ICIS 480-270613/5 | X009013901.D |
| Level 4 | IC 480-270613/6 | X009013902.D |
| Level 5 | IC 480-270613/7 | X009013903.D |
| Level 6 | IC 480-270613/8 | X009013904.D |

| ANALYTE | RRF | | | | | CURVE TYPE | COEFFICIENT | | | # | MIN RRF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | | B | M1 | M2 | | | | | | | | |
| 1,4-Dioxane | 0.5841<br>0.6290 | 0.6231 | 0.6087 | 0.6493 | 0.6230 | Ave | | 0.6195 | | | | 3.5 | | 20.0 | | | |
| N-Nitrosodimethylamine | 0.7520<br>0.7140 | 0.7196 | 0.6976 | 0.7361 | 0.7109 | Ave | | 0.7217 | | | | 2.7 | | 20.0 | | | |
| Pyridine | 1.3173<br>1.2940 | 1.3014 | 1.2673 | 1.3189 | 1.2916 | Ave | | 1.2984 | | | | 1.5 | | 20.0 | | | |
| Benzaldehyde | 0.4617<br>0.5332 | 0.4880 | 0.4957 | 0.5555 | 0.5413 | Lin1 | -0.562 | 0.5408 | | | 0.0100 | | | | 0.9980 | | 0.9900 |
| Phenol | 1.8269<br>1.7330 | 1.8130 | 1.7280 | 1.7532 | 1.7507 | Ave | | 1.7674 | | | 0.8000 | 2.4 | | 20.0 | | | |
| Aniline | 1.9708<br>2.1279 | 2.1887 | 2.1146 | 2.1835 | 2.1554 | Ave | | 2.1235 | | | | 3.8 | | 20.0 | | | |
| Bis(2-chloroethyl)ether | 1.4336<br>1.4114 | 1.4621 | 1.3823 | 1.4320 | 1.4146 | Ave | | 1.4227 | | | 0.7000 | 1.9 | | 20.0 | | | |
| 2-Chlorophenol | 1.4881<br>1.4320 | 1.4549 | 1.4329 | 1.4613 | 1.4446 | Ave | | 1.4523 | | | 0.8000 | 1.5 | | 20.0 | | | |
| n-Decane | 1.9241<br>1.7105 | 1.8465 | 1.7319 | 1.7547 | 1.7540 | Ave | | 1.7869 | | | 0.0100 | 4.6 | | 20.0 | | | |
| 1,3-Dichlorobenzene | 1.5989<br>1.5358 | 1.5555 | 1.5424 | 1.5670 | 1.5475 | Ave | | 1.5578 | | | | 1.5 | | 20.0 | | | |
| 1,4-Dichlorobenzene | 1.6305<br>1.5639 | 1.6180 | 1.5688 | 1.6027 | 1.5756 | Ave | | 1.5933 | | | | 1.7 | | 20.0 | | | |
| Benzyl alcohol | 0.8791<br>0.9268 | 0.9363 | 0.9156 | 0.9468 | 0.9287 | Ave | | 0.9222 | | | | 2.6 | | 20.0 | | | |
| 1,2-Dichlorobenzene | 1.5771<br>1.4553 | 1.4873 | 1.4590 | 1.4869 | 1.4680 | Ave | | 1.4889 | | | | 3.0 | | 20.0 | | | |
| 2-Methylphenol | 1.2847<br>1.2658 | 1.2777 | 1.2392 | 1.2791 | 1.2812 | Ave | | 1.2713 | | | 0.7000 | 1.3 | | 20.0 | | | |
| bis (2-chloroisopropyl) ether | 2.0381<br>1.7580 | 1.9551 | 1.7997 | 1.8252 | 1.8204 | Ave | | 1.8661 | | | 0.0100 | 5.7 | | 20.0 | | | |

Note: The m1 coefficient is the same as Ave RRF for an Ave curve type.

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 270613

SDG No.:

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/23/2015 08:33 Calibration End Date: 10/23/2015 10:48 Calibration ID: 25373

| ANALYTE | RRF | | | | | CURVE TYPE | COEFFICIENT | | | # | MIN RRF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | | B | M1 | M2 | | | | | | | | |
| Indene | 0.8133<br>0.7333 | 0.7833 | 0.7876 | 0.7706 | 0.7560 | Ave | | 0.7740 | | | | 3.6 | | 20.0 | | | |
| 4-Methylphenol | 1.3361<br>1.2949 | 1.3397 | 1.2851 | 1.3185 | 1.3137 | Ave | | 1.3148 | | | 0.6000 | 1.7 | | 20.0 | | | |
| N-Nitrosodi-n-propylamine | 0.9750<br>0.9767 | 0.9909 | 0.9376 | 0.9840 | 0.9713 | Ave | | 0.9726 | | | 0.5000 | 1.9 | | 20.0 | | | |
| Acetophenone | 1.9756<br>1.8049 | 1.9208 | 1.7901 | 1.8262 | 1.8287 | Ave | | 1.8577 | | | 0.0100 | 4.0 | | 20.0 | | | |
| Hexachloroethane | 0.6213<br>0.6148 | 0.6019 | 0.6025 | 0.6185 | 0.6118 | Ave | | 0.6118 | | | 0.3000 | 1.3 | | 20.0 | | | |
| Nitrobenzene | 0.3851<br>0.3724 | 0.3770 | 0.3741 | 0.3838 | 0.3710 | Ave | | 0.3772 | | | 0.2000 | 1.6 | | 20.0 | | | |
| Isophorone | 0.6826<br>0.6540 | 0.6762 | 0.6698 | 0.6766 | 0.6592 | Ave | | 0.6697 | | | 0.4000 | 1.7 | | 20.0 | | | |
| 2-Nitrophenol | 0.1800<br>0.2033 | 0.1863 | 0.2013 | 0.2077 | 0.1994 | Lin1 | -0.158 | 0.2042 | | | 0.1000 | | | | 0.9990 | | 0.9900 |
| 2,4-Dimethylphenol | 0.3599<br>0.3598 | 0.3677 | 0.3637 | 0.3723 | 0.3590 | Ave | | 0.3637 | | | 0.2000 | 1.5 | | 20.0 | | | |
| Benzoic acid | 0.2088<br>0.2782 | 0.2293 | 0.2559 | 0.2777 | 0.2716 | Lin1 | -0.476 | 0.2775 | | | | | | | 0.9990 | | 0.9900 |
| Bis(2-chloroethoxy)methane | 0.4399<br>0.4176 | 0.4288 | 0.4225 | 0.4284 | 0.4170 | Ave | | 0.4257 | | | 0.3000 | 2.0 | | 20.0 | | | |
| 2,4-Dichlorophenol | 0.2961<br>0.3040 | 0.3068 | 0.3018 | 0.3102 | 0.3005 | Ave | | 0.3032 | | | 0.2000 | 1.6 | | 20.0 | | | |
| 1,2,4-Trichlorobenzene | 0.3369<br>0.3279 | 0.3317 | 0.3302 | 0.3399 | 0.3234 | Ave | | 0.3317 | | | | 1.8 | | 20.0 | | | |
| Naphthalene | 1.0780<br>0.9270 | 1.0538 | 1.0041 | 0.9735 | 0.9489 | Ave | | 0.9976 | | | 0.7000 | 5.9 | | 20.0 | | | |
| 4-Chloroaniline | 0.3996<br>0.4424 | 0.4404 | 0.4521 | 0.4589 | 0.4434 | Ave | | 0.4395 | | | 0.0100 | 4.7 | | 20.0 | | | |
| 2,6-Dichlorophenol | 0.2975<br>0.2961 | 0.2998 | 0.2983 | 0.3049 | 0.2987 | Ave | | 0.2992 | | | | 1.0 | | 20.0 | | | |
| Hexachlorobutadiene | 0.1895<br>0.1850 | 0.1852 | 0.1884 | 0.1906 | 0.1865 | Ave | | 0.1875 | | | 0.0100 | 1.2 | | 20.0 | | | |
| Caprolactam | 0.1044<br>0.1147 | 0.1098 | 0.1144 | 0.1214 | 0.1146 | Lin1 | -0.072 | 0.1168 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| 4-Chloro-3-methylphenol | 0.2951<br>0.3023 | 0.3079 | 0.3013 | 0.3125 | 0.3033 | Ave | | 0.3038 | | | 0.2000 | 2.0 | | 20.0 | | | |
| 2-Methylnaphthalene | 0.6982<br>0.6417 | 0.6767 | 0.6643 | 0.6689 | 0.6478 | Ave | | 0.6663 | | | 0.4000 | 3.1 | | 20.0 | | | |

Note: The m1 coefficient is the same as Ave RRF for an Ave curve type.

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 270613

SDG No.:

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/23/2015 08:33 Calibration End Date: 10/23/2015 10:48 Calibration ID: 25373

| ANALYTE | RRF | | | | | CURVE TYPE | COEFFICIENT | | | # | MIN RRF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | | B | M1 | M2 | | | | | | | | |
| 1-Methylnaphthalene | 0.6162<br>0.5852 | 0.6259 | 0.6049 | 0.6105 | 0.5926 | Ave | | 0.6059 | | | 0.0100 | 2.5 | | 20.0 | | | |
| Hexachlorocyclopentadiene | 0.4026<br>0.4281 | 0.4242 | 0.4283 | 0.4462 | 0.4356 | Lin1 | -0.174 | 0.4362 | | | 0.0500 | | | | 1.0000 | | 0.9900 |
| 1,2,4,5-Tetrachlorobenzene | 0.5578<br>0.5458 | 0.5790 | 0.5521 | 0.5714 | 0.5553 | Ave | | 0.5602 | | | 0.0100 | 2.2 | | 20.0 | | | |
| 2,4,6-Trichlorophenol | 0.3915<br>0.3984 | 0.3790 | 0.3902 | 0.4146 | 0.3961 | Lin1 | -0.119 | 0.4009 | | | 0.2000 | | | | 0.9990 | | 0.9900 |
| 2,4,5-Trichlorophenol | 0.4049<br>0.4177 | 0.4084 | 0.4087 | 0.4287 | 0.4199 | Lin1 | -0.119 | 0.4207 | | | 0.2000 | | | | 1.0000 | | 0.9900 |
| Biphenyl | 1.4395<br>1.3264 | 1.4599 | 1.3874 | 1.3773 | 1.3423 | Ave | | 1.3888 | | | 0.0100 | 3.8 | | 20.0 | | | |
| 2-Chloronaphthalene | 1.1749<br>1.1062 | 1.2056 | 1.1408 | 1.1590 | 1.1205 | Ave | | 1.1511 | | | 0.8000 | 3.2 | | 20.0 | | | |
| 2-Nitroaniline | 0.3227<br>0.3545 | 0.3427 | 0.3465 | 0.3619 | 0.3539 | Lin1 | -0.199 | 0.3570 | | | 0.0100 | | | | 1.0000 | | 0.9900 |
| Dimethyl phthalate | 1.2855<br>1.2283 | 1.3381 | 1.2832 | 1.2882 | 1.2474 | Ave | | 1.2784 | | | 0.0100 | 3.0 | | 20.0 | | | |
| 1,3-Dinitrobenzene | 0.0965<br>0.1265 | 0.1091 | 0.1198 | 0.1304 | 0.1244 | Lin1 | -0.199 | 0.1277 | | | | | | | 0.9990 | | 0.9900 |
| 2,6-Dinitrotoluene | 0.2704<br>0.3188 | 0.3112 | 0.3136 | 0.3294 | 0.3157 | Lin1 | -0.253 | 0.3224 | | | | | | | 1.0000 | | 0.9900 |
| Acenaphthylene | 1.7771<br>1.6084 | 1.8131 | 1.7203 | 1.7029 | 1.6492 | Ave | | 1.7118 | | | 0.9000 | 4.5 | | 20.0 | | | |
| 3-Nitroaniline | 0.3012<br>0.3521 | 0.3395 | 0.3479 | 0.3633 | 0.3508 | Lin1 | -0.286 | 0.3568 | | | 0.0100 | | | | 1.0000 | | 0.9900 |
| Acenaphthene | 1.1329<br>1.0163 | 1.1322 | 1.0667 | 1.0656 | 1.0447 | Ave | | 1.0764 | | | 0.9000 | 4.4 | | 20.0 | | | |
| 2,4-Dinitrophenol | 0.1272<br>0.1936 | 0.1585 | 0.1796 | 0.1975 | 0.1922 | Lin1 | -0.860 | 0.1963 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| 4-Nitrophenol | 0.1557<br>0.1777 | 0.1731 | 0.1762 | 0.1833 | 0.1788 | Lin1 | -0.253 | 0.1805 | | | 0.0100 | | | | 1.0000 | | 0.9900 |
| 2,4-Dinitrotoluene | 0.3678<br>0.4223 | 0.4056 | 0.4071 | 0.4398 | 0.4226 | Lin1 | -0.340 | 0.4279 | | | 0.2000 | | | | 0.9990 | | 0.9900 |
| Dibenzofuran | 1.6847<br>1.4893 | 1.6785 | 1.5859 | 1.5559 | 1.5062 | Ave | | 1.5834 | | | 0.8000 | 5.3 | | 20.0 | | | |
| 2,3,4,6-Tetrachlorophenol | 0.2718<br>0.3245 | 0.3059 | 0.3151 | 0.3293 | 0.3149 | Lin1 | -0.286 | 0.3246 | | | 0.0100 | | | | 1.0000 | | 0.9900 |
| Diethyl phthalate | 1.2244<br>1.1664 | 1.2732 | 1.2266 | 1.2300 | 1.1919 | Ave | | 1.2188 | | | 0.0100 | 3.0 | | 20.0 | | | |

Note: The m1 coefficient is the same as Ave RRF for an Ave curve type.

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 270613

SDG No.:

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/23/2015 08:33 Calibration End Date: 10/23/2015 10:48 Calibration ID: 25373

| ANALYTE | RRF | | | | | CURVE TYPE | COEFFICIENT | | | # | MIN RRF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | | B | M1 | M2 | | | | | | | | |
| Hexadecane | 0.9659<br>0.8230 | 0.9359 | 0.8855 | 0.8686 | 0.8434 | Lin1 | 0.9657 | 0.8403 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| 4-Chlorophenyl phenyl ether | 0.6669<br>0.6270 | 0.6533 | 0.6418 | 0.6514 | 0.6273 | Ave | | 0.6446 | | | 0.4000 | 2.4 | | 20.0 | | | |
| 4-Nitroaniline | 0.3444<br>0.3575 | 0.3451 | 0.3489 | 0.3641 | 0.3520 | Lin1 | -0.101 | 0.3571 | | | 0.0100 | | | | 1.0000 | | 0.9900 |
| Fluorene | 1.3125<br>1.1933 | 1.3373 | 1.2601 | 1.2581 | 1.2290 | Ave | | 1.2651 | | | 0.9000 | 4.2 | | 20.0 | | | |
| 4,6-Dinitro-2-methylphenol | 0.1110<br>0.1638 | 0.1367 | 0.1600 | 0.1702 | 0.1634 | Lin1 | -0.676 | 0.1678 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| Diphenylamine | 0.7113<br>0.5917 | 0.6862 | 0.6552 | 0.6232 | 0.6140 | Ave | | 0.6469 | | | | 7.1 | | 20.0 | | | |
| N-Nitrosodiphenylamine | 0.6082<br>0.5059 | 0.5867 | 0.5602 | 0.5328 | 0.5250 | Ave | | 0.5531 | | | 0.0100 | 7.1 | | 20.0 | | | |
| 1,2-Diphenylhydrazine | 1.2728<br>1.1775 | 1.2872 | 1.2251 | 1.2448 | 1.2024 | Ave | | 1.2350 | | | | 3.4 | | 20.0 | | | |
| trans-Azobenzene | 0.7947<br>0.7267 | 0.7890 | 0.7679 | 0.7696 | 0.7480 | Ave | | 0.7660 | | | | 3.3 | | 20.0 | | | |
| 4-Bromophenyl phenyl ether | 0.2336<br>0.2304 | 0.2319 | 0.2313 | 0.2399 | 0.2325 | Ave | | 0.2333 | | | 0.1000 | 1.5 | | 20.0 | | | |
| Hexachlorobenzene | 0.2439<br>0.2429 | 0.2449 | 0.2411 | 0.2501 | 0.2429 | Ave | | 0.2443 | | | 0.1000 | 1.3 | | 20.0 | | | |
| Atrazine | 0.3708<br>0.3559 | 0.3670 | 0.3675 | 0.3783 | 0.3623 | Lin1 | 0.0662 | 0.3636 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| Pentachlorophenol | 0.1009<br>0.1430 | 0.1156 | 0.1338 | 0.1430 | 0.1418 | Lin1 | -0.571 | 0.1440 | | | 0.0500 | | | | 0.9990 | | 0.9900 |
| n-Octadecane | 0.6067<br>0.5258 | 0.5788 | 0.5685 | 0.5547 | 0.5432 | Ave | | 0.5630 | | | 0.0100 | 5.0 | | 20.0 | | | |
| Phenanthrene | 1.2325<br>0.9912 | 1.1733 | 1.1074 | 1.0419 | 1.0354 | Lin1 | 1.6028 | 1.0166 | | | 0.7000 | | | | 0.9980 | | 0.9900 |
| Anthracene | 1.1986<br>0.9991 | 1.1719 | 1.1064 | 1.0531 | 1.0470 | Lin1 | 1.3604 | 1.0278 | | | 0.7000 | | | | 0.9980 | | 0.9900 |
| Carbazole | 1.1306<br>0.9490 | 1.1311 | 1.0579 | 1.0039 | 1.0082 | Ave | | 1.0468 | | | 0.0100 | 7.0 | | 20.0 | | | |
| Di-n-butyl phthalate | 1.2591<br>1.0812 | 1.2942 | 1.2445 | 1.1454 | 1.1528 | Ave | | 1.1962 | | | 0.0100 | 6.9 | | 20.0 | | | |
| Fluoranthene | 1.2526<br>1.0630 | 1.2754 | 1.1903 | 1.1240 | 1.1207 | Ave | | 1.1710 | | | 0.6000 | 7.1 | | 20.0 | | | |
| Benzidine | 0.0609<br>0.4619 | 0.3452 | 0.4154 | 0.4720 | 0.4471 | Lin1 | -2.204 | 0.4776 | | | | | | | 0.9990 | | 0.9900 |

Note: The m1 coefficient is the same as Ave RRF for an Ave curve type.

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 270613

SDG No.:

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/23/2015 08:33 Calibration End Date: 10/23/2015 10:48 Calibration ID: 25373

| ANALYTE | RRF | | | | | CURVE TYPE | COEFFICIENT | | | # | MIN RRF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | | B | M1 | M2 | | | | | | | | |
| Pyrene | 1.2211<br>1.0557 | 1.2305 | 1.1685 | 1.1349 | 1.0916 | Ave | | 1.1504 | | | 0.6000 | 6.1 | | 20.0 | | | |
| Butyl benzyl phthalate | 0.5524<br>0.5480 | 0.5540 | 0.5685 | 0.5871 | 0.5552 | Lin1 | -0.018 | 0.5613 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| Bis(2-ethylhexyl) phthalate | 0.7847<br>0.7578 | 0.8018 | 0.8039 | 0.8093 | 0.7774 | Lin1 | 0.1840 | 0.7799 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| 3,3'-Dichlorobenzidine | 0.4105<br>0.4317 | 0.4453 | 0.4299 | 0.4505 | 0.4333 | Lin1 | -0.083 | 0.4377 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| Benzo[a]anthracene | 1.1732<br>1.0590 | 1.1988 | 1.1416 | 1.1324 | 1.0802 | Ave | | 1.1309 | | | 0.8000 | 4.7 | | 20.0 | | | |
| Chrysene | 1.1639<br>0.9977 | 1.1346 | 1.0726 | 1.0540 | 1.0239 | Ave | | 1.0745 | | | 0.7000 | 6.0 | | 20.0 | | | |
| Di-n-octyl phthalate | 1.3400<br>1.2456 | 1.3785 | 1.3402 | 1.3196 | 1.2985 | Lin1 | 0.7016 | 1.2852 | | | 0.0100 | | | | 0.9990 | | 0.9900 |
| Benzo[b]fluoranthene | 1.1320<br>1.1333 | 1.2021 | 1.2355 | 1.2451 | 1.1326 | Lin1 | 0.1716 | 1.1715 | | | 0.7000 | | | | 0.9970 | | 0.9900 |
| Benzo[k]fluoranthene | 1.2739<br>1.1655 | 1.2260 | 1.1682 | 1.2031 | 1.2554 | Ave | | 1.2150 | | | 0.7000 | 3.7 | | 20.0 | | | |
| Benzo[a]pyrene | 1.1311<br>1.0967 | 1.1286 | 1.1126 | 1.1472 | 1.1173 | Ave | | 1.1223 | | | 0.7000 | 1.6 | | 20.0 | | | |
| Dibenz(a,h)anthracene | 1.0495<br>1.0678 | 1.0803 | 1.0803 | 1.1085 | 1.1026 | Ave | | 1.0815 | | | | 2.0 | | 20.0 | | | |
| Indeno[1,2,3-cd]pyrene | 1.2628<br>1.2501 | 1.2758 | 1.2576 | 1.2846 | 1.2833 | Ave | | 1.2691 | | | 0.5000 | 1.1 | | 20.0 | | | |
| Benzo[g,h,i]perylene | 1.0257<br>1.0474 | 1.0593 | 1.0468 | 1.0723 | 1.0739 | Ave | | 1.0542 | | | 0.5000 | 1.7 | | 20.0 | | | |
| 2-Fluorophenol (Surr) | 1.4587<br>1.4473 | 1.4461 | 1.4252 | 1.4878 | 1.4365 | Ave | | 1.4503 | | | | 1.5 | | 20.0 | | | |
| Phenol-d5 (Surr) | 1.6946<br>1.6916 | 1.7052 | 1.6626 | 1.7123 | 1.7084 | Ave | | 1.6958 | | | | 1.1 | | 20.0 | | | |
| Nitrobenzene-d5 (Surr) | 0.3699<br>0.3790 | 0.3765 | 0.3835 | 0.3914 | 0.3785 | Ave | | 0.3798 | | | | 1.9 | | 20.0 | | | |
| 2-Fluorobiphenyl | 1.3658<br>1.2542 | 1.3787 | 1.3261 | 1.3237 | 1.2781 | Ave | | 1.3214 | | | | 3.7 | | 20.0 | | | |
| 2,4,6-Tribromophenol (Surr) | 0.1166<br>0.1215 | 0.1118 | 0.1164 | 0.1249 | 0.1212 | Lin1 | -0.063 | 0.1219 | | | | | | | 0.9990 | | 0.9900 |
| p-Terphenyl-d14 (Surr) | 0.8522<br>0.8035 | 0.8624 | 0.8434 | 0.8504 | 0.8105 | Ave | | 0.8371 | | | | 2.9 | | 20.0 | | | |

Note: The m1 coefficient is the same as Ave RRF for an Ave curve type.

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 270613

SDG No.:

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/23/2015 08:33 Calibration End Date: 10/23/2015 10:48 Calibration ID: 25373

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | IC 480-270613/3 | X009013899.D |
| Level 2 | IC 480-270613/4 | X009013900.D |
| Level 3 | ICIS 480-270613/5 | X009013901.D |
| Level 4 | IC 480-270613/6 | X009013902.D |
| Level 5 | IC 480-270613/7 | X009013903.D |
| Level 6 | IC 480-270613/8 | X009013904.D |

| ANALYTE | IS REF | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (NG/UL) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 |
| 1,4-Dioxane | DCB | Ave | 26028<br>564061 | 96760 | 323288 | 527812 | 461418 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| N-Nitrosodimethylamine | DCB | Ave | 23508<br>640349 | 111760 | 370461 | 598314 | 526494 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Pyridine | DCB | Ave | 58701<br>1160497 | 202102 | 673015 | 1072059 | 956592 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Benzaldehyde | DCB | Lin1 | 20573<br>478130 | 75791 | 263275 | 451536 | 400922 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Phenol | DCB | Ave | 81408<br>1554163 | 281557 | 917689 | 1425038 | 1296602 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Aniline | DCB | Ave | 87821<br>1908376 | 339903 | 1123007 | 1774802 | 1596404 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Bis(2-chloroethyl)ether | DCB | Ave | 63883<br>1265772 | 227063 | 734103 | 1163983 | 1047679 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2-Chlorophenol | DCB | Ave | 66313<br>1284289 | 225941 | 760957 | 1187814 | 1069946 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| n-Decane | DCB | Ave | 85738<br>1534003 | 286760 | 919787 | 1426318 | 1299045 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 1,3-Dichlorobenzene | DCB | Ave | 71250<br>1377330 | 241570 | 819113 | 1273742 | 1146125 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 1,4-Dichlorobenzene | DCB | Ave | 72639<br>1402581 | 251278 | 833130 | 1302724 | 1166951 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Benzyl alcohol | DCB | Ave | 39172<br>831196 | 145411 | 486244 | 769630 | 687855 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 1,2-Dichlorobenzene | DCB | Ave | 70277<br>1305174 | 230981 | 774824 | 1208651 | 1087242 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2-Methylphenol | DCB | Ave | 57249<br>1135212 | 198428 | 658093 | 1039690 | 948909 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| bis (2-chloroisopropyl) ether | DCB | Ave | 90822<br>1576661 | 303628 | 955755 | 1483633 | 1348279 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Indene | PHN | Ave | 118921<br>2174384 | 404157 | 1312844 | 2024784 | 1846365 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |

623

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 270613

SDG No.:

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/23/2015 08:33 Calibration End Date: 10/23/2015 10:48 Calibration ID: 25373

| ANALYTE | IS REF | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (NG/UL) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 |
| 4-Methylphenol | DCB | Ave | 59536<br>1161311 | 308059 | 682486 | 1072575 | 972947 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| N-Nitrosodi-n-propylamine | DCB | Ave | 43445<br>875921 | 153882 | 497919 | 799796 | 719415 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Acetophenone | DCB | Ave | 88035<br>1618719 | 298296 | 950675 | 1484396 | 1354381 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Hexachloroethane | DCB | Ave | 27687<br>551390 | 93482 | 319980 | 502779 | 453121 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Nitrobenzene | NPT | Ave | 64343<br>1249016 | 218746 | 714677 | 1140879 | 1035010 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Isophorone | NPT | Ave | 114040<br>2193557 | 392333 | 1279375 | 2011035 | 1838853 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2-Nitrophenol | NPT | Lin1 | 30068<br>681786 | 108114 | 384512 | 617358 | 556329 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2,4-Dimethylphenol | NPT | Ave | 60133<br>1206796 | 213347 | 694705 | 1106536 | 1001411 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Benzoic acid | NPT | Lin1 | 34887<br>933231 | 133060 | 488780 | 825387 | 757755 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Bis(2-chloroethoxy)methane | NPT | Ave | 73499<br>1400803 | 248786 | 807033 | 1273553 | 1163286 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2,4-Dichlorophenol | NPT | Ave | 49470<br>1019524 | 178041 | 576541 | 922108 | 838192 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 1,2,4-Trichlorobenzene | NPT | Ave | 56297<br>1099672 | 192467 | 630642 | 1010336 | 902070 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Naphthalene | NPT | Ave | 180115<br>3109464 | 611471 | 1917973 | 2893580 | 2646999 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 4-Chloroaniline | NPT | Ave | 66761<br>1483896 | 255539 | 863498 | 1364178 | 1236930 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2,6-Dichlorophenol | NPT | Ave | 49703<br>993082 | 173965 | 569863 | 906242 | 833281 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Hexachlorobutadiene | NPT | Ave | 31660<br>620358 | 107446 | 359866 | 566432 | 520374 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Caprolactam | NPT | Lin1 | 17448<br>384870 | 63703 | 218559 | 360730 | 319695 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 4-Chloro-3-methylphenol | NPT | Ave | 49312<br>1014119 | 178667 | 575572 | 928835 | 846144 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2-Methylnaphthalene | NPT | Ave | 116652<br>2152342 | 392684 | 1269005 | 1988386 | 1807015 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 1-Methylnaphthalene | NPT | Ave | 102947<br>1962936 | 363186 | 1155500 | 1814599 | 1653063 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Hexachlorocyclopentadiene | ANT | Lin1 | 36754<br>783444 | 134160 | 447486 | 724833 | 661791 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |

624

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 270613

SDG No.:

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/23/2015 08:33 Calibration End Date: 10/23/2015 10:48 Calibration ID: 25373

| ANALYTE | IS REF | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (NG/UL) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 |
| 1,2,4,5-Tetrachlorobenzene | ANT | Ave | 50923<br>999006 | 183137 | 576884 | 928153 | 843780 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2,4,6-Trichlorophenol | ANT | Lin1 | 35741<br>729073 | 119866 | 407747 | 673483 | 601857 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2,4,5-Trichlorophenol | ANT | Lin1 | 36968<br>764433 | 129156 | 427083 | 696476 | 638046 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Biphenyl | ANT | Ave | 131425<br>2427625 | 461720 | 1449689 | 2237376 | 2039495 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2-Chloronaphthalene | ANT | Ave | 107265<br>2024501 | 381232 | 1181975 | 1882772 | 1702384 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2-Nitroaniline | ANT | Lin1 | 29458<br>648801 | 108380 | 362052 | 587947 | 537712 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Dimethyl phthalate | ANT | Ave | 117365<br>2248039 | 423201 | 1340761 | 2092562 | 1895323 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 1,3-Dinitrobenzene | NPT | Lin1 | 16094<br>424340 | 63299 | 228826 | 387694 | 346893 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2,6-Dinitrotoluene | ANT | Lin1 | 24683<br>583494 | 98425 | 327672 | 535156 | 479670 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Acenaphthylene | ANT | Ave | 162253<br>2943783 | 573438 | 1797472 | 2766371 | 2505670 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 3-Nitroaniline | ANT | Lin1 | 27505<br>644405 | 107379 | 363472 | 590143 | 532973 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Acenaphthene | ANT | Ave | 103434<br>1860047 | 358100 | 1114531 | 1730991 | 1587305 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2,4-Dinitrophenol | ANT | Lin1 | 23225<br>708821 | 100286 | 375285 | 641806 | 584017 | 10.0<br>240 | 40.0 | 100 | 160 | 200 |
| 4-Nitrophenol | ANT | Lin1 | 28425<br>650293 | 109514 | 368118 | 595631 | 543369 | 10.0<br>240 | 40.0 | 100 | 160 | 200 |
| 2,4-Dinitrotoluene | ANT | Lin1 | 33582<br>772966 | 128291 | 425401 | 714444 | 642079 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Dibenzofuran | ANT | Ave | 153810<br>2725663 | 530855 | 1657029 | 2527477 | 2288524 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2,3,4,6-Tetrachlorophenol | ANT | Lin1 | 24816<br>593831 | 96744 | 329266 | 534976 | 478385 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Diethyl phthalate | ANT | Ave | 111790<br>2134812 | 402679 | 1281670 | 1998092 | 1810884 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Hexadecane | ANT | Lin1 | 88190<br>1506174 | 296010 | 935654 | 1411041 | 1281472 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 4-Chlorophenyl phenyl ether | ANT | Ave | 60892<br>1147469 | 206621 | 670570 | 1058167 | 953135 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 4-Nitroaniline | ANT | Lin1 | 31441<br>654317 | 109142 | 364542 | 591506 | 534757 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 270613

SDG No.:

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/23/2015 08:33 Calibration End Date: 10/23/2015 10:48 Calibration ID: 25373

| ANALYTE | IS REF | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (NG/UL) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 |
| Fluorene | ANT | Ave | 119830<br>2183935 | 422968 | 1316688 | 2043817 | 1867237 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 4,6-Dinitro-2-methylphenol | PHN | Linl | 32475<br>971310 | 141091 | 533396 | 894206 | 797932 | 10.0<br>240 | 40.0 | 100 | 160 | 200 |
| Diphenylamine | PHN | Ave | 177867<br>3000456 | 605432 | 1867740 | 2800101 | 2564523 | 8.55<br>205 | 34.2 | 85.5 | 137 | 171 |
| N-Nitrosodiphenylamine | PHN | Ave | 177867<br>3000456 | 605432 | 1867740 | 2800101 | 2564523 | 10.0<br>240 | 40.0 | 100 | 160 | 200 |
| 1,2-Diphenylhydrazine | ANT | Ave | 116210<br>2154986 | 407100 | 1280034 | 2022145 | 1826878 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| trans-Azobenzene | PHN | Ave | 116210<br>2154986 | 407100 | 1280034 | 2022145 | 1826878 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 4-Bromophenyl phenyl ether | PHN | Ave | 34156<br>683077 | 119680 | 385503 | 630244 | 567868 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Hexachlorobenzene | PHN | Ave | 35661<br>720277 | 126363 | 401843 | 657067 | 593306 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Atrazine | ANT | Linl | 33857<br>651291 | 116071 | 384042 | 614578 | 550399 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Pentachlorophenol | PHN | Linl | 29514<br>848140 | 119308 | 445978 | 751560 | 692527 | 10.0<br>240 | 40.0 | 100 | 160 | 200 |
| n-Octadecane | PHN | Ave | 88721<br>1559318 | 298641 | 947712 | 1457465 | 1326600 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Phenanthrene | PHN | Linl | 180222<br>2939175 | 605382 | 1845939 | 2737775 | 2528797 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Anthracene | PHN | Linl | 175275<br>2962749 | 604700 | 1844391 | 2767086 | 2557296 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Carbazole | PHN | Ave | 165326<br>2814027 | 583624 | 1763414 | 2637727 | 2462294 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Di-n-butyl phthalate | PHN | Ave | 184114<br>3206091 | 667806 | 2074479 | 3009743 | 2815577 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Fluoranthene | PHN | Ave | 183159<br>3152219 | 658072 | 1984145 | 2953525 | 2737300 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Benzidine | CRY | Linl | 9675<br>1431770 | 194229 | 752428 | 1279927 | 1171556 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Pyrene | CRY | Ave | 194086<br>3272676 | 692375 | 2116523 | 3077387 | 2860261 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Butyl benzyl phthalate | CRY | Linl | 87808<br>1698812 | 311720 | 1024391 | 1592040 | 1454756 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Bis(2-ethylhexyl) phthalate | CRY | Linl | 124719<br>2349197 | 451162 | 1456236 | 2194476 | 2037083 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 3,3'-Dichlorobenzidine | CRY | Linl | 65245<br>1338355 | 250568 | 778638 | 1221710 | 1135502 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |

FORM VI
GC/MS SEMI VOA BY INTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 270613

SDG No.:

Instrument ID: HP5973X GC Column: RXI-5Sil MS ID: 0.25(mm) Heated Purge: (Y/N) N

Calibration Start Date: 10/23/2015 08:33 Calibration End Date: 10/23/2015 10:48 Calibration ID: 25373

| ANALYTE | IS REF | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (NG/UL) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | LVL 1<br>LVL 6 | LVL 2 | LVL 3 | LVL 4 | LVL 5 |
| Benzo[a]anthracene | CRY | Ave | 186472<br>3282854 | 674516 | 2067914 | 3070619 | 2830358 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Chrysene | CRY | Ave | 185000<br>3092739 | 638418 | 1942926 | 2857969 | 2682843 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Di-n-octyl phthalate | CRY | Lin1 | 212987<br>3861152 | 775601 | 2427667 | 3578121 | 3402521 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Benzo[b]fluoranthene | PRY | Lin1 | 171061<br>3432908 | 656217 | 2180983 | 3229871 | 2824695 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Benzo[k]fluoranthene | PRY | Ave | 182489<br>3530364 | 669248 | 2058669 | 3120973 | 3130900 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Benzo[a]pyrene | PRY | Ave | 170918<br>3321924 | 616089 | 1963952 | 2976080 | 2786599 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Dibenz(a,h)anthracene | PRY | Ave | 158591<br>3234327 | 589700 | 1907059 | 2875665 | 2749848 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Indeno[1,2,3-cd]pyrene | PRY | Ave | 190828<br>3786598 | 696452 | 2219963 | 3332442 | 3200498 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Benzo[g,h,i]perylene | PRY | Ave | 154988<br>3172555 | 578253 | 1847803 | 2781774 | 2678158 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2-Fluorophenol (Surr) | DCB | Ave | 65002<br>1298005 | 224581 | 756882 | 1209378 | 1063928 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Phenol-d5 (Surr) | DCB | Ave | 75514<br>1517077 | 264812 | 882969 | 1391863 | 1265322 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| Nitrobenzene-d5 (Surr) | NPT | Ave | 61797<br>1271296 | 218477 | 732564 | 1163487 | 1055987 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2-Fluorobiphenyl | ANT | Ave | 124697<br>2295352 | 436044 | 1385559 | 2153634 | 1941884 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| 2,4,6-Tribromophenol (Surr) | PHN | Lin1 | 17043<br>360322 | 57670 | 193986 | 328064 | 296054 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |
| p-Terphenyl-d14 (Surr) | CRY | Ave | 135459<br>2490897 | 485226 | 1527782 | 2305848 | 2123660 | 5.00<br>120 | 20.0 | 50.0 | 80.0 | 100 |

Curve Type Legend:
Ave = Average ISTD
Lin1 = Linear 1/conc ISTD

627

FORM VI
RESOLUTION CHECK SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID (1): CCVIS 480-273506/3 Instrument ID (1): HP5973X

GC Column (1): RXI-5Sil MS ID: 0.25(mm) Date Analyzed (1): 11/05/2015 10:42

| ANALYTE | RT | RESOLUTION (%) |
|---|---|---|
| 2-Fluorophenol (Surr) | 5.21 | 100.0 |
| Phenol-d5 (Surr) | 6.34 | 100.0 |
| Nitrobenzene-d5 (Surr) | 7.48 | 100.0 |
| Naphthalene | 8.38 | 100.0 |
| 2-Fluorobiphenyl | 9.62 | 100.0 |
| Acenaphthylene | 10.26 | 100.0 |
| Acenaphthene | 10.46 | 100.0 |
| Fluorene | 11.01 | 100.0 |
| 2,4,6-Tribromophenol (Surr) | 11.25 | 100.0 |
| Phenanthrene | 11.96 | 100.0 |
| Anthracene | 12.01 | 100.0 |
| Fluoranthene | 13.05 | 100.0 |
| Pyrene | 13.26 | 100.0 |
| p-Terphenyl-d14 (Surr) | 13.35 | 100.0 |
| Benzo[a]anthracene | 14.33 | 100.0 |
| Chrysene | 14.36 | 100.0 |
| Benzo[b]fluoranthene | 15.43 | 36.60 |
| Benzo[k]fluoranthene | 15.46 | 100.0 |
| Benzo[a]pyrene | 15.84 | 100.0 |
| Indeno[1,2,3-cd]pyrene | 17.50 | 100.0 |
| Dibenz(a,h)anthracene | 17.50 | 100.0 |

FORM VI
RESOLUTION CHECK SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID (1): CCVIS 480-273910/3 Instrument ID (1): HP5973V

GC Column (1): RXI-5Sil MS ID: 0.25(mm) Date Analyzed (1): 11/09/2015 12:57

| ANALYTE | RT | RESOLUTION (%) |
|---|---|---|
| 2-Fluorophenol (Surr) | 5.73 | 100.0 |
| Phenol-d5 (Surr) | 6.50 | 100.0 |
| Nitrobenzene-d5 (Surr) | 7.30 | 100.0 |
| Naphthalene | 7.94 | 100.0 |
| 2-Fluorobiphenyl | 8.81 | 100.0 |
| Acenaphthylene | 9.30 | 100.0 |
| Acenaphthene | 9.45 | 100.0 |
| Fluorene | 9.88 | 100.0 |
| 2,4,6-Tribromophenol (Surr) | 10.09 | 100.0 |
| Phenanthrene | 10.71 | 100.0 |
| Anthracene | 10.75 | 100.0 |
| Fluoranthene | 11.81 | 100.0 |
| Pyrene | 12.07 | 100.0 |
| p-Terphenyl-d14 (Surr) | 12.16 | 100.0 |
| Benzo[a]anthracene | 13.58 | 100.0 |
| Chrysene | 13.64 | 100.0 |
| Benzo[b]fluoranthene | 15.30 | 19.20 |
| Benzo[k]fluoranthene | 15.35 | 100.0 |
| Benzo[a]pyrene | 15.86 | 100.0 |
| Indeno[1,2,3-cd]pyrene | 18.05 | 100.0 |
| Dibenz(a,h)anthracene | 18.06 | 100.0 |

FORM VI
RESOLUTION CHECK SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID (1): CCVIS 480-273999/3 Instrument ID (1): HP5973V

GC Column (1): RXI-5Sil MS ID: 0.25(mm) Date Analyzed (1): 11/10/2015 11:07

| ANALYTE | RT | RESOLUTION (%) |
|---|---|---|
| 2-Fluorophenol (Surr) | 5.74 | 100.0 |
| Phenol-d5 (Surr) | 6.51 | 100.0 |
| Nitrobenzene-d5 (Surr) | 7.30 | 100.0 |
| Naphthalene | 7.95 | 100.0 |
| 2-Fluorobiphenyl | 8.81 | 100.0 |
| Acenaphthylene | 9.30 | 100.0 |
| Acenaphthene | 9.45 | 100.0 |
| Fluorene | 9.88 | 100.0 |
| 2,4,6-Tribromophenol (Surr) | 10.09 | 100.0 |
| Phenanthrene | 10.71 | 100.0 |
| Anthracene | 10.75 | 100.0 |
| Fluoranthene | 11.81 | 100.0 |
| Pyrene | 12.07 | 100.0 |
| p-Terphenyl-d14 (Surr) | 12.16 | 100.0 |
| Benzo[a]anthracene | 13.59 | 100.0 |
| Chrysene | 13.64 | 100.0 |
| Benzo[b]fluoranthene | 15.31 | 19.50 |
| Benzo[k]fluoranthene | 15.35 | 100.0 |
| Benzo[a]pyrene | 15.87 | 100.0 |
| Indeno[1,2,3-cd]pyrene | 18.07 | 100.0 |
| Dibenz(a,h)anthracene | 18.08 | 100.0 |

FORM VI
RESOLUTION CHECK SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID (1): CCVIS 480-274392/3 Instrument ID (1): HP5973V

GC Column (1): RXI-5Sil MS ID: 0.25(mm) Date Analyzed (1): 11/11/2015 12:49

| ANALYTE | RT | RESOLUTION (%) |
|---|---|---|
| 2-Fluorophenol (Surr) | 5.72 | 100.0 |
| Phenol-d5 (Surr) | 6.49 | 100.0 |
| Nitrobenzene-d5 (Surr) | 7.29 | 100.0 |
| Naphthalene | 7.94 | 100.0 |
| 2-Fluorobiphenyl | 8.80 | 100.0 |
| Acenaphthylene | 9.29 | 100.0 |
| Acenaphthene | 9.44 | 100.0 |
| Fluorene | 9.88 | 100.0 |
| 2,4,6-Tribromophenol (Surr) | 10.08 | 100.0 |
| Phenanthrene | 10.70 | 100.0 |
| Anthracene | 10.75 | 100.0 |
| Fluoranthene | 11.80 | 100.0 |
| Pyrene | 12.06 | 100.0 |
| p-Terphenyl-d14 (Surr) | 12.15 | 100.0 |
| Benzo[a]anthracene | 13.57 | 100.0 |
| Chrysene | 13.63 | 100.0 |
| Benzo[b]fluoranthene | 15.29 | 16.20 |
| Benzo[k]fluoranthene | 15.33 | 100.0 |
| Benzo[a]pyrene | 15.85 | 100.0 |
| Indeno[1,2,3-cd]pyrene | 18.03 | 100.0 |
| Dibenz(a,h)anthracene | 18.04 | 100.0 |

FORM VII
GC/MS SEMI VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCVIS 480-273910/3 | Calibration Date: 11/09/2015 12:57

Instrument ID: HP5973V | Calib Start Date: 10/26/2015 19:36

GC Column: RXI-5Sil MS ID: 0.25(mm) | Calib End Date: 10/26/2015 22:31

Lab File ID: V54272.D | Conc. Units: ug/L

| ANALYTE | CURVE TYPE | AVE RRF | RRF | MIN RRF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| 1,4-Dioxane | Lin1 | | 0.4301 | 0.0100 | 3670 | 4000 | -8.4 | 50.0 |
| N-Nitrosodimethylamine | Lin1 | | 0.9124 | 0.0100 | 4940 | 4000 | 23.5 | 25.0 |
| Pyridine | Ave | 1.384 | 1.393 | 0.0100 | 4030 | 4000 | 0.6 | 50.0 |
| Benzaldehyde | Lin1 | | 0.3101 | 0.0100 | 1820 | 4000 | -54.4* | 40.0 |
| Phenol | Ave | 1.482 | 1.309 | 0.8000 | 3530 | 4000 | -11.7 | 20.0 |
| Aniline | Ave | 1.905 | 1.685 | 0.0100 | 3540 | 4000 | -11.5 | 50.0 |
| Bis(2-chloroethyl)ether | Ave | 1.283 | 1.176 | 0.7000 | 3670 | 4000 | -8.4 | 20.0 |
| n-Decane | Ave | 1.986 | 1.864 | 0.0100 | 3760 | 4000 | -6.1 | 40.0 |
| 2-Chlorophenol | Lin1 | | 1.260 | 0.8000 | 3850 | 4000 | -3.8 | 20.0 |
| 1,3-Dichlorobenzene | Ave | 1.454 | 1.460 | 0.0100 | 4020 | 4000 | 0.4 | 20.0 |
| 1,4-Dichlorobenzene | Ave | 1.499 | 1.463 | 0.0100 | 3900 | 4000 | -2.4 | 20.0 |
| Benzyl alcohol | Ave | 0.8436 | 0.6782 | 0.0100 | 3220 | 4000 | -19.6 | 50.0 |
| 1,2-Dichlorobenzene | Ave | 1.407 | 1.378 | 0.0100 | 3920 | 4000 | -2.0 | 20.0 |
| 2-Methylphenol | Ave | 1.154 | 0.9801 | 0.7000 | 3400 | 4000 | -15.1 | 20.0 |
| bis (2-chloroisopropyl) ether | Ave | 2.585 | 2.388 | 0.0100 | 3700 | 4000 | -7.6 | 20.0 |
| Indene | Ave | 0.6110 | 0.6179 | | 4040 | 4000 | 1.1 | |
| 4-Methylphenol | Ave | 1.192 | 0.9481 | 0.6000 | 3180 | 4000 | -20.4* | 20.0 |
| N-Nitrosodi-n-propylamine | Ave | 0.8006 | 0.6586 | 0.5000 | 3290 | 4000 | -17.7 | 20.0 |
| Acetophenone | Ave | 1.671 | 1.504 | 0.0100 | 3600 | 4000 | -10.0 | 40.0 |
| Hexachloroethane | Ave | 0.5976 | 0.6397 | 0.3000 | 4280 | 4000 | 7.0 | 20.0 |
| Nitrobenzene | Ave | 0.3393 | 0.3478 | 0.2000 | 4100 | 4000 | 2.5 | 20.0 |
| Isophorone | Ave | 0.5778 | 0.5634 | 0.4000 | 3900 | 4000 | -2.5 | 20.0 |
| 2,4-Dimethylphenol | Ave | 0.3293 | 0.3306 | 0.2000 | 4020 | 4000 | 0.4 | 20.0 |
| 2-Nitrophenol | Lin1 | | 0.1993 | 0.1000 | 4000 | 4000 | -0.1 | 20.0 |
| Benzoic acid | Lin1 | | 0.2333 | 0.0100 | 3750 | 4000 | -6.3 | 25.0 |
| Bis(2-chloroethoxy)methane | Ave | 0.3772 | 0.3383 | 0.3000 | 3590 | 4000 | -10.3 | 20.0 |
| 2,4-Dichlorophenol | Ave | 0.2857 | 0.2779 | 0.2000 | 3890 | 4000 | -2.7 | 20.0 |
| 1,2,4-Trichlorobenzene | Ave | 0.3314 | 0.3515 | 0.0100 | 4240 | 4000 | 6.0 | 20.0 |
| Naphthalene | Ave | 1.021 | 0.9712 | 0.7000 | 3810 | 4000 | -4.9 | 20.0 |
| 4-Chloroaniline | Ave | 0.5492 | 0.4227 | 0.0100 | 3080 | 4000 | -23.0* | 20.0 |
| 2,6-Dichlorophenol | Ave | 0.2874 | 0.2783 | 0.0100 | 3870 | 4000 | -3.2 | 50.0 |
| Hexachlorobutadiene | Ave | 0.1962 | 0.2330 | 0.0100 | 4750 | 4000 | 18.8 | 20.0 |
| Caprolactam | Lin1 | | 0.1104 | 0.0100 | 3770 | 4000 | -5.6 | 40.0 |
| 4-Chloro-3-methylphenol | Ave | 0.2785 | 0.3226 | 0.2000 | 4630 | 4000 | 15.8 | 20.0 |
| 2-Methylnaphthalene | Ave | 0.6860 | 0.6750 | 0.4000 | 3940 | 4000 | -1.6 | 20.0 |
| 1-Methylnaphthalene | Ave | 0.6344 | 0.6259 | 0.0100 | 3950 | 4000 | -1.3 | 40.0 |
| Hexachlorocyclopentadiene | Lin1 | | 0.3931 | 0.0500 | 3530 | 4000 | -11.8 | 20.0 |
| 1,2,4,5-Tetrachlorobenzene | Ave | 0.5662 | 0.5704 | 0.0100 | 4030 | 4000 | 0.7 | 40.0 |
| 2,4,6-Trichlorophenol | Ave | 0.3808 | 0.3988 | 0.2000 | 4190 | 4000 | 4.7 | 20.0 |
| 2,4,5-Trichlorophenol | Ave | 0.4014 | 0.4271 | 0.2000 | 4260 | 4000 | 6.4 | 20.0 |

FORM VII
GC/MS SEMI VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCVIS 480-273910/3 | Calibration Date: 11/09/2015 12:57

Instrument ID: HP5973V | Calib Start Date: 10/26/2015 19:36

GC Column: RXI-5Sil MS ID: 0.25(mm) | Calib End Date: 10/26/2015 22:31

Lab File ID: V54272.D | Conc. Units: ug/L

| ANALYTE | CURVE TYPE | AVE RRF | RRF | MIN RRF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Biphenyl | Ave | 1.513 | 1.520 | 0.0100 | 4020 | 4000 | 0.4 | 40.0 |
| 2-Chloronaphthalene | Ave | 1.163 | 1.147 | 0.8000 | 3940 | 4000 | -1.4 | 25.0 |
| 2-Nitroaniline | Lin1 | | 0.4076 | 0.0100 | 4370 | 4000 | 9.2 | 20.0 |
| Dimethyl phthalate | Ave | 1.303 | 1.425 | 0.0100 | 4380 | 4000 | 9.4 | 20.0 |
| 1,3-Dinitrobenzene | Lin1 | | 0.1509 | 0.0100 | 4360 | 4000 | 9.0 | 50.0 |
| 2,6-Dinitrotoluene | Lin1 | | 0.3269 | 0.2000 | 4090 | 4000 | 2.2 | 20.0 |
| Acenaphthylene | Ave | 1.856 | 1.984 | 0.9000 | 4280 | 4000 | 6.9 | 20.0 |
| 3-Nitroaniline | Lin1 | | 0.3759 | 0.0100 | 4050 | 4000 | 1.2 | 20.0 |
| 2,4-Dinitrophenol | Lin1 | | 0.1815 | 0.0100 | 6870 | 8000 | -14.2 | 20.0 |
| Acenaphthene | Ave | 1.189 | 1.245 | 0.0100 | 4190 | 4000 | 4.7 | 20.0 |
| 4-Nitrophenol | Lin1 | | 0.2170 | 0.0100 | 9860 | 8000 | 23.2* | 20.0 |
| 2,4-Dinitrotoluene | Lin1 | | 0.4642 | 0.0100 | 4390 | 4000 | 9.7 | 20.0 |
| Dibenzofuran | Ave | 1.664 | 1.797 | 0.8000 | 4320 | 4000 | 8.0 | 20.0 |
| 2,3,4,6-Tetrachlorophenol | Lin1 | | 0.3311 | 0.0100 | 3820 | 4000 | -4.5 | 40.0 |
| Hexadecane | Ave | 0.6634 | 0.6502 | 0.0100 | 3920 | 4000 | -2.0 | 40.0 |
| Diethyl phthalate | Lin1 | | 1.590 | 0.0100 | 3540 | 4000 | -11.4 | 20.0 |
| 4-Chlorophenyl phenyl ether | Ave | 0.6674 | 0.7282 | 0.4000 | 4360 | 4000 | 9.1 | 20.0 |
| 4-Nitroaniline | Lin1 | | 0.3642 | 0.0100 | 4030 | 4000 | 0.8 | 20.0 |
| Fluorene | Ave | 1.384 | 1.429 | 0.9000 | 4130 | 4000 | 3.3 | 20.0 |
| 4,6-Dinitro-2-methylphenol | Lin1 | | 0.1468 | 0.0100 | 7840 | 8000 | -2.0 | 20.0 |
| Diphenylamine | Ave | 0.6569 | 0.6517 | 0.0100 | 6790 | 6840 | -0.8 | 50.0 |
| N-Nitrosodiphenylamine | Ave | 0.5617 | 0.5572 | 0.0100 | 7940 | 8000 | -0.8 | 20.0 |
| 1,2-Diphenylhydrazine | Ave | 0.7097 | 0.7188 | 0.0100 | 4050 | 4000 | 1.3 | 25.0 |
| trans-Azobenzene | Ave | 0.7097 | 0.7188 | 0.0100 | 4050 | 4000 | 1.3 | 40.0 |
| 4-Bromophenyl phenyl ether | Ave | 0.2476 | 0.2587 | 0.1000 | 4180 | 4000 | 4.5 | 20.0 |
| Atrazine | Lin1 | | 0.3950 | 0.0100 | 4270 | 4000 | 6.9 | 25.0 |
| Hexachlorobenzene | Ave | 0.2903 | 0.3254 | 0.1000 | 4480 | 4000 | 12.1 | 20.0 |
| n-Octadecane | Ave | 0.6565 | 0.6798 | 0.0100 | 4140 | 4000 | 3.5 | 40.0 |
| Pentachlorophenol | Lin1 | | 0.1185 | 0.0500 | 5250 | 8000 | -34.4* | 20.0 |
| Phenanthrene | Ave | 1.090 | 1.098 | 0.7000 | 4030 | 4000 | 0.7 | 20.0 |
| Anthracene | Ave | 1.080 | 1.089 | 0.7000 | 4030 | 4000 | 0.8 | 20.0 |
| Carbazole | Ave | 1.029 | 1.030 | 0.0100 | 4000 | 4000 | 0.0 | 20.0 |
| Di-n-butyl phthalate | Lin1 | | 1.533 | 0.0100 | 4660 | 4000 | 16.5 | 20.0 |
| Fluoranthene | Ave | 1.199 | 1.270 | 0.6000 | 4230 | 4000 | 5.8 | 20.0 |
| Benzidine | Lin1 | | 0.2963 | 0.0100 | 2110 | 4000 | -47.2* | 25.0 |
| Pyrene | Ave | 1.226 | 1.243 | 0.6000 | 4050 | 4000 | 1.3 | 20.0 |
| Butyl benzyl phthalate | Lin1 | | 0.6800 | 0.0100 | 4440 | 4000 | 11.0 | 20.0 |
| Bis(2-ethylhexyl) phthalate | Lin1 | | 0.9786 | 0.0100 | 4520 | 4000 | 12.9 | 20.0 |
| 3,3'-Dichlorobenzidine | Lin1 | | 0.4449 | 0.0100 | 3950 | 4000 | -1.2 | 20.0 |
| Benzo[a]anthracene | Ave | 1.123 | 1.148 | 0.8000 | 4090 | 4000 | 2.3 | 20.0 |
| Chrysene | Ave | 1.063 | 1.071 | 0.7000 | 4030 | 4000 | 0.8 | 20.0 |

FORM VII
GC/MS SEMI VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCVIS 480-273910/3 Calibration Date: 11/09/2015 12:57

Instrument ID: HP5973V Calib Start Date: 10/26/2015 19:36

GC Column: RXI-5Sil MS ID: 0.25(mm) Calib End Date: 10/26/2015 22:31

Lab File ID: V54272.D Conc. Units: ug/L

| ANALYTE | CURVE TYPE | AVE RRF | RRF | MIN RRF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Di-n-octyl phthalate | Lin1 | | 1.681 | 0.0100 | 4620 | 4000 | 15.5 | 20.0 |
| Benzo[b]fluoranthene | Lin1 | | 1.085 | 0.7000 | 3800 | 4000 | -5.0 | 20.0 |
| Benzo[k]fluoranthene | Lin1 | | 1.127 | 0.7000 | 3940 | 4000 | -1.6 | 20.0 |
| Benzo[a]pyrene | Lin1 | | 1.075 | 0.7000 | 3940 | 4000 | -1.6 | 20.0 |
| Indeno[1,2,3-cd]pyrene | Lin1 | | 1.317 | 0.5000 | 4180 | 4000 | 4.4 | 20.0 |
| Dibenz(a,h)anthracene | Lin1 | | 1.099 | 0.4000 | 4060 | 4000 | 1.5 | 20.0 |
| Benzo[g,h,i]perylene | Ave | 0.9852 | 1.070 | 0.5000 | 4350 | 4000 | 8.6 | 20.0 |
| 2-Fluorophenol (Surr) | Ave | 1.168 | 1.109 | 0.0100 | 3800 | 4000 | -5.0 | 25.0 |
| Phenol-d5 (Surr) | Ave | 1.436 | 1.273 | 0.0100 | 3550 | 4000 | -11.3 | 25.0 |
| Nitrobenzene-d5 (Surr) | Ave | 0.3649 | 0.4003 | 0.0100 | 4390 | 4000 | 9.7 | 25.0 |
| 2-Fluorobiphenyl | Ave | 1.359 | 1.394 | 0.0100 | 4100 | 4000 | 2.6 | 25.0 |
| 2,4,6-Tribromophenol (Surr) | Ave | 0.1525 | 0.1762 | 0.0100 | 4620 | 4000 | 15.6 | 25.0 |
| p-Terphenyl-d14 (Surr) | Ave | 0.8914 | 0.9176 | 0.0100 | 4120 | 4000 | 2.9 | 25.0 |

FORM VII
GC/MS SEMI VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCVIS 480-273999/3 | Calibration Date: 11/10/2015 11:07

Instrument ID: HP5973V | Calib Start Date: 10/26/2015 19:36

GC Column: RXI-5Sil MS ID: 0.25(mm) | Calib End Date: 10/26/2015 22:31

Lab File ID: V60002.D | Conc. Units: ug/L

| ANALYTE | CURVE TYPE | AVE RRF | RRF | MIN RRF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| 1,4-Dioxane | Lin1 | | 0.3817 | 0.0100 | 3260 | 4000 | -18.5 | 50.0 |
| N-Nitrosodimethylamine | Lin1 | | 0.8980 | 0.0100 | 4860 | 4000 | 21.6 | 25.0 |
| Pyridine | Ave | 1.384 | 1.299 | 0.0100 | 3760 | 4000 | -6.1 | 50.0 |
| Benzaldehyde | Lin1 | | 0.3338 | 0.0100 | 1950 | 4000 | -51.3* | 40.0 |
| Phenol | Ave | 1.482 | 1.321 | 0.8000 | 3570 | 4000 | -10.9 | 20.0 |
| Aniline | Ave | 1.905 | 1.662 | 0.0100 | 3490 | 4000 | -12.8 | 50.0 |
| Bis(2-chloroethyl)ether | Ave | 1.283 | 1.173 | 0.7000 | 3660 | 4000 | -8.6 | 20.0 |
| n-Decane | Ave | 1.986 | 1.790 | 0.0100 | 3600 | 4000 | -9.9 | 40.0 |
| 2-Chlorophenol | Lin1 | | 1.268 | 0.8000 | 3870 | 4000 | -3.2 | 20.0 |
| 1,3-Dichlorobenzene | Ave | 1.454 | 1.451 | 0.0100 | 3990 | 4000 | -0.2 | 20.0 |
| 1,4-Dichlorobenzene | Ave | 1.499 | 1.537 | 0.0100 | 4100 | 4000 | 2.5 | 20.0 |
| Benzyl alcohol | Ave | 0.8436 | 0.7176 | 0.0100 | 3400 | 4000 | -14.9 | 50.0 |
| 1,2-Dichlorobenzene | Ave | 1.407 | 1.384 | 0.0100 | 3930 | 4000 | -1.6 | 20.0 |
| 2-Methylphenol | Ave | 1.154 | 1.040 | 0.7000 | 3600 | 4000 | -9.9 | 20.0 |
| bis (2-chloroisopropyl) ether | Ave | 2.585 | 2.297 | 0.0100 | 3560 | 4000 | -11.1 | 20.0 |
| Indene | Ave | 0.6110 | 0.6027 | | 3950 | 4000 | -1.4 | |
| 4-Methylphenol | Ave | 1.192 | 1.051 | 0.6000 | 3530 | 4000 | -11.8 | 20.0 |
| N-Nitrosodi-n-propylamine | Ave | 0.8006 | 0.7659 | 0.5000 | 3830 | 4000 | -4.3 | 20.0 |
| Acetophenone | Ave | 1.671 | 1.726 | 0.0100 | 4130 | 4000 | 3.3 | 40.0 |
| Hexachloroethane | Ave | 0.5976 | 0.6638 | 0.3000 | 4440 | 4000 | 11.1 | 20.0 |
| Nitrobenzene | Ave | 0.3393 | 0.3615 | 0.2000 | 4260 | 4000 | 6.5 | 20.0 |
| Isophorone | Ave | 0.5778 | 0.5490 | 0.4000 | 3800 | 4000 | -5.0 | 20.0 |
| 2-Nitrophenol | Lin1 | | 0.1963 | 0.1000 | 3940 | 4000 | -1.5 | 20.0 |
| 2,4-Dimethylphenol | Ave | 0.3293 | 0.3467 | 0.2000 | 4210 | 4000 | 5.3 | 20.0 |
| Benzoic acid | Lin1 | | 0.2287 | 0.0100 | 3680 | 4000 | -7.9 | 25.0 |
| Bis(2-chloroethoxy)methane | Ave | 0.3772 | 0.3423 | 0.3000 | 3630 | 4000 | -9.3 | 20.0 |
| 2,4-Dichlorophenol | Ave | 0.2857 | 0.2977 | 0.2000 | 4170 | 4000 | 4.2 | 20.0 |
| 1,2,4-Trichlorobenzene | Ave | 0.3314 | 0.3483 | 0.0100 | 4200 | 4000 | 5.1 | 20.0 |
| Naphthalene | Ave | 1.021 | 0.9940 | 0.7000 | 3890 | 4000 | -2.6 | 20.0 |
| 4-Chloroaniline | Ave | 0.5492 | 0.4189 | 0.0100 | 3050 | 4000 | -23.7* | 20.0 |
| 2,6-Dichlorophenol | Ave | 0.2874 | 0.2927 | 0.0100 | 4070 | 4000 | 1.8 | 50.0 |
| Hexachlorobutadiene | Ave | 0.1962 | 0.2387 | 0.0100 | 4870 | 4000 | 21.7* | 20.0 |
| Caprolactam | Lin1 | | 0.1017 | 0.0100 | 3490 | 4000 | -12.7 | 40.0 |
| 4-Chloro-3-methylphenol | Ave | 0.2785 | 0.3055 | 0.2000 | 4390 | 4000 | 9.7 | 20.0 |
| 2-Methylnaphthalene | Ave | 0.6860 | 0.6913 | 0.4000 | 4030 | 4000 | 0.8 | 20.0 |
| 1-Methylnaphthalene | Ave | 0.6344 | 0.6333 | 0.0100 | 3990 | 4000 | -0.2 | 40.0 |
| Hexachlorocyclopentadiene | Lin1 | | 0.4483 | 0.0500 | 4020 | 4000 | 0.5 | 20.0 |
| 1,2,4,5-Tetrachlorobenzene | Ave | 0.5662 | 0.6285 | 0.0100 | 4440 | 4000 | 11.0 | 40.0 |
| 2,4,6-Trichlorophenol | Ave | 0.3808 | 0.4192 | 0.2000 | 4400 | 4000 | 10.1 | 20.0 |
| 2,4,5-Trichlorophenol | Ave | 0.4014 | 0.4134 | 0.2000 | 4120 | 4000 | 3.0 | 20.0 |

FORM VII
GC/MS SEMI VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCVIS 480-273999/3 | Calibration Date: 11/10/2015 11:07

Instrument ID: HP5973V | Calib Start Date: 10/26/2015 19:36

GC Column: RXI-5Sil MS ID: 0.25(mm) | Calib End Date: 10/26/2015 22:31

Lab File ID: V60002.D | Conc. Units: ug/L

| ANALYTE | CURVE TYPE | AVE RRF | RRF | MIN RRF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Biphenyl | Ave | 1.513 | 1.510 | 0.0100 | 3990 | 4000 | -0.2 | 40.0 |
| 2-Chloronaphthalene | Ave | 1.163 | 1.169 | 0.8000 | 4020 | 4000 | 0.5 | 25.0 |
| 2-Nitroaniline | Lin1 | | 0.3829 | 0.0100 | 4110 | 4000 | 2.7 | 20.0 |
| Dimethyl phthalate | Ave | 1.303 | 1.415 | 0.0100 | 4350 | 4000 | 8.6 | 20.0 |
| 1,3-Dinitrobenzene | Lin1 | | 0.1447 | 0.0100 | 4190 | 4000 | 4.6 | 50.0 |
| 2,6-Dinitrotoluene | Lin1 | | 0.3364 | 0.2000 | 4210 | 4000 | 5.2 | 20.0 |
| Acenaphthylene | Ave | 1.856 | 1.962 | 0.9000 | 4230 | 4000 | 5.7 | 20.0 |
| 3-Nitroaniline | Lin1 | | 0.3417 | 0.0100 | 3690 | 4000 | -7.8 | 20.0 |
| 2,4-Dinitrophenol | Lin1 | | 0.1553 | 0.0100 | 5930 | 8000 | -25.9* | 20.0 |
| Acenaphthene | Ave | 1.189 | 1.233 | 0.0100 | 4150 | 4000 | 3.7 | 20.0 |
| 4-Nitrophenol | Lin1 | | 0.2206 | 0.0100 | 10000 | 8000 | 25.2* | 20.0 |
| 2,4-Dinitrotoluene | Lin1 | | 0.4453 | 0.0100 | 4210 | 4000 | 5.4 | 20.0 |
| Dibenzofuran | Ave | 1.664 | 1.760 | 0.8000 | 4230 | 4000 | 5.8 | 20.0 |
| 2,3,4,6-Tetrachlorophenol | Lin1 | | 0.3415 | 0.0100 | 3940 | 4000 | -1.6 | 40.0 |
| Hexadecane | Ave | 0.6634 | 0.6173 | 0.0100 | 3720 | 4000 | -7.0 | 40.0 |
| Diethyl phthalate | Lin1 | | 1.608 | 0.0100 | 3600 | 4000 | -10.0 | 20.0 |
| 4-Chlorophenyl phenyl ether | Ave | 0.6674 | 0.7207 | 0.4000 | 4320 | 4000 | 8.0 | 20.0 |
| 4-Nitroaniline | Lin1 | | 0.3529 | 0.0100 | 3910 | 4000 | -2.2 | 20.0 |
| Fluorene | Ave | 1.384 | 1.416 | 0.9000 | 4090 | 4000 | 2.3 | 20.0 |
| 4,6-Dinitro-2-methylphenol | Lin1 | | 0.1394 | 0.0100 | 7470 | 8000 | -6.7 | 20.0 |
| Diphenylamine | Ave | 0.6569 | 0.6506 | 0.0100 | 6770 | 6840 | -1.0 | 50.0 |
| N-Nitrosodiphenylamine | Ave | 0.5617 | 0.5562 | 0.0100 | 7920 | 8000 | -1.0 | 20.0 |
| 1,2-Diphenylhydrazine | Ave | 0.7097 | 0.6934 | 0.0100 | 3910 | 4000 | -2.3 | 25.0 |
| trans-Azobenzene | Ave | 0.7097 | 0.6934 | 0.0100 | 3910 | 4000 | -2.3 | 40.0 |
| 4-Bromophenyl phenyl ether | Ave | 0.2476 | 0.2771 | 0.1000 | 4480 | 4000 | 12.0 | 20.0 |
| Atrazine | Lin1 | | 0.4241 | 0.0100 | 4590 | 4000 | 14.7 | 25.0 |
| Hexachlorobenzene | Ave | 0.2903 | 0.3535 | 0.1000 | 4870 | 4000 | 21.8* | 20.0 |
| n-Octadecane | Ave | 0.6565 | 0.6300 | 0.0100 | 3840 | 4000 | -4.0 | 40.0 |
| Pentachlorophenol | Lin1 | | 0.1167 | 0.0500 | 5180 | 8000 | -35.3* | 20.0 |
| Phenanthrene | Ave | 1.090 | 1.104 | 0.7000 | 4050 | 4000 | 1.3 | 20.0 |
| Anthracene | Ave | 1.080 | 1.104 | 0.7000 | 4090 | 4000 | 2.2 | 20.0 |
| Carbazole | Ave | 1.029 | 1.028 | 0.0100 | 4000 | 4000 | -0.1 | 20.0 |
| Di-n-butyl phthalate | Lin1 | | 1.528 | 0.0100 | 4640 | 4000 | 16.1 | 20.0 |
| Fluoranthene | Ave | 1.199 | 1.269 | 0.6000 | 4230 | 4000 | 5.8 | 20.0 |
| Benzidine | Lin1 | | 0.2291 | 0.0100 | 1700 | 4000 | -57.6* | 25.0 |
| Pyrene | Ave | 1.226 | 1.241 | 0.6000 | 4050 | 4000 | 1.2 | 20.0 |
| Butyl benzyl phthalate | Lin1 | | 0.6450 | 0.0100 | 4210 | 4000 | 5.3 | 20.0 |
| Bis(2-ethylhexyl) phthalate | Lin1 | | 0.9407 | 0.0100 | 4340 | 4000 | 8.6 | 20.0 |
| 3,3'-Dichlorobenzidine | Lin1 | | 0.4451 | 0.0100 | 3950 | 4000 | -1.2 | 20.0 |
| Benzo[a]anthracene | Ave | 1.123 | 1.124 | 0.8000 | 4000 | 4000 | 0.1 | 20.0 |
| Chrysene | Ave | 1.063 | 1.076 | 0.7000 | 4050 | 4000 | 1.3 | 20.0 |

FORM VII
GC/MS SEMI VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCVIS 480-273999/3 | Calibration Date: 11/10/2015 11:07

Instrument ID: HP5973V | Calib Start Date: 10/26/2015 19:36

GC Column: RXI-5Sil MS ID: 0.25(mm) | Calib End Date: 10/26/2015 22:31

Lab File ID: V60002.D | Conc. Units: ug/L

| ANALYTE | CURVE TYPE | AVE RRF | RRF | MIN RRF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Di-n-octyl phthalate | Lin1 | | 1.571 | 0.0100 | 4320 | 4000 | 8.1 | 20.0 |
| Benzo[b]fluoranthene | Lin1 | | 1.152 | 0.7000 | 4030 | 4000 | 0.8 | 20.0 |
| Benzo[k]fluoranthene | Lin1 | | 1.144 | 0.7000 | 4000 | 4000 | -0.0 | 20.0 |
| Benzo[a]pyrene | Lin1 | | 1.100 | 0.7000 | 4030 | 4000 | 0.6 | 20.0 |
| Indeno[1,2,3-cd]pyrene | Lin1 | | 1.394 | 0.5000 | 4420 | 4000 | 10.5 | 20.0 |
| Dibenz(a,h)anthracene | Lin1 | | 1.148 | 0.4000 | 4240 | 4000 | 6.0 | 20.0 |
| Benzo[g,h,i]perylene | Ave | 0.9852 | 1.136 | 0.5000 | 4610 | 4000 | 15.3 | 20.0 |
| 2-Fluorophenol (Surr) | Ave | 1.168 | 1.107 | 0.0100 | 3790 | 4000 | -5.2 | 25.0 |
| Phenol-d5 (Surr) | Ave | 1.436 | 1.285 | 0.0100 | 3580 | 4000 | -10.5 | 25.0 |
| Nitrobenzene-d5 (Surr) | Ave | 0.3649 | 0.4065 | 0.0100 | 4460 | 4000 | 11.4 | 25.0 |
| 2-Fluorobiphenyl | Ave | 1.359 | 1.394 | 0.0100 | 4100 | 4000 | 2.6 | 25.0 |
| 2,4,6-Tribromophenol (Surr) | Ave | 0.1525 | 0.1907 | 0.0100 | 5000 | 4000 | 25.0 | 25.0 |
| p-Terphenyl-d14 (Surr) | Ave | 0.8914 | 0.9110 | 0.0100 | 4090 | 4000 | 2.2 | 25.0 |

FORM VII
GC/MS SEMI VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCVIS 480-274392/3 Calibration Date: 11/11/2015 12:49

Instrument ID: HP5973V Calib Start Date: 10/26/2015 19:36

GC Column: RXI-5Sil MS ID: 0.25(mm) Calib End Date: 10/26/2015 22:31

Lab File ID: V60044.D Conc. Units: ug/L

| ANALYTE | CURVE TYPE | AVE RRF | RRF | MIN RRF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| 1,4-Dioxane | Lin1 | | 0.4255 | 0.0100 | 3630 | 4000 | -9.3 | 50.0 |
| N-Nitrosodimethylamine | Lin1 | | 0.9564 | 0.0100 | 5180 | 4000 | 29.5* | 25.0 |
| Pyridine | Ave | 1.384 | 1.370 | 0.0100 | 3960 | 4000 | -1.0 | 50.0 |
| Benzaldehyde | Lin1 | | 0.3419 | 0.0100 | 1990 | 4000 | -50.2* | 40.0 |
| Phenol | Ave | 1.482 | 1.356 | 0.8000 | 3660 | 4000 | -8.5 | 20.0 |
| Aniline | Ave | 1.905 | 1.737 | 0.0100 | 3650 | 4000 | -8.8 | 50.0 |
| Bis(2-chloroethyl)ether | Ave | 1.283 | 1.173 | 0.7000 | 3660 | 4000 | -8.6 | 20.0 |
| n-Decane | Ave | 1.986 | 1.865 | 0.0100 | 3760 | 4000 | -6.1 | 40.0 |
| 2-Chlorophenol | Lin1 | | 1.279 | 0.8000 | 3910 | 4000 | -2.3 | 20.0 |
| 1,3-Dichlorobenzene | Ave | 1.454 | 1.480 | 0.0100 | 4070 | 4000 | 1.8 | 20.0 |
| 1,4-Dichlorobenzene | Ave | 1.499 | 1.530 | 0.0100 | 4080 | 4000 | 2.0 | 20.0 |
| Benzyl alcohol | Ave | 0.8436 | 0.6859 | 0.0100 | 3250 | 4000 | -18.7 | 50.0 |
| 1,2-Dichlorobenzene | Ave | 1.407 | 1.374 | 0.0100 | 3910 | 4000 | -2.4 | 20.0 |
| 2-Methylphenol | Ave | 1.154 | 1.055 | 0.7000 | 3660 | 4000 | -8.6 | 20.0 |
| bis (2-chloroisopropyl) ether | Ave | 2.585 | 2.363 | 0.0100 | 3660 | 4000 | -8.6 | 20.0 |
| Indene | Ave | 0.6110 | 0.6182 | | 4050 | 4000 | 1.2 | |
| 4-Methylphenol | Ave | 1.192 | 1.075 | 0.6000 | 3610 | 4000 | -9.8 | 20.0 |
| N-Nitrosodi-n-propylamine | Ave | 0.8006 | 0.7589 | 0.5000 | 3790 | 4000 | -5.2 | 20.0 |
| Acetophenone | Ave | 1.671 | 1.675 | 0.0100 | 4010 | 4000 | 0.3 | 40.0 |
| Hexachloroethane | Ave | 0.5976 | 0.6568 | 0.3000 | 4400 | 4000 | 9.9 | 20.0 |
| Nitrobenzene | Ave | 0.3393 | 0.3666 | 0.2000 | 4320 | 4000 | 8.0 | 20.0 |
| Isophorone | Ave | 0.5778 | 0.5904 | 0.4000 | 4090 | 4000 | 2.2 | 20.0 |
| 2,4-Dimethylphenol | Ave | 0.3293 | 0.3632 | 0.2000 | 4410 | 4000 | 10.3 | 20.0 |
| 2-Nitrophenol | Lin1 | | 0.2034 | 0.1000 | 4080 | 4000 | 1.9 | 20.0 |
| Benzoic acid | Lin1 | | 0.2064 | 0.0100 | 3370 | 4000 | -15.7 | 25.0 |
| Bis(2-chloroethoxy)methane | Ave | 0.3772 | 0.3584 | 0.3000 | 3800 | 4000 | -5.0 | 20.0 |
| 2,4-Dichlorophenol | Ave | 0.2857 | 0.2993 | 0.2000 | 4190 | 4000 | 4.7 | 20.0 |
| 1,2,4-Trichlorobenzene | Ave | 0.3314 | 0.3473 | 0.0100 | 4190 | 4000 | 4.8 | 20.0 |
| Naphthalene | Ave | 1.021 | 0.997 | 0.7000 | 3910 | 4000 | -2.4 | 20.0 |
| 4-Chloroaniline | Ave | 0.5492 | 0.4315 | 0.0100 | 3140 | 4000 | -21.4* | 20.0 |
| 2,6-Dichlorophenol | Ave | 0.2874 | 0.3015 | 0.0100 | 4200 | 4000 | 4.9 | 50.0 |
| Hexachlorobutadiene | Ave | 0.1962 | 0.2366 | 0.0100 | 4820 | 4000 | 20.6* | 20.0 |
| Caprolactam | Lin1 | | 0.0987 | 0.0100 | 3390 | 4000 | -15.2 | 40.0 |
| 4-Chloro-3-methylphenol | Ave | 0.2785 | 0.3163 | 0.2000 | 4540 | 4000 | 13.6 | 20.0 |
| 2-Methylnaphthalene | Ave | 0.6860 | 0.6907 | 0.4000 | 4030 | 4000 | 0.7 | 20.0 |
| 1-Methylnaphthalene | Ave | 0.6344 | 0.6403 | 0.0100 | 4040 | 4000 | 0.9 | 40.0 |
| Hexachlorocyclopentadiene | Lin1 | | 0.4520 | 0.0500 | 4050 | 4000 | 1.3 | 20.0 |
| 1,2,4,5-Tetrachlorobenzene | Ave | 0.5662 | 0.6340 | 0.0100 | 4480 | 4000 | 12.0 | 40.0 |
| 2,4,6-Trichlorophenol | Ave | 0.3808 | 0.4027 | 0.2000 | 4230 | 4000 | 5.7 | 20.0 |
| 2,4,5-Trichlorophenol | Ave | 0.4014 | 0.4294 | 0.2000 | 4280 | 4000 | 7.0 | 20.0 |

FORM VII
GC/MS SEMI VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCVIS 480-274392/3 Calibration Date: 11/11/2015 12:49

Instrument ID: HP5973V Calib Start Date: 10/26/2015 19:36

GC Column: RXI-5Sil MS ID: 0.25(mm) Calib End Date: 10/26/2015 22:31

Lab File ID: V60044.D Conc. Units: ug/L

| ANALYTE | CURVE TYPE | AVE RRF | RRF | MIN RRF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Biphenyl | Ave | 1.513 | 1.534 | 0.0100 | 4050 | 4000 | 1.4 | 40.0 |
| 2-Chloronaphthalene | Ave | 1.163 | 1.193 | 0.8000 | 4100 | 4000 | 2.6 | 25.0 |
| 2-Nitroaniline | Lin1 | | 0.4119 | 0.0100 | 4410 | 4000 | 10.3 | 20.0 |
| Dimethyl phthalate | Ave | 1.303 | 1.420 | 0.0100 | 4360 | 4000 | 9.0 | 20.0 |
| 1,3-Dinitrobenzene | Lin1 | | 0.1475 | 0.0100 | 4270 | 4000 | 6.6 | 50.0 |
| 2,6-Dinitrotoluene | Lin1 | | 0.3458 | 0.2000 | 4320 | 4000 | 8.1 | 20.0 |
| Acenaphthylene | Ave | 1.856 | 1.984 | 0.9000 | 4280 | 4000 | 6.9 | 20.0 |
| 3-Nitroaniline | Lin1 | | 0.3589 | 0.0100 | 3870 | 4000 | -3.3 | 20.0 |
| 2,4-Dinitrophenol | Lin1 | | 0.1792 | 0.0100 | 6780 | 8000 | -15.2 | 20.0 |
| Acenaphthene | Ave | 1.189 | 1.255 | 0.0100 | 4220 | 4000 | 5.5 | 20.0 |
| 4-Nitrophenol | Lin1 | | 0.2491 | 0.0100 | 11300 | 8000 | 41.2* | 20.0 |
| 2,4-Dinitrotoluene | Lin1 | | 0.4615 | 0.0100 | 4370 | 4000 | 9.1 | 20.0 |
| Dibenzofuran | Ave | 1.664 | 1.766 | 0.8000 | 4250 | 4000 | 6.1 | 20.0 |
| 2,3,4,6-Tetrachlorophenol | Lin1 | | 0.3289 | 0.0100 | 3800 | 4000 | -5.1 | 40.0 |
| Hexadecane | Ave | 0.6634 | 0.6606 | 0.0100 | 3980 | 4000 | -0.4 | 40.0 |
| Diethyl phthalate | Lin1 | | 1.607 | 0.0100 | 3590 | 4000 | -10.1 | 20.0 |
| 4-Chlorophenyl phenyl ether | Ave | 0.6674 | 0.6975 | 0.4000 | 4180 | 4000 | 4.5 | 20.0 |
| 4-Nitroaniline | Lin1 | | 0.3614 | 0.0100 | 4000 | 4000 | 0.0 | 20.0 |
| Fluorene | Ave | 1.384 | 1.410 | 0.9000 | 4070 | 4000 | 1.9 | 20.0 |
| 4,6-Dinitro-2-methylphenol | Lin1 | | 0.1438 | 0.0100 | 7690 | 8000 | -3.9 | 20.0 |
| Diphenylamine | Ave | 0.6569 | 0.6757 | 0.0100 | 7040 | 6840 | 2.9 | 50.0 |
| N-Nitrosodiphenylamine | Ave | 0.5617 | 0.5777 | 0.0100 | 8230 | 8000 | 2.9 | 20.0 |
| 1,2-Diphenylhydrazine | Ave | 0.7097 | 0.7425 | 0.0100 | 4190 | 4000 | 4.6 | 25.0 |
| trans-Azobenzene | Ave | 0.7097 | 0.7425 | 0.0100 | 4190 | 4000 | 4.6 | 40.0 |
| 4-Bromophenyl phenyl ether | Ave | 0.2476 | 0.2654 | 0.1000 | 4290 | 4000 | 7.2 | 20.0 |
| Atrazine | Lin1 | | 0.3986 | 0.0100 | 4310 | 4000 | 7.8 | 25.0 |
| Hexachlorobenzene | Ave | 0.2903 | 0.3398 | 0.1000 | 4680 | 4000 | 17.1 | 20.0 |
| n-Octadecane | Ave | 0.6565 | 0.6560 | 0.0100 | 4000 | 4000 | -0.0 | 40.0 |
| Pentachlorophenol | Lin1 | | 0.1464 | 0.0500 | 6430 | 8000 | -19.6 | 20.0 |
| Phenanthrene | Ave | 1.090 | 1.093 | 0.7000 | 4010 | 4000 | 0.3 | 20.0 |
| Anthracene | Ave | 1.080 | 1.099 | 0.7000 | 4070 | 4000 | 1.8 | 20.0 |
| Carbazole | Ave | 1.029 | 0.9916 | 0.0100 | 3860 | 4000 | -3.6 | 20.0 |
| Di-n-butyl phthalate | Lin1 | | 1.548 | 0.0100 | 4710 | 4000 | 17.7 | 20.0 |
| Fluoranthene | Ave | 1.199 | 1.229 | 0.6000 | 4100 | 4000 | 2.5 | 20.0 |
| Benzidine | Lin1 | | 0.3088 | 0.0100 | 2190 | 4000 | -45.2* | 25.0 |
| Pyrene | Ave | 1.226 | 1.257 | 0.6000 | 4100 | 4000 | 2.5 | 20.0 |
| Butyl benzyl phthalate | Lin1 | | 0.6897 | 0.0100 | 4500 | 4000 | 12.5 | 20.0 |
| Bis(2-ethylhexyl) phthalate | Lin1 | | 0.9843 | 0.0100 | 4540 | 4000 | 13.5 | 20.0 |
| 3,3'-Dichlorobenzidine | Lin1 | | 0.4607 | 0.0100 | 4090 | 4000 | 2.2 | 20.0 |
| Benzo[a]anthracene | Ave | 1.123 | 1.126 | 0.8000 | 4010 | 4000 | 0.3 | 20.0 |
| Chrysene | Ave | 1.063 | 1.031 | 0.7000 | 3880 | 4000 | -3.0 | 20.0 |

FORM VII
GC/MS SEMI VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCVIS 480-274392/3 Calibration Date: 11/11/2015 12:49

Instrument ID: HP5973V Calib Start Date: 10/26/2015 19:36

GC Column: RXI-5Sil MS ID: 0.25(mm) Calib End Date: 10/26/2015 22:31

Lab File ID: V60044.D Conc. Units: ug/L

| ANALYTE | CURVE TYPE | AVE RRF | RRF | MIN RRF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Di-n-octyl phthalate | Lin1 | | 1.675 | 0.0100 | 4610 | 4000 | 15.1 | 20.0 |
| Benzo[b]fluoranthene | Lin1 | | 1.152 | 0.7000 | 4030 | 4000 | 0.8 | 20.0 |
| Benzo[k]fluoranthene | Lin1 | | 1.145 | 0.7000 | 4000 | 4000 | 0.0 | 20.0 |
| Benzo[a]pyrene | Lin1 | | 1.111 | 0.7000 | 4060 | 4000 | 1.6 | 20.0 |
| Indeno[1,2,3-cd]pyrene | Lin1 | | 1.388 | 0.5000 | 4400 | 4000 | 10.0 | 20.0 |
| Dibenz(a,h)anthracene | Lin1 | | 1.176 | 0.4000 | 4340 | 4000 | 8.5 | 20.0 |
| Benzo[g,h,i]perylene | Ave | 0.9852 | 1.147 | 0.5000 | 4660 | 4000 | 16.4 | 20.0 |
| 2-Fluorophenol (Surr) | Ave | 1.168 | 1.134 | 0.0100 | 3880 | 4000 | -2.9 | 25.0 |
| Phenol-d5 (Surr) | Ave | 1.436 | 1.321 | 0.0100 | 3680 | 4000 | -8.0 | 25.0 |
| Nitrobenzene-d5 (Surr) | Ave | 0.3649 | 0.4256 | 0.0100 | 4660 | 4000 | 16.6 | 25.0 |
| 2-Fluorobiphenyl | Ave | 1.359 | 1.431 | 0.0100 | 4210 | 4000 | 5.3 | 25.0 |
| 2,4,6-Tribromophenol (Surr) | Ave | 0.1525 | 0.1842 | 0.0100 | 4830 | 4000 | 20.8 | 25.0 |
| p-Terphenyl-d14 (Surr) | Ave | 0.8914 | 0.9139 | 0.0100 | 4100 | 4000 | 2.5 | 25.0 |

FORM VII
GC/MS SEMI VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCVIS 480-273506/3 | Calibration Date: 11/05/2015 10:42

Instrument ID: HP5973X | Calib Start Date: 10/23/2015 08:33

GC Column: RXI-5Sil MS ID: 0.25(mm) | Calib End Date: 10/23/2015 10:48

Lab File ID: X009014095.D | Conc. Units: ug/L

| ANALYTE | CURVE TYPE | AVE RRF | RRF | MIN RRF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| 1,4-Dioxane | Ave | 0.6195 | 0.6388 | 0.0100 | 51600 | 50000 | 3.1 | 50.0 |
| N-Nitrosodimethylamine | Ave | 0.7217 | 0.6399 | 0.0100 | 44300 | 50000 | -11.3 | 25.0 |
| Pyridine | Ave | 1.298 | 1.164 | 0.0100 | 44800 | 50000 | -10.4 | 50.0 |
| Benzaldehyde | Lin1 | | 0.4299 | 0.0100 | 40800 | 50000 | -18.4 | 40.0 |
| Phenol | Ave | 1.767 | 1.692 | 0.8000 | 47900 | 50000 | -4.3 | 20.0 |
| Aniline | Ave | 2.123 | 2.086 | 0.0100 | 49100 | 50000 | -1.8 | 50.0 |
| Bis(2-chloroethyl)ether | Ave | 1.423 | 1.388 | 0.7000 | 48800 | 50000 | -2.4 | 20.0 |
| 2-Chlorophenol | Ave | 1.452 | 1.418 | 0.8000 | 48800 | 50000 | -2.4 | 20.0 |
| n-Decane | Ave | 1.787 | 1.604 | 0.0100 | 44900 | 50000 | -10.2 | 40.0 |
| 1,3-Dichlorobenzene | Ave | 1.558 | 1.570 | 0.0100 | 50400 | 50000 | 0.8 | 20.0 |
| 1,4-Dichlorobenzene | Ave | 1.593 | 1.595 | 0.0100 | 50100 | 50000 | 0.1 | 20.0 |
| Benzyl alcohol | Ave | 0.9222 | 0.9150 | 0.0100 | 49600 | 50000 | -0.8 | 50.0 |
| 1,2-Dichlorobenzene | Ave | 1.489 | 1.477 | 0.0100 | 49600 | 50000 | -0.8 | 20.0 |
| 2-Methylphenol | Ave | 1.271 | 1.242 | 0.7000 | 48800 | 50000 | -2.3 | 20.0 |
| bis (2-chloroisopropyl) ether | Ave | 1.866 | 1.584 | 0.0100 | 42400 | 50000 | -15.1 | 20.0 |
| Indene | Ave | 0.7740 | 0.8537 | | 55200 | 50000 | 10.3 | |
| 4-Methylphenol | Ave | 1.315 | 1.266 | 0.6000 | 48200 | 50000 | -3.7 | 20.0 |
| N-Nitrosodi-n-propylamine | Ave | 0.9726 | 0.9126 | 0.5000 | 46900 | 50000 | -6.2 | 20.0 |
| Acetophenone | Ave | 1.858 | 1.811 | 0.0100 | 48700 | 50000 | -2.5 | 40.0 |
| Hexachloroethane | Ave | 0.6118 | 0.6065 | 0.3000 | 49600 | 50000 | -0.9 | 20.0 |
| Nitrobenzene | Ave | 0.3772 | 0.3526 | 0.2000 | 46700 | 50000 | -6.5 | 20.0 |
| Isophorone | Ave | 0.6697 | 0.6557 | 0.4000 | 49000 | 50000 | -2.1 | 20.0 |
| 2-Nitrophenol | Lin1 | | 0.1794 | 0.1000 | 44700 | 50000 | -10.6 | 20.0 |
| 2,4-Dimethylphenol | Ave | 0.3637 | 0.3607 | 0.2000 | 49600 | 50000 | -0.8 | 20.0 |
| Benzoic acid | Lin1 | | 0.1991 | 0.0100 | 37600 | 50000 | -24.8 | 25.0 |
| Bis(2-chloroethoxy)methane | Ave | 0.4257 | 0.4147 | 0.3000 | 48700 | 50000 | -2.6 | 20.0 |
| 2,4-Dichlorophenol | Ave | 0.3032 | 0.3081 | 0.2000 | 50800 | 50000 | 1.6 | 20.0 |
| 1,2,4-Trichlorobenzene | Ave | 0.3317 | 0.3428 | 0.0100 | 51700 | 50000 | 3.4 | 20.0 |
| Naphthalene | Ave | 0.998 | 1.026 | 0.7000 | 51400 | 50000 | 2.9 | 20.0 |
| 4-Chloroaniline | Ave | 0.4395 | 0.4512 | 0.0100 | 51300 | 50000 | 2.7 | 20.0 |
| 2,6-Dichlorophenol | Ave | 0.2992 | 0.3052 | 0.0100 | 51000 | 50000 | 2.0 | 50.0 |
| Hexachlorobutadiene | Ave | 0.1875 | 0.2004 | 0.0100 | 53400 | 50000 | 6.9 | 20.0 |
| Caprolactam | Lin1 | | 0.1001 | 0.0100 | 43500 | 50000 | -13.1 | 40.0 |
| 4-Chloro-3-methylphenol | Ave | 0.3038 | 0.2996 | 0.2000 | 49300 | 50000 | -1.4 | 20.0 |
| 2-Methylnaphthalene | Ave | 0.6663 | 0.6719 | 0.4000 | 50400 | 50000 | 0.8 | 20.0 |
| 1-Methylnaphthalene | Ave | 0.6059 | 0.6212 | 0.0100 | 51300 | 50000 | 2.5 | 40.0 |
| Hexachlorocyclopentadiene | Lin1 | | 0.4386 | 0.0500 | 50700 | 50000 | 1.4 | 20.0 |
| 1,2,4,5-Tetrachlorobenzene | Ave | 0.5602 | 0.5874 | 0.0100 | 52400 | 50000 | 4.8 | 40.0 |
| 2,4,6-Trichlorophenol | Lin1 | | 0.3941 | 0.2000 | 49500 | 50000 | -1.1 | 20.0 |
| 2,4,5-Trichlorophenol | Lin1 | | 0.4011 | 0.2000 | 48000 | 50000 | -4.1 | 20.0 |

FORM VII
GC/MS SEMI VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCVIS 480-273506/3 | Calibration Date: 11/05/2015 10:42

Instrument ID: HP5973X | Calib Start Date: 10/23/2015 08:33

GC Column: RXI-5Sil MS ID: 0.25(mm) | Calib End Date: 10/23/2015 10:48

Lab File ID: X009014095.D | Conc. Units: ug/L

| ANALYTE | CURVE TYPE | AVE RRF | RRF | MIN RRF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Biphenyl | Ave | 1.389 | 1.436 | 0.0100 | 51700 | 50000 | 3.4 | 40.0 |
| 2-Chloronaphthalene | Ave | 1.151 | 1.192 | 0.8000 | 51800 | 50000 | 3.6 | 25.0 |
| 2-Nitroaniline | Lin1 | | 0.3079 | 0.0100 | 43700 | 50000 | -12.7 | 20.0 |
| Dimethyl phthalate | Ave | 1.278 | 1.276 | 0.0100 | 49900 | 50000 | -0.2 | 20.0 |
| 1,3-Dinitrobenzene | Lin1 | | 0.1022 | 0.0100 | 41600 | 50000 | -16.9 | 50.0 |
| 2,6-Dinitrotoluene | Lin1 | | 0.2785 | 0.2000 | 44000 | 50000 | -12.1 | 20.0 |
| Acenaphthylene | Ave | 1.712 | 1.750 | 0.9000 | 51100 | 50000 | 2.2 | 20.0 |
| 3-Nitroaniline | Lin1 | | 0.3120 | 0.0100 | 44500 | 50000 | -10.9 | 20.0 |
| 2,4-Dinitrophenol | Lin1 | | 0.1617 | 0.0100 | 86700 | 100000 | -13.3 | 20.0 |
| Acenaphthene | Ave | 1.076 | 1.088 | 0.0100 | 50500 | 50000 | 1.1 | 20.0 |
| 4-Nitrophenol | Lin1 | | 0.1593 | 0.0100 | 89700 | 100000 | -10.3 | 20.0 |
| 2,4-Dinitrotoluene | Lin1 | | 0.3620 | 0.0100 | 43100 | 50000 | -13.8 | 20.0 |
| Dibenzofuran | Ave | 1.583 | 1.605 | 0.8000 | 50700 | 50000 | 1.3 | 20.0 |
| 2,3,4,6-Tetrachlorophenol | Lin1 | | 0.3072 | 0.0100 | 48200 | 50000 | -3.6 | 40.0 |
| Diethyl phthalate | Ave | 1.219 | 1.196 | 0.0100 | 49100 | 50000 | -1.9 | 20.0 |
| Hexadecane | Lin1 | | 0.8266 | 0.0100 | 48000 | 50000 | -3.9 | 40.0 |
| 4-Chlorophenyl phenyl ether | Ave | 0.6446 | 0.6530 | 0.4000 | 50600 | 50000 | 1.3 | 20.0 |
| 4-Nitroaniline | Lin1 | | 0.3196 | 0.0100 | 45000 | 50000 | -9.9 | 20.0 |
| Fluorene | Ave | 1.265 | 1.286 | 0.9000 | 50800 | 50000 | 1.6 | 20.0 |
| 4,6-Dinitro-2-methylphenol | Lin1 | | 0.1427 | 0.0100 | 89100 | 100000 | -10.9 | 20.0 |
| Diphenylamine | Ave | 0.6469 | 0.6769 | 0.0100 | 89500 | 85500 | 4.6 | 50.0 |
| N-Nitrosodiphenylamine | Ave | 0.5531 | 0.5788 | 0.0100 | 105000 | 100000 | 4.6 | 20.0 |
| 1,2-Diphenylhydrazine | Ave | 1.235 | 1.189 | 0.0100 | 48100 | 50000 | -3.7 | 25.0 |
| trans-Azobenzene | Ave | 0.7660 | 0.7725 | 0.0100 | 50400 | 50000 | 0.8 | 40.0 |
| 4-Bromophenyl phenyl ether | Ave | 0.2333 | 0.2525 | 0.1000 | 54100 | 50000 | 8.2 | 20.0 |
| Hexachlorobenzene | Ave | 0.2443 | 0.2639 | 0.1000 | 54000 | 50000 | 8.0 | 20.0 |
| Atrazine | Lin1 | | 0.3434 | 0.0100 | 47000 | 50000 | -5.9 | 25.0 |
| Pentachlorophenol | Lin1 | | 0.1493 | 0.0500 | 108000 | 100000 | 7.7 | 20.0 |
| n-Octadecane | Ave | 0.5630 | 0.5156 | 0.0100 | 45800 | 50000 | -8.4 | 40.0 |
| Phenanthrene | Lin1 | | 1.127 | 0.7000 | 53900 | 50000 | 7.7 | 20.0 |
| Anthracene | Lin1 | | 1.132 | 0.7000 | 53700 | 50000 | 7.5 | 20.0 |
| Carbazole | Ave | 1.047 | 1.041 | 0.0100 | 49700 | 50000 | -0.6 | 20.0 |
| Di-n-butyl phthalate | Ave | 1.196 | 1.200 | 0.0100 | 50200 | 50000 | 0.3 | 20.0 |
| Fluoranthene | Ave | 1.171 | 1.206 | 0.6000 | 51500 | 50000 | 3.0 | 20.0 |
| Benzidine | Lin1 | | 0.3350 | 0.0100 | 39700 | 50000 | -20.6 | 25.0 |
| Pyrene | Ave | 1.150 | 1.172 | 0.6000 | 51000 | 50000 | 1.9 | 20.0 |
| Butyl benzyl phthalate | Lin1 | | 0.5391 | 0.0100 | 48100 | 50000 | -3.9 | 20.0 |
| Bis(2-ethylhexyl) phthalate | Lin1 | | 0.7597 | 0.0100 | 48500 | 50000 | -3.1 | 20.0 |
| 3,3'-Dichlorobenzidine | Lin1 | | 0.4446 | 0.0100 | 51000 | 50000 | 2.0 | 20.0 |
| Benzo[a]anthracene | Ave | 1.131 | 1.143 | 0.8000 | 50500 | 50000 | 1.0 | 20.0 |
| Chrysene | Ave | 1.074 | 1.090 | 0.7000 | 50700 | 50000 | 1.5 | 20.0 |

FORM VII
GC/MS SEMI VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCVIS 480-273506/3 Calibration Date: 11/05/2015 10:42

Instrument ID: HP5973X Calib Start Date: 10/23/2015 08:33

GC Column: RXI-5Sil MS ID: 0.25(mm) Calib End Date: 10/23/2015 10:48

Lab File ID: X009014095.D Conc. Units: ug/L

| ANALYTE | CURVE TYPE | AVE RRF | RRF | MIN RRF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Di-n-octyl phthalate | Lin1 | | 1.312 | 0.0100 | 50500 | 50000 | 1.0 | 20.0 |
| Benzo[b]fluoranthene | Lin1 | | 1.279 | 0.7000 | 54400 | 50000 | 8.9 | 20.0 |
| Benzo[k]fluoranthene | Ave | 1.215 | 1.183 | 0.7000 | 48700 | 50000 | -2.6 | 20.0 |
| Benzo[a]pyrene | Ave | 1.122 | 1.151 | 0.7000 | 51300 | 50000 | 2.5 | 20.0 |
| Dibenz(a,h)anthracene | Ave | 1.082 | 1.135 | 0.4000 | 52500 | 50000 | 5.0 | 20.0 |
| Indeno[1,2,3-cd]pyrene | Ave | 1.269 | 1.337 | 0.5000 | 52700 | 50000 | 5.3 | 20.0 |
| Benzo[g,h,i]perylene | Ave | 1.054 | 1.126 | 0.5000 | 53400 | 50000 | 6.8 | 20.0 |
| 2-Fluorophenol (Surr) | Ave | 1.450 | 1.430 | 0.0100 | 49300 | 50000 | -1.4 | 25.0 |
| Phenol-d5 (Surr) | Ave | 1.696 | 1.664 | 0.0100 | 49100 | 50000 | -1.9 | 25.0 |
| Nitrobenzene-d5 (Surr) | Ave | 0.3798 | 0.3391 | 0.0100 | 44600 | 50000 | -10.7 | 25.0 |
| 2-Fluorobiphenyl | Ave | 1.321 | 1.383 | 0.0100 | 52300 | 50000 | 4.6 | 25.0 |
| 2,4,6-Tribromophenol (Surr) | Lin1 | | 0.1224 | 0.0100 | 50700 | 50000 | 1.4 | 25.0 |
| p-Terphenyl-d14 (Surr) | Ave | 0.8371 | 0.8520 | 0.0100 | 50900 | 50000 | 1.8 | 25.0 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1
SDG No.:
Client Sample ID: | Lab Sample ID: MB 480-273073/1-A
Matrix: Waste | Lab File ID: X009014105.D
Analysis Method: 8270D | Date Collected:
Extract. Method: 3580A | Date Extracted: 11/04/2015 13:45
Sample wt/vol: 0.10(g) | Date Analyzed: 11/05/2015 15:13
Con. Extract Vol.: 1(mL) | Dilution Factor: 1
Injection Volume: 1(uL) | Level: (low/med) Low
% Moisture: | GPC Cleanup:(Y/N) N
Analysis Batch No.: 273506 | Units: ug/Kg

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | ND | | 3400 | 40 |
| 208-96-8 | Acenaphthylene | ND | | 3400 | 28 |
| 120-12-7 | Anthracene | ND | | 3400 | 86 |
| 56-55-3 | Benzo[a]anthracene | ND | | 3400 | 58 |
| 50-32-8 | Benzo[a]pyrene | ND | | 3400 | 82 |
| 205-99-2 | Benzo[b]fluoranthene | ND | | 3400 | 66 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | | 3400 | 40 |
| 207-08-9 | Benzo[k]fluoranthene | ND | | 3400 | 38 |
| 218-01-9 | Chrysene | ND | | 3400 | 34 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | | 3400 | 40 |
| 206-44-0 | Fluoranthene | ND | | 3400 | 48 |
| 86-73-7 | Fluorene | ND | | 3400 | 78 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | | 3400 | 94 |
| 91-20-3 | Naphthalene | ND | | 3400 | 56 |
| 85-01-8 | Phenanthrene | ND | | 3400 | 70 |
| 129-00-0 | Pyrene | ND | | 3400 | 22 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 98 | | 37-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 86 | | 34-132 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 99 | | 65-153 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: | Lab Sample ID: MB 480-273586/1-A

Matrix: Water | Lab File ID: V54275.D

Analysis Method: 8270D | Date Collected:

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 250(mL) | Date Analyzed: 11/09/2015 14:26

Con. Extract Vol.: 1(mL) | Dilution Factor: 1

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273910 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | ND | | 5.0 | 0.41 |
| 208-96-8 | Acenaphthylene | ND | | 5.0 | 0.38 |
| 120-12-7 | Anthracene | ND | | 5.0 | 0.28 |
| 56-55-3 | Benzo[a]anthracene | ND | | 5.0 | 0.36 |
| 50-32-8 | Benzo[a]pyrene | ND | | 5.0 | 0.47 |
| 205-99-2 | Benzo[b]fluoranthene | ND | | 5.0 | 0.34 |
| 191-24-2 | Benzo[g,h,i]perylene | ND | | 5.0 | 0.35 |
| 207-08-9 | Benzo[k]fluoranthene | ND | | 5.0 | 0.73 |
| 218-01-9 | Chrysene | ND | | 5.0 | 0.33 |
| 53-70-3 | Dibenz(a,h)anthracene | ND | | 5.0 | 0.42 |
| 206-44-0 | Fluoranthene | ND | | 5.0 | 0.40 |
| 86-73-7 | Fluorene | ND | | 5.0 | 0.36 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | ND | | 5.0 | 0.47 |
| 91-20-3 | Naphthalene | ND | | 5.0 | 0.76 |
| 85-01-8 | Phenanthrene | ND | | 5.0 | 0.44 |
| 129-00-0 | Pyrene | ND | | 5.0 | 0.34 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 86 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 82 | | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 99 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: | Lab Sample ID: LCS 480-273073/2-A

Matrix: Waste | Lab File ID: X009014106.D

Analysis Method: 8270D | Date Collected:

Extract. Method: 3580A | Date Extracted: 11/04/2015 13:45

Sample wt/vol: 0.10(g) | Date Analyzed: 11/05/2015 15:40

Con. Extract Vol.: 1(mL) | Dilution Factor: 1

Injection Volume: 1(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273506 | Units: ug/Kg

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 460000 | | 3400 | 40 |
| 208-96-8 | Acenaphthylene | 453000 | | 3400 | 28 |
| 120-12-7 | Anthracene | 517000 | | 3400 | 86 |
| 56-55-3 | Benzo[a]anthracene | 502000 | | 3400 | 58 |
| 50-32-8 | Benzo[a]pyrene | 497000 | | 3400 | 82 |
| 205-99-2 | Benzo[b]fluoranthene | 488000 | | 3400 | 66 |
| 191-24-2 | Benzo[g,h,i]perylene | 508000 | | 3400 | 40 |
| 207-08-9 | Benzo[k]fluoranthene | 514000 | | 3400 | 38 |
| 218-01-9 | Chrysene | 492000 | | 3400 | 34 |
| 53-70-3 | Dibenz(a,h)anthracene | 506000 | | 3400 | 40 |
| 206-44-0 | Fluoranthene | 503000 | | 3400 | 48 |
| 86-73-7 | Fluorene | 483000 | | 3400 | 78 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | 505000 | | 3400 | 94 |
| 91-20-3 | Naphthalene | 438000 | | 3400 | 56 |
| 85-01-8 | Phenanthrene | 518000 | | 3400 | 70 |
| 129-00-0 | Pyrene | 516000 | | 3400 | 22 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 93 | | 37-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 79 | | 34-132 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 102 | | 65-153 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: | Lab Sample ID: LCS 480-273586/2-A

Matrix: Water | Lab File ID: V54276.D

Analysis Method: 8270D | Date Collected:

Extract. Method: 3510C | Date Extracted: 11/06/2015 12:33

Sample wt/vol: 250(mL) | Date Analyzed: 11/09/2015 14:56

Con. Extract Vol.: 1(mL) | Dilution Factor: 1

Injection Volume: 2(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273910 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 14.5 | | 5.0 | 0.41 |
| 208-96-8 | Acenaphthylene | 14.7 | | 5.0 | 0.38 |
| 120-12-7 | Anthracene | 14.8 | | 5.0 | 0.28 |
| 56-55-3 | Benzo[a]anthracene | 15.0 | | 5.0 | 0.36 |
| 50-32-8 | Benzo[a]pyrene | 14.5 | | 5.0 | 0.47 |
| 205-99-2 | Benzo[b]fluoranthene | 14.5 | | 5.0 | 0.34 |
| 191-24-2 | Benzo[g,h,i]perylene | 17.1 | | 5.0 | 0.35 |
| 207-08-9 | Benzo[k]fluoranthene | 14.4 | | 5.0 | 0.73 |
| 218-01-9 | Chrysene | 15.0 | | 5.0 | 0.33 |
| 53-70-3 | Dibenz(a,h)anthracene | 15.9 | | 5.0 | 0.42 |
| 206-44-0 | Fluoranthene | 15.4 | | 5.0 | 0.40 |
| 86-73-7 | Fluorene | 15.0 | | 5.0 | 0.36 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | 15.8 | | 5.0 | 0.47 |
| 91-20-3 | Naphthalene | 12.8 | | 5.0 | 0.76 |
| 85-01-8 | Phenanthrene | 14.9 | | 5.0 | 0.44 |
| 129-00-0 | Pyrene | 15.5 | | 5.0 | 0.34 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 83 | | 48-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 83 | | 46-120 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 98 | | 67-150 |

FORM I
GC/MS SEMI VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: | Lab Sample ID: LCSD 480-273073/3-A

Matrix: Waste | Lab File ID: X009014107.D

Analysis Method: 8270D | Date Collected:

Extract. Method: 3580A | Date Extracted: 11/04/2015 13:45

Sample wt/vol: 0.10(g) | Date Analyzed: 11/05/2015 16:07

Con. Extract Vol.: 1(mL) | Dilution Factor: 1

Injection Volume: 1(uL) | Level: (low/med) Low

% Moisture: | GPC Cleanup:(Y/N) N

Analysis Batch No.: 273506 | Units: ug/Kg

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 83-32-9 | Acenaphthene | 455000 | | 3400 | 40 |
| 208-96-8 | Acenaphthylene | 452000 | | 3400 | 28 |
| 120-12-7 | Anthracene | 492000 | | 3400 | 86 |
| 56-55-3 | Benzo[a]anthracene | 469000 | | 3400 | 58 |
| 50-32-8 | Benzo[a]pyrene | 471000 | | 3400 | 82 |
| 205-99-2 | Benzo[b]fluoranthene | 466000 | | 3400 | 66 |
| 191-24-2 | Benzo[g,h,i]perylene | 482000 | | 3400 | 40 |
| 207-08-9 | Benzo[k]fluoranthene | 491000 | | 3400 | 38 |
| 218-01-9 | Chrysene | 467000 | | 3400 | 34 |
| 53-70-3 | Dibenz(a,h)anthracene | 481000 | | 3400 | 40 |
| 206-44-0 | Fluoranthene | 486000 | | 3400 | 48 |
| 86-73-7 | Fluorene | 469000 | | 3400 | 78 |
| 193-39-5 | Indeno[1,2,3-cd]pyrene | 474000 | | 3400 | 94 |
| 91-20-3 | Naphthalene | 428000 | | 3400 | 56 |
| 85-01-8 | Phenanthrene | 495000 | | 3400 | 70 |
| 129-00-0 | Pyrene | 478000 | | 3400 | 22 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 321-60-8 | 2-Fluorobiphenyl | 93 | | 37-120 |
| 4165-60-0 | Nitrobenzene-d5 (Surr) | 82 | | 34-132 |
| 1718-51-0 | p-Terphenyl-d14 (Surr) | 96 | | 65-153 |

GC/MS SEMI VOA ANALYSIS RUN LOG

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5973V Start Date: 10/26/2015 19:07

Analysis Batch Number: 271208 End Date: 10/27/2015 06:08

| LAB SAMPLE ID | CLIENT SAMPLE ID | DATE ANALYZED | DILUTION FACTOR | LAB FILE ID | COLUMN ID |
|---|---|---|---|---|---|
| DFTPP 480-271208/2 | | 10/26/2015 19:07 | 1 | V53779.D | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/3 | | 10/26/2015 19:36 | 1 | V53780.D | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/4 | | 10/26/2015 20:05 | 1 | V53781.D | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/5 | | 10/26/2015 20:35 | 1 | V53782.D | RXI-5Sil MS 0.25(mm) |
| ICIS 480-271208/6 | | 10/26/2015 21:04 | 1 | V53783.D | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/7 | | 10/26/2015 21:33 | 1 | V53784.D | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/8 | | 10/26/2015 22:02 | 1 | V53785.D | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/9 | | 10/26/2015 22:31 | 1 | V53786.D | RXI-5Sil MS 0.25(mm) |
| ICV 480-271208/10 | | 10/26/2015 23:00 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/11 | | 10/26/2015 23:29 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/12 | | 10/26/2015 23:57 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/13 | | 10/27/2015 00:26 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/14 | | 10/27/2015 00:55 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/15 | | 10/27/2015 01:23 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/16 | | 10/27/2015 01:52 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/17 | | 10/27/2015 02:20 | 1 | | RXI-5Sil MS 0.25(mm) |
| ICV 480-271208/18 | | 10/27/2015 02:49 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/19 | | 10/27/2015 03:17 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/20 | | 10/27/2015 03:45 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/21 | | 10/27/2015 04:14 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/22 | | 10/27/2015 04:42 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/23 | | 10/27/2015 05:11 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/24 | | 10/27/2015 05:39 | 1 | | RXI-5Sil MS 0.25(mm) |
| IC 480-271208/25 | | 10/27/2015 06:08 | 1 | | RXI-5Sil MS 0.25(mm) |

GC/MS SEMI VOA ANALYSIS RUN LOG

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5973V Start Date: 11/09/2015 12:27

Analysis Batch Number: 273910 End Date: 11/09/2015 23:22

| LAB SAMPLE ID | CLIENT SAMPLE ID | DATE ANALYZED | DILUTION FACTOR | LAB FILE ID | COLUMN ID |
|---|---|---|---|---|---|
| DFTPP 480-273910/2 | | 11/09/2015 12:27 | 1 | V54271.D | RXI-5Sil MS 0.25(mm) |
| CCVIS 480-273910/3 | | 11/09/2015 12:57 | 1 | V54272.D | RXI-5Sil MS 0.25(mm) |
| RL 480-273910/4 | | 11/09/2015 13:26 | 1 | | RXI-5Sil MS 0.25(mm) |
| CCV 480-273910/5 | | 11/09/2015 13:56 | 1 | | RXI-5Sil MS 0.25(mm) |
| MB 480-273586/1-A | | 11/09/2015 14:26 | 1 | V54275.D | RXI-5Sil MS 0.25(mm) |
| LCS 480-273586/2-A | | 11/09/2015 14:56 | 1 | V54276.D | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/09/2015 15:25 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/09/2015 15:55 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/09/2015 20:53 | 5 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/09/2015 21:23 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/09/2015 21:53 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/09/2015 22:23 | 10 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/09/2015 22:52 | 5 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/09/2015 23:22 | 1 | | RXI-5Sil MS 0.25(mm) |

GC/MS SEMI VOA ANALYSIS RUN LOG

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5973V Start Date: 11/10/2015 10:38

Analysis Batch Number: 273999 End Date: 11/10/2015 21:15

| LAB SAMPLE ID | CLIENT SAMPLE ID | DATE ANALYZED | DILUTION FACTOR | LAB FILE ID | COLUMN ID |
|---|---|---|---|---|---|
| DFTPP 480-273999/2 | | 11/10/2015 10:38 | 1 | V60001.D | RXI-5Sil MS 0.25(mm) |
| CCVIS 480-273999/3 | | 11/10/2015 11:07 | 1 | V60002.D | RXI-5Sil MS 0.25(mm) |
| RL 480-273999/4 | | 11/10/2015 11:36 | 1 | | RXI-5Sil MS 0.25(mm) |
| CCV 480-273999/5 | | 11/10/2015 12:05 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/10/2015 12:34 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/10/2015 13:03 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/10/2015 13:32 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/10/2015 14:00 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/10/2015 14:29 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/10/2015 14:58 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/10/2015 15:27 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/10/2015 15:56 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/10/2015 16:25 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/10/2015 16:54 | 1 | | RXI-5Sil MS 0.25(mm) |
| 480-89467-2 | WW-02-030515-1557 | 11/10/2015 17:23 | 20 | V60015.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-5 | WW-01-030515-1352 | 11/10/2015 17:52 | 20 | V60016.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-6 | WW-01-042815-1600 | 11/10/2015 18:21 | 20 | V60017.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-8 | WW-01-050715-1600 | 11/10/2015 18:50 | 20 | V60018.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-10 | P-01-030515-1557 | 11/10/2015 19:19 | 20 | V60019.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-13 | P-01-051315-1530 | 11/10/2015 19:48 | 20 | V60020.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-18 | P-01-101514-0910 | 11/10/2015 20:17 | 20 | V60021.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-19 | P-01-100814-1120 | 11/10/2015 20:46 | 20 | V60022.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-20 | P-01-013015-0915 | 11/10/2015 21:15 | 20 | V60023.D | RXI-5Sil MS 0.25(mm) |

GC/MS SEMI VOA ANALYSIS RUN LOG

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5973V Start Date: 11/11/2015 12:20

Analysis Batch Number: 274392 End Date: 11/11/2015 22:57

| LAB SAMPLE ID | CLIENT SAMPLE ID | DATE ANALYZED | DILUTION FACTOR | LAB FILE ID | COLUMN ID |
|---|---|---|---|---|---|
| DFTPP 480-274392/2 | | 11/11/2015 12:20 | 1 | V60043.D | RXI-5Sil MS 0.25(mm) |
| CCVIS 480-274392/3 | | 11/11/2015 12:49 | 1 | V60044.D | RXI-5Sil MS 0.25(mm) |
| RL 480-274392/4 | | 11/11/2015 13:18 | 1 | | RXI-5Sil MS 0.25(mm) |
| 480-89467-6 DL | WW-01-042815-1600 DL | 11/11/2015 13:47 | 100 | V60046.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-8 DL | WW-01-050715-1600 DL | 11/11/2015 14:16 | 100 | V60047.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-20 DL | P-01-013015-0915 DL | 11/11/2015 14:45 | 100 | V60048.D | RXI-5Sil MS 0.25(mm) |
| CCV 480-274392/8 | | 11/11/2015 15:14 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 15:43 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 16:12 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 16:41 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 17:10 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 17:39 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 18:08 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 18:37 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 19:06 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 19:35 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 20:04 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 20:33 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 21:02 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 21:31 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 22:00 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 22:28 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/11/2015 22:57 | 1 | | RXI-5Sil MS 0.25(mm) |

GC/MS SEMI VOA ANALYSIS RUN LOG

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5973X Start Date: 10/23/2015 08:06

Analysis Batch Number: 270613 End Date: 10/23/2015 11:46

| LAB SAMPLE ID | CLIENT SAMPLE ID | DATE ANALYZED | DILUTION FACTOR | LAB FILE ID | COLUMN ID |
|---|---|---|---|---|---|
| DFTPP 480-270613/2 | | 10/23/2015 08:06 | 1 | X009013898.D | RXI-5Sil MS 0.25(mm) |
| IC 480-270613/3 | | 10/23/2015 08:33 | 1 | X009013899.D | RXI-5Sil MS 0.25(mm) |
| IC 480-270613/4 | | 10/23/2015 09:00 | 1 | X009013900.D | RXI-5Sil MS 0.25(mm) |
| ICIS 480-270613/5 | | 10/23/2015 09:27 | 1 | X009013901.D | RXI-5Sil MS 0.25(mm) |
| IC 480-270613/6 | | 10/23/2015 09:54 | 1 | X009013902.D | RXI-5Sil MS 0.25(mm) |
| IC 480-270613/7 | | 10/23/2015 10:21 | 1 | X009013903.D | RXI-5Sil MS 0.25(mm) |
| IC 480-270613/8 | | 10/23/2015 10:48 | 1 | X009013904.D | RXI-5Sil MS 0.25(mm) |
| ICV 480-270613/9 | | 10/23/2015 11:46 | 1 | | RXI-5Sil MS 0.25(mm) |

GC/MS SEMI VOA ANALYSIS RUN LOG

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5973X Start Date: 11/05/2015 10:14

Analysis Batch Number: 273506 End Date: 11/05/2015 20:33

| LAB SAMPLE ID | CLIENT SAMPLE ID | DATE ANALYZED | DILUTION FACTOR | LAB FILE ID | COLUMN ID |
|---|---|---|---|---|---|
| DFTPP 480-273506/2 | | 11/05/2015 10:14 | 1 | X009014094.D | RXI-5Sil MS 0.25(mm) |
| CCVIS 480-273506/3 | | 11/05/2015 10:42 | 1 | X009014095.D | RXI-5Sil MS 0.25(mm) |
| RL 480-273506/11 | | 11/05/2015 14:19 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/05/2015 14:46 | 25 | | RXI-5Sil MS 0.25(mm) |
| MB 480-273073/1-A | | 11/05/2015 15:13 | 1 | X009014105.D | RXI-5Sil MS 0.25(mm) |
| LCS 480-273073/2-A | | 11/05/2015 15:40 | 1 | X009014106.D | RXI-5Sil MS 0.25(mm) |
| LCSD 480-273073/3-A | | 11/05/2015 16:07 | 1 | X009014107.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-14 | OS-01-031815-1530 | 11/05/2015 16:34 | 100 | X009014108.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-15 | OS-01-042415-1600 | 11/05/2015 17:01 | 10 | X009014109.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-16 | OS-01-042815-1600 | 11/05/2015 17:28 | 200 | X009014110.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-17 | OS-01-050715-1630 | 11/05/2015 17:55 | 100 | X009014111.D | RXI-5Sil MS 0.25(mm) |
| 480-89467-22 | OS-01-101514-0910 | 11/05/2015 18:21 | 100 | X009014112.D | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/05/2015 18:47 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/05/2015 19:14 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/05/2015 19:40 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/05/2015 20:06 | 1 | | RXI-5Sil MS 0.25(mm) |
| ZZZZZ | | 11/05/2015 20:33 | 1 | | RXI-5Sil MS 0.25(mm) |

# GC/MS SEMI VOA BATCH WORKSHEET

Lab Name: TestAmerica Buffalo  Job No.: 480-89467-1

SDG No.:

Batch Number: 273073  Batch Start Date: 11/04/15 13:44  Batch Analyst: Myers, Carmela A

Batch Method: 3580A  Batch End Date:

| Lab Sample ID | Client Sample ID | Method Chain | Basis | InitialAmount | FinalAmount | O_8270/625LCS 00048 | O_8270surr 00036 | | |
|---|---|---|---|---|---|---|---|---|---|
| MB 480-273073/1 | | 3580A, 8270D | | 0.10 g | 1 mL | | 1 mL | | |
| LCS 480-273073/2 | | 3580A, 8270D | | 0.10 g | 1 mL | 1 mL | 1 mL | | |
| LCSD 480-273073/3 | | 3580A, 8270D | | 0.10 g | 1 mL | 1 mL | 1 mL | | |
| 480-89467-A-14 | OS-01-031815-153 0 | 3580A, 8270D | T | +0.13 g | 1 mL | | 1 mL | | |
| 480-89467-A-15 | OS-01-042415-160 0 | 3580A, 8270D | T | +0.11 g | 1 mL | | 1 mL | | |
| 480-89467-A-16 | OS-01-042815-160 0 | 3580A, 8270D | T | +0.12 g | 1 mL | | 1 mL | | |
| 480-89467-A-17 | OS-01-050715-163 0 | 3580A, 8270D | T | +0.12 g | 1 mL | | 1 mL | | |
| 480-89467-A-22 | OS-01-101514-091 0 | 3580A, 8270D | T | +0.13 g | 1 mL | | 1 mL | | |

| Batch Notes | |
|---|---|
| Balance ID | 40029 |
| Prep Solvent Volume Used | 20 mL |
| Solvent Lot # | 3061608 |
| Solvent Name | MeCl2 |
| Person who performed Spike | CM |
| Vial Lot Number | 68828 |

| Basis | Basis Description |
|---|---|
| T | Total/NA |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.



655

GC/MS SEMI VOA BATCH WORKSHEET

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Batch Number: 273586 Batch Start Date: 11/06/15 12:32 Batch Analyst: Hartigan, Connor P

Batch Method: 3510C Batch End Date:

| Lab Sample ID | Client Sample ID | Method Chain | Basis | ReceivedpH | GrossWeight | TareWeight | InitialAmount | FinalAmount | FirstAdjustpH |
|---|---|---|---|---|---|---|---|---|---|
| MB 480-273586/1 | | 3510C, 8270D | | 7 SU | | | 250 mL | 1 mL | <2 SU |
| LCS 480-273586/2 | | 3510C, 8270D | | 7 SU | | | 250 mL | 1 mL | <2 SU |
| 480-89467-B-2 | WW-02-030515-1557 | 3510C, 8270D | T | 3 SU | 439.2 g | 181.2 g | 258 mL | 1 mL | <2 SU |
| 480-89467-B-5 | WW-01-030515-1352 | 3510C, 8270D | T | 3 SU | 440.6 g | 181.7 g | 258.9 mL | 1 mL | <2 SU |
| 480-89467-B-6 | WW-01-042815-1600 | 3510C, 8270D | T | 3 SU | 440.1 g | 180.4 g | 259.7 mL | 1 mL | <2 SU |
| 480-89467-B-8 | WW-01-050715-1600 | 3510C, 8270D | T | 3 SU | 438.6 g | 179.5 g | 259.1 mL | 1 mL | <2 SU |
| 480-89467-B-10 | P-01-030515-1557 | 3510C, 8270D | T | 3 SU | 443.2 g | 185.7 g | 257.5 mL | 1 mL | <2 SU |
| 480-89467-B-13 | P-01-051315-1530 | 3510C, 8270D | T | 4 SU | 422.3 g | 179.9 g | 242.4 mL | 1 mL | <2 SU |
| 480-89467-B-18 | P-01-101514-0910 | 3510C, 8270D | T | 7 SU | 445.7 g | 178.7 g | 267 mL | 1 mL | <2 SU |
| 480-89467-B-19 | P-01-100814-1120 | 3510C, 8270D | T | 7 SU | 436.7 g | 179.2 g | 257.5 mL | 1 mL | <2 SU |
| 480-89467-B-20 | P-01-013015-0915 | 3510C, 8270D | T | 3 SU | 437.1 g | 181.6 g | 255.5 mL | 1 mL | <2 SU |

| Lab Sample ID | Client Sample ID | Method Chain | Basis | SecondAdjustpH | O_8270LL_LCS 00032 | O_8270LLsurr 00034 | AnalyeisComment | | |
|---|---|---|---|---|---|---|---|---|---|
| MB 480-273586/1 | | 3510C, 8270D | | >11 SU | | 1 mL | | | |
| LCS 480-273586/2 | | 3510C, 8270D | | >11 SU | 1 mL | 1 mL | | | |
| 480-89467-B-2 | WW-02-030515-1557 | 3510C, 8270D | T | >11 SU | | 1 mL | Density = 1.00 g/mL | | |
| 480-89467-B-5 | WW-01-030515-1352 | 3510C, 8270D | T | >11 SU | | 1 mL | Density = 1.00 g/mL | | |
| 480-89467-B-6 | WW-01-042815-1600 | 3510C, 8270D | T | >11 SU | | 1 mL | Density = 1.00 g/mL | | |
| 480-89467-B-8 | WW-01-050715-1600 | 3510C, 8270D | T | >11 SU | | 1 mL | Density = 1.00 g/mL | | |
| 480-89467-B-10 | P-01-030515-1557 | 3510C, 8270D | T | >11 SU | | 1 mL | Density = 1.00 g/mL | | |
| 480-89467-B-13 | P-01-051315-1530 | 3510C, 8270D | T | >11 SU | | 1 mL | Density = 1.00 g/mL | | |
| 480-89467-B-18 | P-01-101514-0910 | 3510C, 8270D | T | >11 SU | | 1 mL | Density = 1.00 g/mL | | |
| 480-89467-B-19 | P-01-100814-1120 | 3510C, 8270D | T | >11 SU | | 1 mL | Density = 1.00 g/mL | | |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

GC/MS SEMI VOA BATCH WORKSHEET

Lab Name: TestAmerica Buffalo  Job No.: 480-89467-1

SDG No.:

Batch Number: 273586  Batch Start Date: 11/06/15 12:32  Batch Analyst: Hartigan, Connor P

Batch Method: 3510C  Batch End Date:

| Lab Sample ID | Client Sample ID | Method Chain | Basis | SecondAdjustpH | C_8270LL_LCS 00032 | C_8270LLsurr 00034 | AnalysisComment | | |
|---|---|---|---|---|---|---|---|---|---|
| 480-89467-B-20 | P-01-013015-0915 | 3510C, 8270D | T | >11 SU | | 1 mL | Density = 1.00 g/mL | | |

| Batch Notes | |
|---|---|
| Acid used for pH adjustment | 1:1 Sulfuric |
| Acid used for pH adjust Lot # | 2810093 |
| Balance ID | 1129012602 |
| Base used for pH adjustment | Sodium Hydroxide |
| Base used for pH adjust Lot # | 3021633 |
| Person's name who did the concentration | CH |
| Final Concentrator Volume | 1 mL |
| Glass Wool ID | 11414001 |
| Na2SO4 Lot Number | 2858178 |
| pH Paper Lot Number | HC554612 |
| Pipette ID | J24885D Tip Lot # E1605931 |
| Prep Solvent Lot # | 3076037 |
| Prep Solvent Name | MeCl2 |
| Prep Solvent Volume Used | 120 mL |
| Person's name who did the prep | CH, TL |
| Person's name who witnessed reagent drop | CH |
| Person who performed Spike | CH |
| Person who witnessed spiking | CH |
| Sufficient volume for MS/MSD? | YES |
| Vial Lot Number | 68828 |

| Basis | Basis Description |
|---|---|
| T | Total/NA |

The pound sign (#) in the amount added field denotes that the reagent was used undiluted. All calculations are performed using the stated concentration for this reagent.

# Method 8021B

## Volatile Organic Compounds (GC) by Method 8021B

FORM II
GC VOA SURROGATE RECOVERY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Matrix: Water Level: Low

GC Column (1): RTX-VGC ID: 0.53(mm)

| Client Sample ID | Lab Sample ID | TFT1 # | BFB1 # |
|---|---|---|---|
| WW-01-101514-1120 | 480-89467-1 | 139 | 122 |
| WW-01-031915-1550 | 480-89467-3 | 138 | 125 |
| WW-01-041415-1640 | 480-89467-4 | 104 | 96 |
| WW-01-050615-1552 | 480-89467-7 | 125 | 116 |
| WW-01-052015-1500 | 480-89467-9 | 109 | 91 |
| P-01-031315-1531 | 480-89467-11 | 94 | 88 |
| P-01-050615-1552 | 480-89467-12 | 135 | 123 |
| P-01-040115-1600 | 480-89467-21 | 131 | 125 |
| P-01-012215-0948 | 480-89467-23 | 124 | 114 |
| WW-01-031315-1531 | 480-89467-24 | 146 X | 126 |
| | MB 480-273207/3 | 128 | 123 |
| | LCS 480-273207/4 | 127 | 119 |
| | LCSD 480-273207/5 | 133 | 125 |

| | QC LIMITS |
|---|---|
| TFT = a,a,a-Trifluorotoluene | 63-145 |
| BFB = 4-Bromofluorobenzene | 64-141 |

# Column to be used to flag recovery values

FORM II 8021B

FORM IV
GC VOA METHOD BLANK SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: MB 480-273207/3

Matrix: Water Date Extracted: 11/05/2015 08:28

Lab File ID:(1) 3_69023.D Lab File ID:(2) 3_69023.D

Date Analyzed:(1) 11/05/2015 08:28 Date Analyzed:(2) 11/05/2015 08:28

Instrument ID:(1) HP5890-3 Instrument ID:(2) HP5890-3

GC Column:(1) RTX-VGC ID: 0.53(mm) GC Column:(2) RTX-VGC ID: 0.53(mm)

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES:

| CLIENT SAMPLE ID | LAB SAMPLE ID | DATE ANALYZED 1 | DATE ANALYZED 2 |
|---|---|---|---|
| | LCS 480-273207/4 | 11/05/2015 09:00 | 11/05/2015 09:00 |
| | LCSD 480-273207/5 | 11/05/2015 09:31 | 11/05/2015 09:31 |
| WW-01-101514-1120 | 480-89467-1 | 11/05/2015 11:33 | 11/05/2015 11:33 |
| WW-01-031915-1550 | 480-89467-3 | 11/05/2015 12:05 | 11/05/2015 12:05 |
| WW-01-041415-1640 | 480-89467-4 | 11/05/2015 12:38 | 11/05/2015 12:38 |
| WW-01-050615-1552 | 480-89467-7 | 11/05/2015 13:10 | 11/05/2015 13:10 |
| P-01-031315-1531 | 480-89467-11 | 11/05/2015 15:10 | 11/05/2015 15:10 |
| P-01-050615-1552 | 480-89467-12 | 11/05/2015 16:14 | 11/05/2015 16:14 |
| P-01-040115-1600 | 480-89467-21 | 11/05/2015 16:45 | 11/05/2015 16:45 |
| WW-01-052015-1500 | 480-89467-9 | 11/05/2015 18:41 | 11/05/2015 18:41 |
| P-01-012215-0948 | 480-89467-23 | 11/05/2015 19:13 | 11/05/2015 19:13 |
| WW-01-031315-1531 | 480-89467-24 | 11/05/2015 19:44 | 11/05/2015 19:44 |

FORM X
IDENTIFICATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-101514-1120 Lab Sample ID: 480-89467-1

Instrument ID (1): HP5890-3 Instrument ID (2): HP5890-3

Date Analyzed (1): 11/05/2015 11:33 Date Analyzed (2): 11/05/2015 11:33

GC Column (1): RTX-VGC ID: 0.53(mm) GC Column (2): RTX-VGC ID: 0.53(mm)

| ANALYTE | COL | PEAK | RT | RT WINDOW | | CONCENTRATION | | RPD |
|---|---|---|---|---|---|---|---|---|
| | | | | FROM | TO | PEAK | MEAN | |
| Benzene | 1 | | 3.49 | 3.42 | 3.56 | 320 | | 44.7 |
| | 2 | | 4.17 | 4.10 | 4.24 | 200 | | |
| Toluene | 1 | | 5.17 | 5.09 | 5.23 | 11 | | 143.4 |
| | 2 | | 6.36 | 6.28 | 6.42 | 65 | | |

FORM X
IDENTIFICATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-031915-1550 Lab Sample ID: 480-89467-3

Instrument ID (1): HP5890-3 Instrument ID (2): HP5890-3

Date Analyzed (1): 11/05/2015 12:05 Date Analyzed (2): 11/05/2015 12:05

GC Column (1): RTX-VGC ID: 0.53(mm) GC Column (2): RTX-VGC ID: 0.53(mm)

| ANALYTE | COL | PEAK | RT | RT WINDOW | | CONCENTRATION | | RPD |
|---|---|---|---|---|---|---|---|---|
| | | | | FROM | TO | PEAK | MEAN | |
| Benzene | 1 | | 3.50 | 3.42 | 3.56 | 1500 | | 27.6 |
| | 2 | | 4.17 | 4.10 | 4.24 | 1200 | | |
| Toluene | 1 | | 5.17 | 5.09 | 5.23 | 240 | | 44.3 |
| | 2 | | 6.35 | 6.28 | 6.42 | 380 | | |
| m,p-Xylene | 1 | | 7.86 | 7.76 | 7.90 | 75 | | 193.7 |
| | 2 | | 9.97 | 9.91 | 10.05 | 4700 | | |

FORM X
IDENTIFICATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-041415-1640 Lab Sample ID: 480-89467-4

Instrument ID (1): HP5890-3 Instrument ID (2): HP5890-3

Date Analyzed (1): 11/05/2015 12:38 Date Analyzed (2): 11/05/2015 12:38

GC Column (1): RTX-VGC ID: 0.53(mm) GC Column (2): RTX-VGC ID: 0.53(mm)

| ANALYTE | COL | PEAK | RT | RT WINDOW | | CONCENTRATION | | RPD |
|---|---|---|---|---|---|---|---|---|
| | | | | FROM | TO | PEAK | MEAN | |
| Benzene | 1 | | 3.50 | 3.42 | 3.56 | 1800 | | 10.8 |
| | 2 | | 4.18 | 4.10 | 4.24 | 2000 | | |
| Toluene | 1 | | 5.17 | 5.09 | 5.23 | 890 | | 15.0 |
| | 2 | | 6.36 | 6.28 | 6.42 | 1000 | | |
| Ethylbenzene | 1 | | 7.50 | 7.42 | 7.56 | 450 | | 30.5 |
| | 2 | | 9.64 | 9.55 | 9.69 | 620 | | |
| m,p-Xylene | 1 | | 7.86 | 7.76 | 7.90 | 300 | | 161.3 |
| | 2 | | 9.97 | 9.91 | 10.05 | 2800 | | |

FORM X
IDENTIFICATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-050615-1552 Lab Sample ID: 480-89467-7

Instrument ID (1): HP5890-3 Instrument ID (2): HP5890-3

Date Analyzed (1): 11/05/2015 13:10 Date Analyzed (2): 11/05/2015 13:10

GC Column (1): RTX-VGC ID: 0.53(mm) GC Column (2): RTX-VGC ID: 0.53(mm)

| ANALYTE | COL | PEAK | RT | RT WINDOW | | CONCENTRATION | | RPD |
|---|---|---|---|---|---|---|---|---|
| | | | | FROM | TO | PEAK | MEAN | |
| Benzene | 1 | | 3.50 | 3.42 | 3.56 | 1900 | | 13.0 |
| | 2 | | 4.18 | 4.10 | 4.24 | 2100 | | |
| Toluene | 1 | | 5.17 | 5.09 | 5.23 | 1400 | | 12.9 |
| | 2 | | 6.36 | 6.28 | 6.42 | 1600 | | |
| Ethylbenzene | 1 | | 7.50 | 7.42 | 7.56 | 890 | | 27.4 |
| | 2 | | 9.64 | 9.55 | 9.69 | 1200 | | |
| m,p-Xylene | 1 | | 7.84 | 7.76 | 7.90 | 2200 | | 77.0 |
| | 2 | | 9.98 | 9.91 | 10.05 | 5000 | | |

FORM X
IDENTIFICATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-052015-1500 Lab Sample ID: 480-89467-9

Instrument ID (1): HP5890-3 Instrument ID (2): HP5890-3

Date Analyzed (1): 11/05/2015 18:41 Date Analyzed (2): 11/05/2015 18:41

GC Column (1): RTX-VGC ID: 0.53(mm) GC Column (2): RTX-VGC ID: 0.53(mm)

| ANALYTE | COL | PEAK | RT | RT WINDOW | | CONCENTRATION | | RPD |
|---|---|---|---|---|---|---|---|---|
| | | | | FROM | TO | PEAK | MEAN | |
| Benzene | 1 | | 3.50 | 3.44 | 3.58 | 670 | | 12.1 |
| | 2 | | 4.18 | 4.11 | 4.25 | 590 | | |
| Toluene | 1 | | 5.17 | 5.10 | 5.24 | 87 | | 40.4 |
| | 2 | | 6.35 | 6.29 | 6.43 | 130 | | |
| m,p-Xylene | 1 | | 7.85 | 7.78 | 7.92 | 55 | | 186.3 |
| | 2 | | 9.96 | 9.94 | 10.08 | 1600 | | |
| o-Xylene | 1 | | 8.87 | 8.79 | 8.93 | 160 | | 32.2 |
| | 2 | | 11.04 | 10.92 | 11.06 | 220 | | |

FORM X
IDENTIFICATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-031315-1531 Lab Sample ID: 480-89467-11

Instrument ID (1): HP5890-3 Instrument ID (2): HP5890-3

Date Analyzed (1): 11/05/2015 15:10 Date Analyzed (2): 11/05/2015 15:10

GC Column (1): RTX-VGC ID: 0.53(mm) GC Column (2): RTX-VGC ID: 0.53(mm)

| ANALYTE | COL | PEAK | RT | RT WINDOW | | CONCENTRATION | | RPD |
|---|---|---|---|---|---|---|---|---|
| | | | | FROM | TO | PEAK | MEAN | |
| Benzene | 1 | | 3.51 | 3.44 | 3.58 | 2400 | | 111.7 |
| | 2 | | 4.18 | 4.11 | 4.25 | 670 | | |
| Toluene | 1 | | 5.18 | 5.10 | 5.24 | 260 | | 25.5 |
| | 2 | | 6.36 | 6.29 | 6.43 | 200 | | |
| m,p-Xylene | 1 | | 7.91 | 7.78 | 7.92 | 110 | | 175.4 |
| | 2 | | 9.99 | 9.94 | 10.08 | 1700 | | |

FORM X
IDENTIFICATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-050615-1552 Lab Sample ID: 480-89467-12

Instrument ID (1): HP5890-3 Instrument ID (2): HP5890-3

Date Analyzed (1): 11/05/2015 16:14 Date Analyzed (2): 11/05/2015 16:14

GC Column (1): RTX-VGC ID: 0.53(mm) GC Column (2): RTX-VGC ID: 0.53(mm)

| ANALYTE | COL | PEAK | RT | RT WINDOW | | CONCENTRATION | | RPD |
|---|---|---|---|---|---|---|---|---|
| | | | | FROM | TO | PEAK | MEAN | |
| Benzene | 1 | | 3.51 | 3.44 | 3.58 | 1400 | | 45.9 |
| | 2 | | 4.19 | 4.11 | 4.25 | 880 | | |
| Toluene | 1 | | 5.19 | 5.10 | 5.24 | 120 | | 40.3 |
| | 2 | | 6.37 | 6.29 | 6.43 | 190 | | |
| m,p-Xylene | 1 | | 7.89 | 7.78 | 7.92 | 50 | | 194.7 |
| | 2 | | 9.98 | 9.94 | 10.08 | 3800 | | |

FORM X
IDENTIFICATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-040115-1600 Lab Sample ID: 480-89467-21

Instrument ID (1): HP5890-3 Instrument ID (2): HP5890-3

Date Analyzed (1): 11/05/2015 16:45 Date Analyzed (2): 11/05/2015 16:45

GC Column (1): RTX-VGC ID: 0.53(mm) GC Column (2): RTX-VGC ID: 0.53(mm)

| ANALYTE | COL | PEAK | RT | RT WINDOW | | CONCENTRATION | | RPD |
|---|---|---|---|---|---|---|---|---|
| | | | | FROM | TO | PEAK | MEAN | |
| Benzene | 1 | | 3.51 | 3.44 | 3.58 | 14000 | | 50.5 |
| | 2 | | 4.18 | 4.11 | 4.25 | 8100 | | |
| Toluene | 1 | | 5.18 | 5.10 | 5.24 | 5500 | | 11.0 |
| | 2 | | 6.36 | 6.29 | 6.43 | 6100 | | |
| Ethylbenzene | 1 | | 7.51 | 7.44 | 7.58 | 3700 | | 7.1 |
| | 2 | | 9.64 | 9.57 | 9.71 | 3900 | | |
| m,p-Xylene | 1 | | 7.85 | 7.78 | 7.92 | 7700 | | 47.1 |
| | 2 | | 9.99 | 9.94 | 10.08 | 12000 | | |

FORM X
IDENTIFICATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-012215-0948 Lab Sample ID: 480-89467-23

Instrument ID (1): HP5890-3 Instrument ID (2): HP5890-3

Date Analyzed (1): 11/05/2015 19:13 Date Analyzed (2): 11/05/2015 19:13

GC Column (1): RTX-VGC ID: 0.53(mm) GC Column (2): RTX-VGC ID: 0.53(mm)

| ANALYTE | COL | PEAK | RT | RT WINDOW | | CONCENTRATION | | RPD |
|---|---|---|---|---|---|---|---|---|
| | | | | FROM | TO | PEAK | MEAN | |
| Benzene | 1 | | 3.51 | 3.44 | 3.58 | 160 | | 156.5 |
| | 2 | | 4.18 | 4.11 | 4.25 | 19 | | |
| Toluene | 1 | | 5.17 | 5.10 | 5.24 | 7.9 | | 19.2 |
| | 2 | | 6.35 | 6.29 | 6.43 | 9.6 | | |
| m,p-Xylene | 1 | | 7.85 | 7.78 | 7.92 | 6.8 | | 168.7 |
| | 2 | | 9.96 | 9.94 | 10.08 | 80 | | |

FORM X
IDENTIFICATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-031315-1531 Lab Sample ID: 480-89467-24

Instrument ID (1): HP5890-3 Instrument ID (2): HP5890-3

Date Analyzed (1): 11/05/2015 19:44 Date Analyzed (2): 11/05/2015 19:44

GC Column (1): RTX-VGC ID: 0.53(mm) GC Column (2): RTX-VGC ID: 0.53(mm)

| ANALYTE | COL | PEAK | RT | RT WINDOW | | CONCENTRATION | | RPD |
|---|---|---|---|---|---|---|---|---|
| | | | | FROM | TO | PEAK | MEAN | |
| Benzene | 1 | | 3.51 | 3.44 | 3.58 | 12 | | 47.1 |
| | 2 | | 4.18 | 4.11 | 4.25 | 7.7 | | |
| Toluene | 1 | | 5.18 | 5.10 | 5.24 | 1.4 | | 43.2 |
| | 2 | | 6.35 | 6.29 | 6.43 | 2.1 | | |
| o-Xylene | 1 | | 8.87 | 8.79 | 8.93 | 3.7 | | 26.9 |
| | 2 | | 11.04 | 10.92 | 11.06 | 4.8 | | |

FORM X
IDENTIFICATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Client Sample ID: Lab Sample ID: LCS 480-273207/4

Instrument ID (1): HP5890-3 Instrument ID (2): HP5890-3

Date Analyzed (1): 11/05/2015 09:00 Date Analyzed (2): 11/05/2015 09:00

GC Column (1): RTX-VGC ID: 0.53(mm) GC Column (2): RTX-VGC ID: 0.53(mm)

| ANALYTE | COL | PEAK | RT | RT WINDOW | | CONCENTRATION | | RPD |
|---|---|---|---|---|---|---|---|---|
| | | | | FROM | TO | PEAK | MEAN | |
| Benzene | 1 | | 3.49 | 3.42 | 3.56 | 3.62 | | 9.0 |
| | 2 | | 4.17 | 4.10 | 4.24 | 3.96 | | |
| Toluene | 1 | | 5.17 | 5.09 | 5.23 | 3.52 | | 10.3 |
| | 2 | | 6.35 | 6.28 | 6.42 | 3.90 | | |
| Ethylbenzene | 1 | | 7.51 | 7.42 | 7.56 | 3.58 | | 11.0 |
| | 2 | | 9.64 | 9.55 | 9.69 | 3.99 | | |
| m,p-Xylene | 1 | | 7.86 | 7.76 | 7.90 | 7.32 | | 8.8 |
| | 2 | | 10.00 | 9.91 | 10.05 | 8.00 | | |
| o-Xylene | 1 | | 8.87 | 8.77 | 8.91 | 3.53 | | 11.2 |
| | 2 | | 10.99 | 10.90 | 11.04 | 3.95 | | |

FORM X
IDENTIFICATION SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Client Sample ID: Lab Sample ID: LCSD 480-273207/5

Instrument ID (1): HP5890-3 Instrument ID (2): HP5890-3

Date Analyzed (1): 11/05/2015 09:31 Date Analyzed (2): 11/05/2015 09:31

GC Column (1): RTX-VGC ID: 0.53(mm) GC Column (2): RTX-VGC ID: 0.53(mm)

| ANALYTE | COL | PEAK | RT | RT WINDOW | | CONCENTRATION | | RPD |
|---|---|---|---|---|---|---|---|---|
| | | | | FROM | TO | PEAK | MEAN | |
| Benzene | 1 | | 3.49 | 3.42 | 3.56 | 3.63 | | 10.0 |
| | 2 | | 4.17 | 4.10 | 4.24 | 4.02 | | |
| Toluene | 1 | | 5.16 | 5.09 | 5.23 | 3.49 | | 12.2 |
| | 2 | | 6.35 | 6.28 | 6.42 | 3.95 | | |
| Ethylbenzene | 1 | | 7.51 | 7.42 | 7.56 | 3.63 | | 9.9 |
| | 2 | | 9.63 | 9.55 | 9.69 | 4.01 | | |
| m,p-Xylene | 1 | | 7.85 | 7.76 | 7.90 | 7.43 | | 7.8 |
| | 2 | | 10.00 | 9.91 | 10.05 | 8.04 | | |
| o-Xylene | 1 | | 8.86 | 8.77 | 8.91 | 3.56 | | 11.6 |
| | 2 | | 10.98 | 10.90 | 11.04 | 4.00 | | |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-101514-1120 | Lab Sample ID: 480-89467-1

Matrix: Water | Lab File ID: 3_69027.D

Analysis Method: 8021B | Date Collected: 10/15/2014 11:20

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 11:33

Soil Aliquot Vol: | Dilution Factor: 200

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | 320 | H | 40 | 4.7 |
| 108-88-3 | Toluene | 11 | J H | 40 | 7.1 |
| 100-41-4 | Ethylbenzene | ND | H | 40 | 5.7 |
| 179601-23-1 | m,p-Xylene | ND | H | 80 | 11 |
| 95-47-6 | o-Xylene | ND | H | 40 | 5.4 |
| 1330-20-7 | Xylenes, Total | ND | H | 120 | 11 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 139 | | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 122 | | 64-141 |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-031915-1550 | Lab Sample ID: 480-89467-3

Matrix: Water | Lab File ID: 3_69028.D

Analysis Method: 8021B | Date Collected: 03/19/2015 15:50

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 12:05

Soil Aliquot Vol: | Dilution Factor: 800

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | 1500 | H | 160 | 19 |
| 108-88-3 | Toluene | 240 | H | 160 | 28 |
| 100-41-4 | Ethylbenzene | ND | H | 160 | 23 |
| 179601-23-1 | m,p-Xylene | 75 | J H | 320 | 43 |
| 95-47-6 | o-Xylene | ND | H | 160 | 22 |
| 1330-20-7 | Xylenes, Total | 75 | J H | 480 | 43 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 138 | | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 125 | | 64-141 |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-041415-1640 | Lab Sample ID: 480-89467-4

Matrix: Water | Lab File ID: 3_69029.D

Analysis Method: 8021B | Date Collected: 04/14/2015 16:40

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 12:38

Soil Aliquot Vol: | Dilution Factor: 200

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | 1800 | H | 40 | 4.7 |
| 108-88-3 | Toluene | 890 | H | 40 | 7.1 |
| 100-41-4 | Ethylbenzene | 450 | H | 40 | 5.7 |
| 179601-23-1 | m,p-Xylene | 300 | H | 80 | 11 |
| 95-47-6 | o-Xylene | ND | H | 40 | 5.4 |
| 1330-20-7 | Xylenes, Total | 300 | H | 120 | 11 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 104 | | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 96 | | 64-141 |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-050615-1552 | Lab Sample ID: 480-89467-7

Matrix: Water | Lab File ID: 3_69030.D

Analysis Method: 8021B | Date Collected: 05/06/2015 15:52

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 13:10

Soil Aliquot Vol: | Dilution Factor: 200

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | 1900 | H | 40 | 4.7 |
| 108-88-3 | Toluene | 1400 | H | 40 | 7.1 |
| 100-41-4 | Ethylbenzene | 890 | H | 40 | 5.7 |
| 179601-23-1 | m,p-Xylene | 2200 | H | 80 | 11 |
| 95-47-6 | o-Xylene | ND | H | 40 | 5.4 |
| 1330-20-7 | Xylenes, Total | 2200 | H | 120 | 11 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 125 | | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 116 | | 64-141 |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-052015-1500 | Lab Sample ID: 480-89467-9

Matrix: Water | Lab File ID: 3_69039.D

Analysis Method: 8021B | Date Collected: 05/20/2015 15:00

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 18:41

Soil Aliquot Vol: | Dilution Factor: 200

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | 670 | H | 40 | 4.7 |
| 108-88-3 | Toluene | 87 | H | 40 | 7.1 |
| 100-41-4 | Ethylbenzene | ND | H | 40 | 5.7 |
| 179601-23-1 | m,p-Xylene | 55 | J H | 80 | 11 |
| 95-47-6 | o-Xylene | 160 | H | 40 | 5.4 |
| 1330-20-7 | Xylenes, Total | 220 | H | 120 | 11 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 109 | | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 91 | | 64-141 |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-031315-1531 | Lab Sample ID: 480-89467-11

Matrix: Water | Lab File ID: 3_69033.D

Analysis Method: 8021B | Date Collected: 03/13/2015 15:31

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 15:10

Soil Aliquot Vol: | Dilution Factor: 2000

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | 2400 | H | 400 | 47 |
| 108-88-3 | Toluene | 260 | J H | 400 | 71 |
| 100-41-4 | Ethylbenzene | ND | H | 400 | 57 |
| 179601-23-1 | m,p-Xylene | 110 | J H | 800 | 110 |
| 95-47-6 | o-Xylene | ND | H | 400 | 54 |
| 1330-20-7 | Xylenes, Total | 110 | J H | 1200 | 110 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 94 | | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 88 | | 64-141 |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-050615-1552 | Lab Sample ID: 480-89467-12

Matrix: Water | Lab File ID: 3_69035.D

Analysis Method: 8021B | Date Collected: 05/06/2015 15:52

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 16:14

Soil Aliquot Vol: | Dilution Factor: 400

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | 1400 | H | 80 | 9.3 |
| 108-88-3 | Toluene | 120 | H | 80 | 14 |
| 100-41-4 | Ethylbenzene | ND | H | 80 | 11 |
| 179601-23-1 | m,p-Xylene | 50 | J H | 160 | 22 |
| 95-47-6 | o-Xylene | ND | H | 80 | 11 |
| 1330-20-7 | Xylenes, Total | 50 | J H | 240 | 22 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 135 | | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 123 | | 64-141 |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-040115-1600 | Lab Sample ID: 480-89467-21

Matrix: Water | Lab File ID: 3_69036.D

Analysis Method: 8021B | Date Collected: 04/01/2015 16:00

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 16:45

Soil Aliquot Vol: | Dilution Factor: 800

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | 14000 | H | 160 | 19 |
| 108-88-3 | Toluene | 5500 | H | 160 | 28 |
| 100-41-4 | Ethylbenzene | 3700 | H | 160 | 23 |
| 179601-23-1 | m,p-Xylene | 7700 | H | 320 | 43 |
| 95-47-6 | o-Xylene | ND | H | 160 | 22 |
| 1330-20-7 | Xylenes, Total | 7700 | H | 480 | 43 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 131 | | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 125 | | 64-141 |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: P-01-012215-0948 | Lab Sample ID: 480-89467-23

Matrix: Water | Lab File ID: 3_69040.D

Analysis Method: 8021B | Date Collected: 01/22/2015 09:46

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 19:13

Soil Aliquot Vol: | Dilution Factor: 800

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | 160 | H | 3.6 | 0.42 |
| 108-88-3 | Toluene | 7.9 | H | 3.6 | 0.65 |
| 100-41-4 | Ethylbenzene | ND | H | 3.6 | 0.52 |
| 179601-23-1 | m,p-Xylene | 6.8 | J H | 7.3 | 0.98 |
| 95-47-6 | o-Xylene | ND | H | 3.6 | 0.49 |
| 1330-20-7 | Xylenes, Total | 6.8 | J H | 11 | 0.98 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 124 | | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 114 | | 64-141 |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: WW-01-031315-1531 | Lab Sample ID: 480-89467-24

Matrix: Water | Lab File ID: 3_69041.D

Analysis Method: 8021B | Date Collected: 03/13/2015 15:31

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 19:44

Soil Aliquot Vol: | Dilution Factor: 200

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | 12 | H | 0.91 | 0.11 |
| 108-88-3 | Toluene | 1.4 | H | 0.91 | 0.16 |
| 100-41-4 | Ethylbenzene | ND | H | 0.91 | 0.13 |
| 179601-23-1 | m,p-Xylene | ND | H | 1.8 | 0.25 |
| 95-47-6 | o-Xylene | 3.7 | H | 0.91 | 0.12 |
| 1330-20-7 | Xylenes, Total | 3.7 | H | 2.7 | 0.25 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 146 | X | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 126 | | 64-141 |

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 262944

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/10/2015 17:44 Calibration End Date: 09/10/2015 19:52 Calibration ID: 24884

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | STD1 480-262944/2 | 3_67061.D |
| Level 2 | STD2 480-262944/3 | 3_67062.D |
| Level 3 | STD3 480-262944/4 | 3_67063.D |
| Level 4 | STD4 480-262944/5 | 3_67064.D |
| Level 5 | STD5 480-262944/6 | 3_67065.D |

| ANALYTE | LVL 1 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | | | | | | RT WINDOW | AVG RT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Methyl tert-butyl ether | 2.237 | 2.233 | 2.233 | 2.233 | 2.227 | | | | | | 2.163 - 2.303 | 2.233 |
| Benzene | 3.487 | 3.483 | 3.480 | 3.480 | 3.477 | | | | | | 3.410 - 3.550 | 3.481 |
| Toluene | 5.163 | 5.153 | 5.147 | 5.143 | 5.140 | | | | | | 5.077 - 5.217 | 5.149 |
| Ethylbenzene | 7.527 | 7.507 | 7.497 | 7.490 | 7.487 | | | | | | 7.427 - 7.567 | 7.502 |
| m,p-Xylene | 7.867 | 7.843 | 7.833 | 7.827 | 7.823 | | | | | | 7.763 - 7.903 | 7.839 |
| o-Xylene | 8.877 | 8.860 | 8.847 | 8.840 | 8.837 | | | | | | 8.777 - 8.917 | 8.852 |
| Isopropylbenzene | 9.710 | 9.707 | 9.697 | 9.690 | 9.690 | | | | | | 9.627 - 9.767 | 9.699 |
| n-Propylbenzene | 10.827 | 10.817 | 10.803 | 10.797 | 10.793 | | | | | | 10.733 - 10.873 | 10.807 |
| 1,3,5-Trimethylbenzene | 11.497 | 11.427 | 11.413 | 11.407 | 11.403 | | | | | | 11.343 - 11.483 | 11.429 |
| tert-Butylbenzene | 12.230 | 12.223 | 12.213 | 12.207 | 12.207 | | | | | | 12.143 - 12.283 | 12.216 |
| 1,2,4-Trimethylbenzene | 12.473 | 12.453 | 12.440 | 12.430 | 12.430 | | | | | | 12.370 - 12.510 | 12.445 |
| sec-Butylbenzene | 12.743 | 12.730 | 12.720 | 12.713 | 12.713 | | | | | | 12.650 - 12.790 | 12.724 |
| 4-Isopropyltoluene | 13.237 | 13.223 | 13.210 | 13.203 | 13.203 | | | | | | 13.140 - 13.280 | 13.215 |
| n-Butylbenzene | 14.463 | 14.417 | 14.400 | 14.390 | 14.390 | | | | | | 14.330 - 14.470 | 14.412 |
| Naphthalene | 17.693 | 17.630 | 17.617 | 17.610 | 17.610 | | | | | | 17.547 - 17.687 | 17.632 |
| a,a,a-Trifluorotoluene | 4.407 | 4.407 | 4.407 | 4.407 | 4.400 | | | | | | 4.337 - 4.477 | 4.406 |
| 4-Bromofluorobenzene | 10.333 | 10.337 | 10.330 | 10.323 | 10.320 | | | | | | 10.260 - 10.400 | 10.329 |

683

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 262944

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/10/2015 17:44 Calibration End Date: 09/10/2015 19:52 Calibration ID: 24884

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | STD1 480-262944/2 | 3_67061.D |
| Level 2 | STD2 480-262944/3 | 3_67062.D |
| Level 3 | STD3 480-262944/4 | 3_67063.D |
| Level 4 | STD4 480-262944/5 | 3_67064.D |
| Level 5 | STD5 480-262944/6 | 3_67065.D |

| ANALYTE | CF | | | | CURVE TYPE | COEFFICIENT | | | # | MIN CF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 5 | LVL 2 | LVL 3 | LVL 4 | | B | M1 | M2 | | | | | | | | |
| Methyl tert-butyl ether | 9345.0<br>8589.9 | 8410.5 | 7998.3 | 9278.6 | Ave | | 8724.47333 | | | | 6.6 | | 20.0 | | | |
| Benzene | 27970<br>24788 | 25301 | 23646 | 25828 | Ave | | 25506.6367 | | | | 5.3 | | 20.0 | | | |
| Toluene | 25695<br>23254 | 23836 | 22086 | 24219 | Ave | | 23817.9633 | | | | 5.6 | | 20.0 | | | |
| Ethylbenzene | 20930<br>20832 | 20977 | 19896 | 21701 | Ave | | 20867.1733 | | | | 3.1 | | 20.0 | | | |
| m,p-Xylene | 25063<br>23879 | 24665 | 22651 | 24684 | Ave | | 24188.3350 | | | | 4.0 | | 20.0 | | | |
| o-Xylene | 22140<br>20870 | 20895 | 19823 | 21931 | Ave | | 21131.9733 | | | | 4.4 | | 20.0 | | | |
| Isopropylbenzene | 20310<br>17961 | 17654 | 16934 | 18780 | Ave | | 18327.7500 | | | | 7.0 | | 20.0 | | | |
| n-Propylbenzene | 27335<br>19469 | 18889 | 18394 | 20228 | Lin1 | 1353.79539 | 19414.4223 | | | | | | | 0.9990 | | 0.9900 |
| 1,3,5-Trimethylbenzene | 62055<br>29340 | 31399 | 27729 | 30570 | Lin1 | 6536.88940 | 29224.1117 | | | | | | | 0.9990 | | 0.9900 |
| tert-Butylbenzene | 17070<br>15910 | 15709 | 14808 | 16599 | Ave | | 16019.0667 | | | | 5.4 | | 20.0 | | | |
| 1,2,4-Trimethylbenzene | 24770<br>22543 | 22598 | 21152 | 23465 | Ave | | 22905.5733 | | | | 5.8 | | 20.0 | | | |
| sec-Butylbenzene | 19115<br>17352 | 17849 | 16259 | 18165 | Ave | | 17748.0067 | | | | 5.9 | | 20.0 | | | |
| 4-Isopropyltoluene | 15970<br>16977 | 17051 | 15910 | 17762 | Ave | | 16733.9100 | | | | 4.7 | | 20.0 | | | |
| n-Butylbenzene | 14175<br>18050 | 17555 | 16599 | 18724 | Ave | | 17020.5633 | | | | 10.4 | | 20.0 | | | |
| Naphthalene | 6555.0<br>12330 | 10700 | 11359 | 13328 | Lin1 | -1462.3680 | 12419.1405 | | | | | | | 0.9970 | | 0.9900 |

Note: The m1 coefficient is the same as Ave CF for an Ave curve type.

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 262944

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/10/2015 17:44 Calibration End Date: 09/10/2015 19:52 Calibration ID: 24884

| ANALYTE | CF | | | | CURVE TYPE | COEFFICIENT | | | # | MIN CF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 5 | LVL 2 | LVL 3 | LVL 4 | | B | M1 | M2 | | | | | | | | |
| a,a,a-Trifluorotoluene | 11509<br>11600 | 11458 | 9234.6 | 8494.4 | Ave | | 10459.2889 | | | | 14.2 | | 20.0 | | | |
| 4-Bromofluorobenzene | 27078<br>27488 | 27004 | 22350 | 20256 | Ave | | 24835.2444 | | | | 13.3 | | 20.0 | | | |

Note: The m1 coefficient is the same as Ave CF for an Ave curve type.

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 262944

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/10/2015 17:44 Calibration End Date: 09/10/2015 19:52 Calibration ID: 24884

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | STD1 480-262944/2 | 3_67061.D |
| Level 2 | STD2 480-262944/3 | 3_67062.D |
| Level 3 | STD3 480-262944/4 | 3_67063.D |
| Level 4 | STD4 480-262944/5 | 3_67064.D |
| Level 5 | STD5 480-262944/6 | 3_67065.D |

| ANALYTE | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (UG/L) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LVL 1 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | LVL 1 | LVL 2 | LVL 3 | LVL 4 | LVL 5 |
| Methyl tert-butyl ether | Ave | 1869 | 33642 | 159966 | 278359 | 515396 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| Benzene | Ave | 5594 | 101202 | 472923 | 774848 | 1487296 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| Toluene | Ave | 5139 | 95344 | 441714 | 726583 | 1395221 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| Ethylbenzene | Ave | 4186 | 83908 | 397918 | 651025 | 1249928 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| m,p-Xylene | Ave | 10025 | 197317 | 906044 | 1481038 | 2865538 | 0.400 | 8.00 | 40.0 | 60.0 | 120 |
| o-Xylene | Ave | 4428 | 83581 | 396466 | 657942 | 1252195 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| Isopropylbenzene | Ave | 4062 | 70615 | 338686 | 563397 | 1077648 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| n-Propylbenzene | Linl | 5467 | 75535 | 367876 | 606844 | 1168154 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| 1,3,5-Trimethylbenzene | Linl | 12411 | 125596 | 554580 | 917104 | 1760387 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| tert-Butylbenzene | Ave | 3414 | 62834 | 296153 | 497979 | 954593 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| 1,2,4-Trimethylbenzene | Ave | 4954 | 90393 | 423036 | 703955 | 1352559 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| sec-Butylbenzene | Ave | 3823 | 71395 | 325179 | 544959 | 1041122 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| 4-Isopropyltoluene | Ave | 3194 | 68203 | 318204 | 532862 | 1018592 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| n-Butylbenzene | Ave | 2835 | 70221 | 331979 | 561709 | 1082999 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| Naphthalene | Linl | 1311 | 42798 | 227182 | 399843 | 739820 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| a,a,a-Trifluorotoluene | Ave | 207162 | 206249 | 166223 | 152900 | 208802 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 |
| 4-Bromofluorobenzene | Ave | 487406 | 486066 | 402305 | 364605 | 494790 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 |

Curve Type Legend:

Ave = Average
Linl = Linear 1/conc

989

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 262944

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/10/2015 17:44 Calibration End Date: 09/10/2015 19:52 Calibration ID: 24885

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | STD1 480-262944/2 | 3_67061.D |
| Level 2 | STD2 480-262944/3 | 3_67062.D |
| Level 3 | STD3 480-262944/4 | 3_67063.D |
| Level 4 | STD4 480-262944/5 | 3_67064.D |
| Level 5 | STD5 480-262944/6 | 3_67065.D |

| ANALYTE | LVL 1 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | | | | | | RT WINDOW | AVG RT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Methyl tert-butyl ether | 2.717 | 2.713 | 2.717 | 2.713 | 2.710 | | | | | | 2.647 - 2.787 | 2.714 |
| Benzene | 4.163 | 4.163 | 4.163 | 4.163 | 4.160 | | | | | | 4.093 - 4.233 | 4.162 |
| Toluene | 6.350 | 6.350 | 6.347 | 6.343 | 6.340 | | | | | | 6.277 - 6.417 | 6.346 |
| Ethylbenzene | 9.640 | 9.643 | 9.633 | 9.630 | 9.627 | | | | | | 9.563 - 9.703 | 9.635 |
| m,p-Xylene | 10.000 | 10.000 | 9.997 | 9.990 | 9.987 | | | | | | 9.927 - 10.067 | 9.995 |
| o-Xylene | 10.983 | 10.987 | 10.980 | 10.973 | 10.973 | | | | | | 10.910 - 11.050 | 10.979 |
| Isopropylbenzene | 12.033 | 12.037 | 12.027 | 12.023 | 12.020 | | | | | | 11.957 - 12.097 | 12.028 |
| n-Propylbenzene | 13.203 | 13.203 | 13.193 | 13.190 | 13.190 | | | | | | 13.123 - 13.263 | 13.196 |
| 1,3,5-Trimethylbenzene | 13.777 | 13.783 | 13.773 | 13.767 | 13.770 | | | | | | 13.703 - 13.843 | 13.774 |
| tert-Butylbenzene | 14.627 | 14.630 | 14.620 | 14.613 | 14.613 | | | | | | 14.550 - 14.690 | 14.621 |
| 1,2,4-Trimethylbenzene | 14.833 | 14.833 | 14.827 | 14.817 | 14.820 | | | | | | 14.757 - 14.897 | 14.826 |
| sec-Butylbenzene | 15.327 | 15.323 | 15.317 | 15.310 | 15.313 | | | | | | 15.247 - 15.387 | 15.318 |
| 4-Isopropyltoluene | 15.757 | 15.760 | 15.753 | 15.747 | 15.747 | | | | | | 15.683 - 15.823 | 15.753 |
| n-Butylbenzene | 16.480 | 16.480 | 16.473 | 16.473 | 16.473 | | | | | | 16.403 - 16.543 | 16.476 |
| Naphthalene | 18.423 | 18.420 | 18.417 | 18.413 | 18.417 | | | | | | 18.347 - 18.487 | 18.418 |
| a,a,a-Trifluorotoluene | 5.050 | 5.050 | 5.050 | 5.047 | 5.043 | | | | | | 4.980 - 5.120 | 5.048 |
| 4-Bromofluorobenzene | 12.463 | 12.467 | 12.460 | 12.453 | 12.453 | | | | | | 12.390 - 12.530 | 12.459 |

687

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 262944

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/10/2015 17:44 Calibration End Date: 09/10/2015 19:52 Calibration ID: 24885

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | STD1 480-262944/2 | 3_67061.D |
| Level 2 | STD2 480-262944/3 | 3_67062.D |
| Level 3 | STD3 480-262944/4 | 3_67063.D |
| Level 4 | STD4 480-262944/5 | 3_67064.D |
| Level 5 | STD5 480-262944/6 | 3_67065.D |

| ANALYTE | CF | | | | CURVE TYPE | COEFFICIENT | | | # | MIN CF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 5 | LVL 2 | LVL 3 | LVL 4 | | B | M1 | M2 | | | | | | | | |
| Methyl tert-butyl ether | 11210<br>10549 | 10442 | 9805.5 | 11277 | Ave | | 10656.4633 | | | | 5.7 | | 20.0 | | | |
| Benzene | 37085<br>31964 | 31844 | 29124 | 32479 | Ave | | 32499.2067 | | | | 8.9 | | 20.0 | | | |
| Toluene | 36380<br>29651 | 29823 | 27192 | 30177 | Ave | | 30644.6867 | | | | 11.1 | | 20.0 | | | |
| Ethylbenzene | 30785<br>26663 | 26740 | 24749 | 27447 | Ave | | 27276.8867 | | | | 8.1 | | 20.0 | | | |
| m,p-Xylene | 35965<br>31222 | 30254 | 28032 | 31778 | Ave | | 31450.1883 | | | | 9.2 | | 20.0 | | | |
| o-Xylene | 29525<br>26454 | 26393 | 24641 | 27408 | Ave | | 26884.2167 | | | | 6.6 | | 20.0 | | | |
| Isopropylbenzene | 24640<br>22665 | 22289 | 21041 | 23500 | Ave | | 22827.1533 | | | | 5.9 | | 20.0 | | | |
| n-Propylbenzene | 31560<br>24769 | 24590 | 22854 | 25505 | Lin1 | 1191.83055 | 24580.1913 | | | | | | | 0.9990 | | 0.9900 |
| 1,3,5-Trimethylbenzene | 47315<br>37603 | 36997 | 34302 | 38517 | Lin1 | 1642.96310 | 37188.8195 | | | | | | | 0.9980 | | 0.9900 |
| tert-Butylbenzene | 21460<br>20035 | 19857 | 18602 | 20828 | Ave | | 20156.2433 | | | | 5.4 | | 20.0 | | | |
| 1,2,4-Trimethylbenzene | 31840<br>29257 | 28450 | 26850 | 30096 | Ave | | 29298.6800 | | | | 6.3 | | 20.0 | | | |
| sec-Butylbenzene | 22415<br>21599 | 21176 | 19871 | 22430 | Ave | | 21498.2333 | | | | 4.9 | | 20.0 | | | |
| 4-Isopropyltoluene | 22965<br>21493 | 20952 | 19830 | 22281 | Ave | | 21504.1300 | | | | 5.6 | | 20.0 | | | |
| n-Butylbenzene | 25850<br>22874 | 22013 | 20892 | 23572 | Ave | | 23040.1633 | | | | 8.1 | | 20.0 | | | |
| Naphthalene | 12320<br>15826 | 14540 | 14635 | 16970 | Lin1 | -882.87647 | 15909.8545 | | | | | | | 0.9970 | | 0.9900 |

Note: The m1 coefficient is the same as Ave CF for an Ave curve type.

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 262944

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/10/2015 17:44 Calibration End Date: 09/10/2015 19:52 Calibration ID: 24885

| ANALYTE | CF | | | | CURVE TYPE | COEFFICIENT | | | # | MIN CF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 5 | LVL 2 | LVL 3 | LVL 4 | | B | M1 | M2 | | | | | | | | |
| a,a,a-Trifluorotoluene | 14343<br>14745 | 14224 | 11617 | 10794 | Ave | | 13144.7333 | | | | 13.7 | | 20.0 | | | |
| 4-Bromofluorobenzene | 34168<br>35251 | 34046 | 28138 | 26032 | Ave | | 31527.0111 | | | | 13.2 | | 20.0 | | | |

Note: The m1 coefficient is the same as Ave CF for an Ave curve type.

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 262944

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/10/2015 17:44 Calibration End Date: 09/10/2015 19:52 Calibration ID: 24885

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | STD1 480-262944/2 | 3_67061.D |
| Level 2 | STD2 480-262944/3 | 3_67062.D |
| Level 3 | STD3 480-262944/4 | 3_67063.D |
| Level 4 | STD4 480-262944/5 | 3_67064.D |
| Level 5 | STD5 480-262944/6 | 3_67065.D |

| ANALYTE | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (UG/L) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LVL 1 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | LVL 1 | LVL 2 | LVL 3 | LVL 4 | LVL 5 |
| Methyl tert-butyl ether | Ave | 2242 | 41766 | 196109 | 338302 | 632918 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| Benzene | Ave | 7417 | 127374 | 582485 | 974380 | 1917837 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| Toluene | Ave | 7276 | 119291 | 543844 | 905318 | 1779073 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| Ethylbenzene | Ave | 6157 | 106959 | 494986 | 823418 | 1599787 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| m,p-Xylene | Ave | 14386 | 242032 | 1121280 | 1906674 | 3746645 | 0.400 | 8.00 | 40.0 | 60.0 | 120 |
| o-Xylene | Ave | 5905 | 105573 | 492824 | 822225 | 1587248 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| Isopropylbenzene | Ave | 4928 | 89156 | 420825 | 705005 | 1359921 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| n-Propylbenzene | Linl | 6312 | 98358 | 457083 | 765152 | 1486112 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| 1,3,5-Trimethylbenzene | Linl | 9463 | 147988 | 686037 | 1155516 | 2256174 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| tert-Butylbenzene | Ave | 4232 | 79427 | 372038 | 624834 | 1202086 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| 1,2,4-Trimethylbenzene | Ave | 6368 | 113901 | 537006 | 902882 | 1755407 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| sec-Butylbenzene | Ave | 4483 | 84704 | 397414 | 672865 | 1295968 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| 4-Isopropyltoluene | Ave | 4593 | 83806 | 396600 | 668424 | 1289601 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| n-Butylbenzene | Ave | 5170 | 88052 | 417848 | 707185 | 1372415 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| Naphthalene | Linl | 2464 | 58159 | 292696 | 509108 | 949564 | 0.200 | 4.00 | 20.0 | 30.0 | 60.0 |
| a,a,a-Trifluorotoluene | Ave | 258178 | 256030 | 209105 | 194300 | 265413 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 |
| 4-Bromofluorobenzene | Ave | 615032 | 612822 | 506488 | 468577 | 634512 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 |

Curve Type Legend:

Ave = Average
Linl = Linear 1/conc

069

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 266158

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/29/2015 15:23 Calibration End Date: 09/29/2015 17:31 Calibration ID: 25065

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | BLK | 3_67154.D |
| Level 2 | BLK | 3_67155.D |
| Level 3 | BLK | 3_67156.D |
| Level 4 | BLK | 3_67157.D |
| Level 5 | BLK | 3_67158.D |

| ANALYTE | LVL 1 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | | | | | | RT WINDOW | AVG RT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| a,a,a-Trifluorotoluene | 4.403 | 4.403 | 4.403 | 4.407 | 4.407 | | | | | | 4.333 - 4.473 | 4.405 |
| 4-Bromofluorobenzene | 10.323 | 10.323 | 10.327 | 10.333 | 10.343 | | | | | | 10.257 - 10.397 | 10.330 |

691

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 266158

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/29/2015 15:23 Calibration End Date: 09/29/2015 17:31 Calibration ID: 25065

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | BLK | 3_67154.D |
| Level 2 | BLK | 3_67155.D |
| Level 3 | BLK | 3_67156.D |
| Level 4 | BLK | 3_67157.D |
| Level 5 | BLK | 3_67158.D |

| ANALYTE | CF | | | | CURVE TYPE | COEFFICIENT | | | # | MIN CF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 5 | LVL 2 | LVL 3 | LVL 4 | | B | M1 | M2 | | | | | | | | |
| a,a,a-Trifluorotoluene | 10695<br>8254.1 | 10991 | 11176 | 10918 | Ave | | 10406.7444 | | | | 11.7 | | 20.0 | | | |
| 4-Bromofluorobenzene | 25742<br>20050 | 26376 | 26955 | 26341 | Ave | | 25092.7333 | | | | 11.4 | | 20.0 | | | |

Note: The m1 coefficient is the same as Ave CF for an Ave curve type.

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 266158

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/29/2015 15:23 Calibration End Date: 09/29/2015 17:31 Calibration ID: 25065

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | BLK | 3_67154.D |
| Level 2 | BLK | 3_67155.D |
| Level 3 | BLK | 3_67156.D |
| Level 4 | BLK | 3_67157.D |
| Level 5 | BLK | 3_67158.D |

| ANALYTE | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (UG/L) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LVL 1 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | LVL 1 | LVL 2 | LVL 3 | LVL 4 | LVL 5 |
| a,a,a-Trifluorotoluene | Ave | 192505 | 197832 | 201174 | 196522 | 148574 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 |
| 4-Bromofluorobenzene | Ave | 463354 | 474764 | 485185 | 474146 | 360897 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 |

Curve Type Legend:
Ave = Average

693

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 266158

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/29/2015 15:23 Calibration End Date: 09/29/2015 17:31 Calibration ID: 25066

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | BLK | 3_67154.D |
| Level 2 | BLK | 3_67155.D |
| Level 3 | BLK | 3_67156.D |
| Level 4 | BLK | 3_67157.D |
| Level 5 | BLK | 3_67158.D |

| ANALYTE | LVL 1 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | | | | | | RT WINDOW | AVG RT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| a,a,a-Trifluorotoluene | 5.047 | 5.047 | 5.047 | 5.050 | 5.053 | | | | | | 4.977 - 5.117 | 5.049 |
| 4-Bromofluorobenzene | 12.450 | 12.450 | 12.453 | 12.457 | 12.463 | | | | | | 12.383 - 12.523 | 12.455 |

694

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
CURVE EVALUATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 266158

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/29/2015 15:23 Calibration End Date: 09/29/2015 17:31 Calibration ID: 25066

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | BLK | 3_67154.D |
| Level 2 | BLK | 3_67155.D |
| Level 3 | BLK | 3_67156.D |
| Level 4 | BLK | 3_67157.D |
| Level 5 | BLK | 3_67158.D |

| ANALYTE | CF | | | | CURVE TYPE | COEFFICIENT | | | # | MIN CF | %RSD | # | MAX %RSD | R^2 OR COD | # | MIN R^2 OR COD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LVL 1<br>LVL 5 | LVL 2 | LVL 3 | LVL 4 | | B | M1 | M2 | | | | | | | | |
| a,a,a-Trifluorotoluene | 14576<br>11421 | 15048 | 15201 | 14916 | Ave | | 14232.1889 | | | | 11.2 | | 20.0 | | | |
| 4-Bromofluorobenzene | 35209<br>27199 | 35883 | 36485 | 35717 | Ave | | 34098.7333 | | | | 11.4 | | 20.0 | | | |

Note: The m1 coefficient is the same as Ave CF for an Ave curve type.

FORM VI
GC VOA BY EXTERNAL STANDARD - INITIAL CALIBRATION DATA
RESPONSE AND CONCENTRATION

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1 Analy Batch No.: 266158

SDG No.:

Instrument ID: HP5890-3 GC Column: RTX-VGC ID: 0.53(mm) Heated Purge: (Y/N) N

Calibration Start Date: 09/29/2015 15:23 Calibration End Date: 09/29/2015 17:31 Calibration ID: 25066

Calibration Files:

| LEVEL: | LAB SAMPLE ID: | LAB FILE ID: |
|---|---|---|
| Level 1 | BLK | 3_67154.D |
| Level 2 | BLK | 3_67155.D |
| Level 3 | BLK | 3_67156.D |
| Level 4 | BLK | 3_67157.D |
| Level 5 | BLK | 3_67158.D |

| ANALYTE | CURVE TYPE | RESPONSE | | | | | CONCENTRATION (UG/L) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LVL 1 | LVL 2 | LVL 3 | LVL 4 | LVL 5 | LVL 1 | LVL 2 | LVL 3 | LVL 4 | LVL 5 |
| a,a,a-Trifluorotoluene | Ave | 262362 | 270870 | 273612 | 268481 | 205572 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 |
| 4-Bromofluorobenzene | Ave | 633770 | 645891 | 656738 | 642899 | 489588 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 |

Curve Type Legend:
Ave = Average

969

FORM VII
GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/2 Calibration Date: 11/05/2015 07:57

Instrument ID: HP5890-3 Calib Start Date: 09/10/2015 17:44

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/10/2015 19:52

Lab File ID: 3_69022.D Conc. Units: ug/L Heated Purge: (Y/N) N

| ANALYTE | CURVE TYPE | AVE CF | CF | MIN CF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Methyl tert-butyl ether | Ave | 8724 | 7723 | | 17.7 | 20.0 | -11.5 | 15.0 |
| Benzene | Ave | 25507 | 22271 | | 17.5 | 20.0 | -12.7 | 15.0 |
| Toluene | Ave | 23818 | 21053 | | 17.7 | 20.0 | -11.6 | 15.0 |
| Ethylbenzene | Ave | 20867 | 18791 | | 18.0 | 20.0 | -9.9 | 15.0 |
| m,p-Xylene | Ave | 24188 | 21394 | | 35.4 | 40.0 | -11.6 | 15.0 |
| o-Xylene | Ave | 21132 | 18519 | | 17.5 | 20.0 | -12.4 | 15.0 |
| Isopropylbenzene | Ave | 18328 | 16187 | | 17.7 | 20.0 | -11.7 | 15.0 |
| n-Propylbenzene | Lin1 | | 17794 | | 18.3 | 20.0 | -8.7 | 15.0 |
| 1,3,5-Trimethylbenzene | Lin1 | | 26356 | | 17.8 | 20.0 | -10.9 | 15.0 |
| tert-Butylbenzene | Ave | 16019 | 14109 | | 17.6 | 20.0 | -11.9 | 15.0 |
| 1,2,4-Trimethylbenzene | Ave | 22906 | 19216 | | 16.8 | 20.0 | -16.1* | 15.0 |
| sec-Butylbenzene | Ave | 17748 | 16188 | | 18.2 | 20.0 | -8.8 | 15.0 |
| 4-Isopropyltoluene | Ave | 16734 | 15195 | | 18.2 | 20.0 | -9.2 | 15.0 |
| n-Butylbenzene | Ave | 17021 | 16289 | | 19.1 | 20.0 | -4.3 | 15.0 |
| Naphthalene | Lin1 | | 8356 | | 13.6 | 20.0 | -32.1* | 15.0 |

FORM VII
GC VOA CONTINUING CALIBRATION RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/2 Calibration Date: 11/05/2015 07:57

Instrument ID: HP5890-3 Calib Start Date: 09/10/2015 17:44

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/10/2015 19:52

Lab File ID: 3_69022.D Heated Purge: (Y/N) N

| Analyte | RT | RT WINDOW | |
|---|---|---|---|
| | | FROM | TO |
| Methyl tert-butyl ether | 2.24 | 2.17 | 2.31 |
| Benzene | 3.49 | 3.42 | 3.56 |
| Toluene | 5.16 | 5.09 | 5.23 |
| Ethylbenzene | 7.49 | 7.42 | 7.56 |
| m,p-Xylene | 7.83 | 7.76 | 7.90 |
| o-Xylene | 8.84 | 8.77 | 8.91 |
| Isopropylbenzene | 9.69 | 9.62 | 9.76 |
| n-Propylbenzene | 10.80 | 10.73 | 10.87 |
| 1,3,5-Trimethylbenzene | 11.41 | 11.34 | 11.48 |
| tert-Butylbenzene | 12.20 | 12.13 | 12.27 |
| 1,2,4-Trimethylbenzene | 12.44 | 12.37 | 12.51 |
| sec-Butylbenzene | 12.71 | 12.64 | 12.78 |
| 4-Isopropyltoluene | 13.20 | 13.13 | 13.27 |
| n-Butylbenzene | 14.40 | 14.33 | 14.47 |
| Naphthalene | 17.61 | 17.54 | 17.68 |

FORM VII
GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/2 Calibration Date: 11/05/2015 07:57

Instrument ID: HP5890-3 Calib Start Date: 09/29/2015 15:23

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/29/2015 17:31

Lab File ID: 3_69022.D Conc. Units: ug/L Heated Purge: (Y/N) N

| ANALYTE | CURVE TYPE | AVE CF | CF | MIN CF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| a,a,a-Trifluorotoluene | Ave | 10407 | 12426 | | 21.5 | 18.0 | 19.4 | 37.0 |
| 4-Bromofluorobenzene | Ave | 25093 | 28992 | | 20.8 | 18.0 | 15.5 | 36.0 |

FORM VII
GC VOA CONTINUING CALIBRATION RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/2 Calibration Date: 11/05/2015 07:57

Instrument ID: HP5890-3 Calib Start Date: 09/29/2015 15:23

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/29/2015 17:31

Lab File ID: 3_69022.D Heated Purge: (Y/N) N

| Analyte | RT | RT WINDOW | |
|---|---|---|---|
| | | FROM | TO |
| a,a,a-Trifluorotoluene | 4.41 | 4.34 | 4.48 |
| 4-Bromofluorobenzene | 10.32 | 10.25 | 10.39 |

FORM VII
GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/2 Calibration Date: 11/05/2015 07:57

Instrument ID: HP5890-3 Calib Start Date: 09/10/2015 17:44

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/10/2015 19:52

Lab File ID: 3_69022.D Conc. Units: ug/L Heated Purge: (Y/N) N

| ANALYTE | CURVE TYPE | AVE CF | CF | MIN CF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Methyl tert-butyl ether | Ave | 10656 | 10665 | | 20.0 | 20.0 | 0.0 | 15.0 |
| Benzene | Ave | 32499 | 31612 | | 19.5 | 20.0 | -2.7 | 15.0 |
| Toluene | Ave | 30645 | 29196 | | 19.1 | 20.0 | -4.7 | 15.0 |
| Ethylbenzene | Ave | 27277 | 26861 | | 19.7 | 20.0 | -1.5 | 15.0 |
| m,p-Xylene | Ave | 31450 | 30437 | | 38.7 | 40.0 | -3.2 | 15.0 |
| o-Xylene | Ave | 26884 | 26127 | | 19.4 | 20.0 | -2.8 | 15.0 |
| Isopropylbenzene | Ave | 22827 | 22824 | | 20.0 | 20.0 | -0.0 | 15.0 |
| n-Propylbenzene | Lin1 | | 24712 | | 20.1 | 20.0 | 0.3 | 15.0 |
| 1,3,5-Trimethylbenzene | Lin1 | | 36932 | | 19.8 | 20.0 | -0.9 | 15.0 |
| tert-Butylbenzene | Ave | 20156 | 20187 | | 20.0 | 20.0 | 0.2 | 15.0 |
| 1,2,4-Trimethylbenzene | Ave | 29299 | 28456 | | 19.4 | 20.0 | -2.9 | 15.0 |
| sec-Butylbenzene | Ave | 21498 | 21668 | | 20.2 | 20.0 | 0.8 | 15.0 |
| 4-Isopropyltoluene | Ave | 21504 | 21456 | | 20.0 | 20.0 | -0.2 | 15.0 |
| n-Butylbenzene | Ave | 23040 | 22772 | | 19.8 | 20.0 | -1.2 | 15.0 |
| Naphthalene | Lin1 | | 12259 | | 15.5 | 20.0 | -22.6* | 15.0 |

FORM VII
GC VOA CONTINUING CALIBRATION RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/2 Calibration Date: 11/05/2015 07:57

Instrument ID: HP5890-3 Calib Start Date: 09/10/2015 17:44

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/10/2015 19:52

Lab File ID: 3_69022.D Heated Purge: (Y/N) N

| Analyte | RT | RT WINDOW | |
|---|---|---|---|
| | | FROM | TO |
| Methyl tert-butyl ether | 2.72 | 2.65 | 2.79 |
| Benzene | 4.17 | 4.10 | 4.24 |
| Toluene | 6.35 | 6.28 | 6.42 |
| Ethylbenzene | 9.62 | 9.55 | 9.69 |
| m,p-Xylene | 9.98 | 9.91 | 10.05 |
| o-Xylene | 10.97 | 10.90 | 11.04 |
| Isopropylbenzene | 12.01 | 11.94 | 12.08 |
| n-Propylbenzene | 13.18 | 13.11 | 13.25 |
| 1,3,5-Trimethylbenzene | 13.77 | 13.70 | 13.84 |
| tert-Butylbenzene | 14.61 | 14.54 | 14.68 |
| 1,2,4-Trimethylbenzene | 14.82 | 14.75 | 14.89 |
| sec-Butylbenzene | 15.30 | 15.23 | 15.37 |
| 4-Isopropyltoluene | 15.74 | 15.67 | 15.81 |
| n-Butylbenzene | 16.47 | 16.40 | 16.54 |
| Naphthalene | 18.41 | 18.34 | 18.48 |

FORM VII
GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/2 Calibration Date: 11/05/2015 07:57

Instrument ID: HP5890-3 Calib Start Date: 09/29/2015 15:23

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/29/2015 17:31

Lab File ID: 3_69022.D Conc. Units: ug/L Heated Purge: (Y/N) N

| ANALYTE | CURVE TYPE | AVE CF | CF | MIN CF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| a,a,a-Trifluorotoluene | Ave | 14232 | 17912 | | 22.7 | 18.0 | 25.9 | 37.0 |
| 4-Bromofluorobenzene | Ave | 34099 | 41726 | | 22.0 | 18.0 | 22.4 | 36.0 |

FORM VII
GC VOA CONTINUING CALIBRATION RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/2 Calibration Date: 11/05/2015 07:57

Instrument ID: HP5890-3 Calib Start Date: 09/29/2015 15:23

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/29/2015 17:31

Lab File ID: 3_69022.D Heated Purge: (Y/N) N

| Analyte | RT | RT WINDOW | |
|---|---|---|---|
| | | FROM | TO |
| a,a,a-Trifluorotoluene | 5.06 | 4.99 | 5.13 |
| 4-Bromofluorobenzene | 12.45 | 12.38 | 12.52 |

FORM VII
GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/12 Calibration Date: 11/05/2015 14:14

Instrument ID: HP5890-3 Calib Start Date: 09/10/2015 17:44

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/10/2015 19:52

Lab File ID: 3_69032.D Conc. Units: ug/L Heated Purge: (Y/N) N

| ANALYTE | CURVE TYPE | AVE CF | CF | MIN CF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Methyl tert-butyl ether | Ave | 8724 | 8591 | | 19.7 | 20.0 | -1.5 | 15.0 |
| Benzene | Ave | 25507 | 22770 | | 17.9 | 20.0 | -10.7 | 15.0 |
| Toluene | Ave | 23818 | 21490 | | 18.0 | 20.0 | -9.8 | 15.0 |
| Ethylbenzene | Ave | 20867 | 19371 | | 18.6 | 20.0 | -7.2 | 15.0 |
| m,p-Xylene | Ave | 24188 | 21861 | | 36.2 | 40.0 | -9.6 | 15.0 |
| o-Xylene | Ave | 21132 | 19083 | | 18.1 | 20.0 | -9.7 | 15.0 |
| Isopropylbenzene | Ave | 18328 | 16983 | | 18.5 | 20.0 | -7.3 | 15.0 |
| n-Propylbenzene | Lin1 | | 18025 | | 18.5 | 20.0 | -7.5 | 15.0 |
| 1,3,5-Trimethylbenzene | Lin1 | | 27093 | | 18.3 | 20.0 | -8.4 | 15.0 |
| tert-Butylbenzene | Ave | 16019 | 14554 | | 18.2 | 20.0 | -9.1 | 15.0 |
| 1,2,4-Trimethylbenzene | Ave | 22906 | 19435 | | 17.0 | 20.0 | -15.2* | 15.0 |
| sec-Butylbenzene | Ave | 17748 | 16877 | | 19.0 | 20.0 | -4.9 | 15.0 |
| 4-Isopropyltoluene | Ave | 16734 | 15504 | | 18.5 | 20.0 | -7.4 | 15.0 |
| n-Butylbenzene | Ave | 17021 | 16466 | | 19.3 | 20.0 | -3.3 | 15.0 |
| Naphthalene | Lin1 | | 9761 | | 15.8 | 20.0 | -20.8* | 15.0 |

FORM VII
GC VOA CONTINUING CALIBRATION RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/12 Calibration Date: 11/05/2015 14:14

Instrument ID: HP5890-3 Calib Start Date: 09/10/2015 17:44

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/10/2015 19:52

Lab File ID: 3_69032.D Heated Purge: (Y/N) N

| Analyte | RT | RT WINDOW | |
|---|---|---|---|
| | | FROM | TO |
| Methyl tert-butyl ether | 2.26 | 2.19 | 2.33 |
| Benzene | 3.51 | 3.44 | 3.58 |
| Toluene | 5.17 | 5.10 | 5.24 |
| Ethylbenzene | 7.51 | 7.44 | 7.58 |
| m,p-Xylene | 7.85 | 7.78 | 7.92 |
| o-Xylene | 8.86 | 8.79 | 8.93 |
| Isopropylbenzene | 9.71 | 9.64 | 9.78 |
| n-Propylbenzene | 10.82 | 10.75 | 10.89 |
| 1,3,5-Trimethylbenzene | 11.44 | 11.37 | 11.51 |
| tert-Butylbenzene | 12.23 | 12.16 | 12.30 |
| 1,2,4-Trimethylbenzene | 12.46 | 12.39 | 12.53 |
| sec-Butylbenzene | 12.73 | 12.66 | 12.80 |
| 4-Isopropyltoluene | 13.23 | 13.16 | 13.30 |
| n-Butylbenzene | 14.42 | 14.35 | 14.49 |
| Naphthalene | 17.62 | 17.55 | 17.69 |

FORM VII
GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/12 Calibration Date: 11/05/2015 14:14

Instrument ID: HP5890-3 Calib Start Date: 09/29/2015 15:23

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/29/2015 17:31

Lab File ID: 3_69032.D Conc. Units: ug/L Heated Purge: (Y/N) N

| ANALYTE | CURVE TYPE | AVE CF | CF | MIN CF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| a,a,a-Trifluorotoluene | Ave | 10407 | 10453 | | 18.1 | 18.0 | 0.4 | 37.0 |
| 4-Bromofluorobenzene | Ave | 25093 | 24555 | | 17.6 | 18.0 | -2.1 | 36.0 |

FORM VII
GC VOA CONTINUING CALIBRATION RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/12 Calibration Date: 11/05/2015 14:14

Instrument ID: HP5890-3 Calib Start Date: 09/29/2015 15:23

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/29/2015 17:31

Lab File ID: 3_69032.D Heated Purge: (Y/N) N

| Analyte | RT | RT WINDOW | |
|---|---|---|---|
| | | FROM | TO |
| a,a,a-Trifluorotoluene | 4.43 | 4.36 | 4.50 |
| 4-Bromofluorobenzene | 10.34 | 10.27 | 10.41 |

FORM VII
GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/12 Calibration Date: 11/05/2015 14:14

Instrument ID: HP5890-3 Calib Start Date: 09/10/2015 17:44

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/10/2015 19:52

Lab File ID: 3_69032.D Conc. Units: ug/L Heated Purge: (Y/N) N

| ANALYTE | CURVE TYPE | AVE CF | CF | MIN CF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Methyl tert-butyl ether | Ave | 10656 | 10936 | | 20.5 | 20.0 | 2.6 | 15.0 |
| Benzene | Ave | 32499 | 31497 | | 19.4 | 20.0 | -3.1 | 15.0 |
| Toluene | Ave | 30645 | 29051 | | 19.0 | 20.0 | -5.2 | 15.0 |
| Ethylbenzene | Ave | 27277 | 26770 | | 19.6 | 20.0 | -1.9 | 15.0 |
| m,p-Xylene | Ave | 31450 | 31113 | | 39.6 | 40.0 | -1.1 | 15.0 |
| o-Xylene | Ave | 26884 | 26425 | | 19.7 | 20.0 | -1.7 | 15.0 |
| Isopropylbenzene | Ave | 22827 | 23005 | | 20.2 | 20.0 | 0.8 | 15.0 |
| n-Propylbenzene | Lin1 | | 24943 | | 20.2 | 20.0 | 1.2 | 15.0 |
| 1,3,5-Trimethylbenzene | Lin1 | | 37523 | | 20.1 | 20.0 | 0.7 | 15.0 |
| tert-Butylbenzene | Ave | 20156 | 20538 | | 20.4 | 20.0 | 1.9 | 15.0 |
| 1,2,4-Trimethylbenzene | Ave | 29299 | 29217 | | 19.9 | 20.0 | -0.3 | 15.0 |
| sec-Butylbenzene | Ave | 21498 | 22143 | | 20.6 | 20.0 | 3.0 | 15.0 |
| 4-Isopropyltoluene | Ave | 21504 | 21778 | | 20.3 | 20.0 | 1.3 | 15.0 |
| n-Butylbenzene | Ave | 23040 | 22831 | | 19.8 | 20.0 | -0.9 | 15.0 |
| Naphthalene | Lin1 | | 13886 | | 17.5 | 20.0 | -12.4 | 15.0 |

FORM VII
GC VOA CONTINUING CALIBRATION RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/12 Calibration Date: 11/05/2015 14:14

Instrument ID: HP5890-3 Calib Start Date: 09/10/2015 17:44

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/10/2015 19:52

Lab File ID: 3_69032.D Heated Purge: (Y/N) N

| Analyte | RT | RT WINDOW | |
|---|---|---|---|
| | | FROM | TO |
| Methyl tert-butyl ether | 2.74 | 2.67 | 2.81 |
| Benzene | 4.18 | 4.11 | 4.25 |
| Toluene | 6.36 | 6.29 | 6.43 |
| Ethylbenzene | 9.64 | 9.57 | 9.71 |
| m,p-Xylene | 10.01 | 9.94 | 10.08 |
| o-Xylene | 10.99 | 10.92 | 11.06 |
| Isopropylbenzene | 12.04 | 11.97 | 12.11 |
| n-Propylbenzene | 13.21 | 13.14 | 13.28 |
| 1,3,5-Trimethylbenzene | 13.80 | 13.73 | 13.87 |
| tert-Butylbenzene | 14.63 | 14.56 | 14.70 |
| 1,2,4-Trimethylbenzene | 14.85 | 14.78 | 14.92 |
| sec-Butylbenzene | 15.33 | 15.26 | 15.40 |
| 4-Isopropyltoluene | 15.76 | 15.69 | 15.83 |
| n-Butylbenzene | 16.48 | 16.41 | 16.55 |
| Naphthalene | 18.42 | 18.35 | 18.49 |

FORM VII
GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/12 Calibration Date: 11/05/2015 14:14

Instrument ID: HP5890-3 Calib Start Date: 09/29/2015 15:23

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/29/2015 17:31

Lab File ID: 3_69032.D Conc. Units: ug/L Heated Purge: (Y/N) N

| ANALYTE | CURVE TYPE | AVE CF | CF | MIN CF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| a,a,a-Trifluorotoluene | Ave | 14232 | 14658 | | 18.5 | 18.0 | 3.0 | 37.0 |
| 4-Bromofluorobenzene | Ave | 34099 | 34832 | | 18.4 | 18.0 | 2.2 | 36.0 |

FORM VII
GC VOA CONTINUING CALIBRATION RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/12 Calibration Date: 11/05/2015 14:14

Instrument ID: HP5890-3 Calib Start Date: 09/29/2015 15:23

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/29/2015 17:31

Lab File ID: 3_69032.D Heated Purge: (Y/N) N

| Analyte | RT | RT WINDOW | |
|---|---|---|---|
| | | FROM | TO |
| a,a,a-Trifluorotoluene | 5.08 | 5.01 | 5.15 |
| 4-Bromofluorobenzene | 12.47 | 12.40 | 12.54 |

FORM VII
GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/22 Calibration Date: 11/05/2015 20:16

Instrument ID: HP5890-3 Calib Start Date: 09/10/2015 17:44

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/10/2015 19:52

Lab File ID: 3_69042.D Conc. Units: ug/L Heated Purge: (Y/N) N

| ANALYTE | CURVE TYPE | AVE CF | CF | MIN CF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Methyl tert-butyl ether | Ave | 8724 | 8237 | | 18.9 | 20.0 | -5.6 | 15.0 |
| Benzene | Ave | 25507 | 22435 | | 17.6 | 20.0 | -12.0 | 15.0 |
| Toluene | Ave | 23818 | 21048 | | 17.7 | 20.0 | -11.6 | 15.0 |
| Ethylbenzene | Ave | 20867 | 19029 | | 18.2 | 20.0 | -8.8 | 15.0 |
| m,p-Xylene | Ave | 24188 | 21523 | | 35.6 | 40.0 | -11.0 | 15.0 |
| o-Xylene | Ave | 21132 | 18699 | | 17.7 | 20.0 | -11.5 | 15.0 |
| Isopropylbenzene | Ave | 18328 | 17462 | | 19.1 | 20.0 | -4.7 | 15.0 |
| n-Propylbenzene | Lin1 | | 17776 | | 18.2 | 20.0 | -8.8 | 15.0 |
| 1,3,5-Trimethylbenzene | Lin1 | | 27017 | | 18.3 | 20.0 | -8.7 | 15.0 |
| tert-Butylbenzene | Ave | 16019 | 14148 | | 17.7 | 20.0 | -11.7 | 15.0 |
| 1,2,4-Trimethylbenzene | Ave | 22906 | 18360 | | 16.0 | 20.0 | -19.8* | 15.0 |
| sec-Butylbenzene | Ave | 17748 | 17134 | | 19.3 | 20.0 | -3.5 | 15.0 |
| 4-Isopropyltoluene | Ave | 16734 | 15257 | | 18.2 | 20.0 | -8.8 | 15.0 |
| n-Butylbenzene | Ave | 17021 | 16286 | | 19.1 | 20.0 | -4.3 | 15.0 |
| Naphthalene | Lin1 | | 8218 | | 13.4 | 20.0 | -33.2* | 15.0 |

FORM VII
GC VOA CONTINUING CALIBRATION RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/22 Calibration Date: 11/05/2015 20:16

Instrument ID: HP5890-3 Calib Start Date: 09/10/2015 17:44

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/10/2015 19:52

Lab File ID: 3_69042.D Heated Purge: (Y/N) N

| Analyte | RT | RT WINDOW | |
|---|---|---|---|
| | | FROM | TO |
| Methyl tert-butyl ether | 2.26 | 2.19 | 2.33 |
| Benzene | 3.50 | 3.43 | 3.57 |
| Toluene | 5.17 | 5.10 | 5.24 |
| Ethylbenzene | 7.48 | 7.41 | 7.55 |
| m,p-Xylene | 7.83 | 7.76 | 7.90 |
| o-Xylene | 8.84 | 8.77 | 8.91 |
| Isopropylbenzene | 9.68 | 9.61 | 9.75 |
| n-Propylbenzene | 10.79 | 10.72 | 10.86 |
| 1,3,5-Trimethylbenzene | 11.42 | 11.35 | 11.49 |
| tert-Butylbenzene | 12.20 | 12.13 | 12.27 |
| 1,2,4-Trimethylbenzene | 12.44 | 12.37 | 12.51 |
| sec-Butylbenzene | 12.71 | 12.64 | 12.78 |
| 4-Isopropyltoluene | 13.21 | 13.14 | 13.28 |
| n-Butylbenzene | 14.40 | 14.33 | 14.47 |
| Naphthalene | 17.61 | 17.54 | 17.68 |

FORM VII
GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/22 Calibration Date: 11/05/2015 20:16

Instrument ID: HP5890-3 Calib Start Date: 09/29/2015 15:23

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/29/2015 17:31

Lab File ID: 3_69042.D Conc. Units: ug/L Heated Purge: (Y/N) N

| ANALYTE | CURVE TYPE | AVE CF | CF | MIN CF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| a,a,a-Trifluorotoluene | Ave | 10407 | 13843 | | 23.9 | 18.0 | 33.0 | 37.0 |
| 4-Bromofluorobenzene | Ave | 25093 | 33057 | | 23.0 | 18.0 | 27.8 | 36.0 |

FORM VII
GC VOA CONTINUING CALIBRATION RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/22 Calibration Date: 11/05/2015 20:16

Instrument ID: HP5890-3 Calib Start Date: 09/29/2015 15:23

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/29/2015 17:31

Lab File ID: 3_69042.D Heated Purge: (Y/N) N

| Analyte | RT | RT WINDOW | |
|---|---|---|---|
| | | FROM | TO |
| a,a,a-Trifluorotoluene | 4.42 | 4.35 | 4.49 |
| 4-Bromofluorobenzene | 10.31 | 10.24 | 10.38 |

FORM VII
GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/22 Calibration Date: 11/05/2015 20:16

Instrument ID: HP5890-3 Calib Start Date: 09/10/2015 17:44

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/10/2015 19:52

Lab File ID: 3_69042.D Conc. Units: ug/L Heated Purge: (Y/N) N

| ANALYTE | CURVE TYPE | AVE CF | CF | MIN CF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| Methyl tert-butyl ether | Ave | 10656 | 10442 | | 19.6 | 20.0 | -2.0 | 15.0 |
| Benzene | Ave | 32499 | 31550 | | 19.4 | 20.0 | -2.9 | 15.0 |
| Toluene | Ave | 30645 | 28553 | | 18.6 | 20.0 | -6.8 | 15.0 |
| Ethylbenzene | Ave | 27277 | 26622 | | 19.5 | 20.0 | -2.4 | 15.0 |
| m,p-Xylene | Ave | 31450 | 31552 | | 40.1 | 40.0 | 0.3 | 15.0 |
| o-Xylene | Ave | 26884 | 26363 | | 19.6 | 20.0 | -1.9 | 15.0 |
| Isopropylbenzene | Ave | 22827 | 22660 | | 19.9 | 20.0 | -0.7 | 15.0 |
| n-Propylbenzene | Lin1 | | 24653 | | 20.0 | 20.0 | 0.0 | 15.0 |
| 1,3,5-Trimethylbenzene | Lin1 | | 37332 | | 20.0 | 20.0 | 0.2 | 15.0 |
| tert-Butylbenzene | Ave | 20156 | 20064 | | 19.9 | 20.0 | -0.5 | 15.0 |
| 1,2,4-Trimethylbenzene | Ave | 29299 | 28981 | | 19.8 | 20.0 | -1.1 | 15.0 |
| sec-Butylbenzene | Ave | 21498 | 21867 | | 20.3 | 20.0 | 1.7 | 15.0 |
| 4-Isopropyltoluene | Ave | 21504 | 21470 | | 20.0 | 20.0 | -0.2 | 15.0 |
| n-Butylbenzene | Ave | 23040 | 22636 | | 19.6 | 20.0 | -1.8 | 15.0 |
| Naphthalene | Lin1 | | 12155 | | 15.3 | 20.0 | -23.3* | 15.0 |

FORM VII
GC VOA CONTINUING CALIBRATION RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/22 Calibration Date: 11/05/2015 20:16

Instrument ID: HP5890-3 Calib Start Date: 09/10/2015 17:44

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/10/2015 19:52

Lab File ID: 3_69042.D Heated Purge: (Y/N) N

| Analyte | RT | RT WINDOW | |
|---|---|---|---|
| | | FROM | TO |
| Methyl tert-butyl ether | 2.74 | 2.67 | 2.81 |
| Benzene | 4.18 | 4.11 | 4.25 |
| Toluene | 6.35 | 6.28 | 6.42 |
| Ethylbenzene | 9.62 | 9.55 | 9.69 |
| m,p-Xylene | 9.98 | 9.91 | 10.05 |
| o-Xylene | 10.96 | 10.89 | 11.03 |
| Isopropylbenzene | 12.01 | 11.94 | 12.08 |
| n-Propylbenzene | 13.18 | 13.11 | 13.25 |
| 1,3,5-Trimethylbenzene | 13.78 | 13.71 | 13.85 |
| tert-Butylbenzene | 14.60 | 14.53 | 14.67 |
| 1,2,4-Trimethylbenzene | 14.83 | 14.76 | 14.90 |
| sec-Butylbenzene | 15.30 | 15.23 | 15.37 |
| 4-Isopropyltoluene | 15.74 | 15.67 | 15.81 |
| n-Butylbenzene | 16.47 | 16.40 | 16.54 |
| Naphthalene | 18.41 | 18.34 | 18.48 |

FORM VII
GC VOA CONTINUING CALIBRATION DATA

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/22 Calibration Date: 11/05/2015 20:16

Instrument ID: HP5890-3 Calib Start Date: 09/29/2015 15:23

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/29/2015 17:31

Lab File ID: 3_69042.D Conc. Units: ug/L Heated Purge: (Y/N) N

| ANALYTE | CURVE TYPE | AVE CF | CF | MIN CF | CALC AMOUNT | SPIKE AMOUNT | %D | MAX %D |
|---|---|---|---|---|---|---|---|---|
| a,a,a-Trifluorotoluene | Ave | 14232 | 19815 | | 25.1 | 18.0 | 39.2* | 37.0 |
| 4-Bromofluorobenzene | Ave | 34099 | 46416 | | 24.5 | 18.0 | 36.1* | 36.0 |

FORM VII
GC VOA CONTINUING CALIBRATION RETENTION TIME SUMMARY

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Lab Sample ID: CCV 480-273207/22 Calibration Date: 11/05/2015 20:16

Instrument ID: HP5890-3 Calib Start Date: 09/29/2015 15:23

GC Column: RTX-VGC ID: 0.53(mm) Calib End Date: 09/29/2015 17:31

Lab File ID: 3_69042.D Heated Purge: (Y/N) N

| Analyte | RT | RT WINDOW | |
|---|---|---|---|
| | | FROM | TO |
| a,a,a-Trifluorotoluene | 5.07 | 5.00 | 5.14 |
| 4-Bromofluorobenzene | 12.44 | 12.37 | 12.51 |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: | Lab Sample ID: MB 480-273207/3

Matrix: Water | Lab File ID: 3_69023.D

Analysis Method: 8021B | Date Collected:

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 08:28

Soil Aliquot Vol: | Dilution Factor: 1

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | ND | | 0.20 | 0.023 |
| 108-88-3 | Toluene | ND | | 0.20 | 0.036 |
| 100-41-4 | Ethylbenzene | ND | | 0.20 | 0.029 |
| 179601-23-1 | m,p-Xylene | ND | | 0.40 | 0.054 |
| 95-47-6 | o-Xylene | ND | | 0.20 | 0.027 |
| 1330-20-7 | Xylenes, Total | ND | | 0.60 | 0.054 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 128 | | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 123 | | 64-141 |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: | Lab Sample ID: LCS 480-273207/4

Matrix: Water | Lab File ID: 3_69024.D

Analysis Method: 8021B | Date Collected:

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 09:00

Soil Aliquot Vol: | Dilution Factor: 1

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | 3.62 | | 0.20 | 0.023 |
| 108-88-3 | Toluene | 3.52 | | 0.20 | 0.036 |
| 100-41-4 | Ethylbenzene | 3.58 | | 0.20 | 0.029 |
| 179601-23-1 | m,p-Xylene | 7.32 | | 0.40 | 0.054 |
| 95-47-6 | o-Xylene | 3.53 | | 0.20 | 0.027 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 127 | | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 119 | | 64-141 |

FORM I
GC VOA ORGANICS ANALYSIS DATA SHEET

Lab Name: TestAmerica Buffalo | Job No.: 480-89467-1

SDG No.:

Client Sample ID: | Lab Sample ID: LCSD 480-273207/5

Matrix: Water | Lab File ID: 3_69025.D

Analysis Method: 8021B | Date Collected:

Sample wt/vol: 44(mL) | Date Analyzed: 11/05/2015 09:31

Soil Aliquot Vol: | Dilution Factor: 1

Soil Extract Vol.: | GC Column: RTX-VGC ID: 0.53(mm)

% Moisture: | Level: (low/med) Low

Analysis Batch No.: 273207 | Units: ug/L

| CAS NO. | COMPOUND NAME | RESULT | Q | RL | MDL |
|---|---|---|---|---|---|
| 71-43-2 | Benzene | 3.63 | | 0.20 | 0.023 |
| 108-88-3 | Toluene | 3.49 | | 0.20 | 0.036 |
| 100-41-4 | Ethylbenzene | 3.63 | | 0.20 | 0.029 |
| 179601-23-1 | m,p-Xylene | 7.43 | | 0.40 | 0.054 |
| 95-47-6 | o-Xylene | 3.56 | | 0.20 | 0.027 |

| CAS NO. | SURROGATE | %REC | Q | LIMITS |
|---|---|---|---|---|
| 98-08-8 | a,a,a-Trifluorotoluene | 133 | | 63-145 |
| 460-00-4 | 4-Bromofluorobenzene | 125 | | 64-141 |

GC VOA ANALYSIS RUN LOG

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5890-3 Start Date: 09/10/2015 17:44

Analysis Batch Number: 262944 End Date: 09/10/2015 20:23

| LAB SAMPLE ID | CLIENT SAMPLE ID | DATE ANALYZED | DILUTION FACTOR | LAB FILE ID | COLUMN ID |
|---|---|---|---|---|---|
| STD1 480-262944/2 IC | | 09/10/2015 17:44 | 1 | 3_67061.D | RTX-VGC 0.53(mm) |
| STD1 480-262944/2 IC | | 09/10/2015 17:44 | 1 | 3_67061.D | RTX-VGC 0.53(mm) |
| STD2 480-262944/3 IC | | 09/10/2015 18:16 | 1 | 3_67062.D | RTX-VGC 0.53(mm) |
| STD2 480-262944/3 IC | | 09/10/2015 18:16 | 1 | 3_67062.D | RTX-VGC 0.53(mm) |
| STD3 480-262944/4 IC | | 09/10/2015 18:48 | 1 | 3_67063.D | RTX-VGC 0.53(mm) |
| STD3 480-262944/4 IC | | 09/10/2015 18:48 | 1 | 3_67063.D | RTX-VGC 0.53(mm) |
| STD4 480-262944/5 IC | | 09/10/2015 19:20 | 1 | 3_67064.D | RTX-VGC 0.53(mm) |
| STD4 480-262944/5 IC | | 09/10/2015 19:20 | 1 | 3_67064.D | RTX-VGC 0.53(mm) |
| STD5 480-262944/6 IC | | 09/10/2015 19:52 | 1 | 3_67065.D | RTX-VGC 0.53(mm) |
| STD5 480-262944/6 IC | | 09/10/2015 19:52 | 1 | 3_67065.D | RTX-VGC 0.53(mm) |
| ICV 480-262944/7 | | 09/10/2015 20:23 | 1 | | RTX-VGC 0.53(mm) |
| ICV 480-262944/7 | | 09/10/2015 20:23 | 1 | | RTX-VGC 0.53(mm) |

GC VOA ANALYSIS RUN LOG

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5890-3 Start Date: 09/29/2015 15:23

Analysis Batch Number: 266158 End Date: 09/29/2015 17:31

| LAB SAMPLE ID | CLIENT SAMPLE ID | DATE ANALYZED | DILUTION FACTOR | LAB FILE ID | COLUMN ID |
|---|---|---|---|---|---|
| BLK | | 09/29/2015 15:23 | 1 | 3_67154.D | RTX-VGC 0.53(mm) |
| BLK | | 09/29/2015 15:23 | 1 | 3_67154.D | RTX-VGC 0.53(mm) |
| BLK | | 09/29/2015 15:55 | 1 | 3_67155.D | RTX-VGC 0.53(mm) |
| BLK | | 09/29/2015 15:55 | 1 | 3_67155.D | RTX-VGC 0.53(mm) |
| BLK | | 09/29/2015 16:27 | 1 | 3_67156.D | RTX-VGC 0.53(mm) |
| BLK | | 09/29/2015 16:27 | 1 | 3_67156.D | RTX-VGC 0.53(mm) |
| BLK | | 09/29/2015 16:59 | 1 | 3_67157.D | RTX-VGC 0.53(mm) |
| BLK | | 09/29/2015 16:59 | 1 | 3_67157.D | RTX-VGC 0.53(mm) |
| BLK | | 09/29/2015 17:31 | 1 | 3_67158.D | RTX-VGC 0.53(mm) |
| BLK | | 09/29/2015 17:31 | 1 | 3_67158.D | RTX-VGC 0.53(mm) |

GC VOA ANALYSIS RUN LOG

Lab Name: TestAmerica Buffalo Job No.: 480-89467-1

SDG No.:

Instrument ID: HP5890-3 Start Date: 11/05/2015 07:57

Analysis Batch Number: 273207 End Date: 11/05/2015 20:16

| LAB SAMPLE ID | CLIENT SAMPLE ID | DATE ANALYZED | DILUTION FACTOR | LAB FILE ID | COLUMN ID |
|---|---|---|---|---|---|
| CCV 480-273207/2 | | 11/05/2015 07:57 | 1 | 3_69022.D | RTX-VGC 0.53(mm) |
| CCV 480-273207/2 | | 11/05/2015 07:57 | 1 | 3_69022.D | RTX-VGC 0.53(mm) |
| MB 480-273207/3 | | 11/05/2015 08:28 | 1 | 3_69023.D | RTX-VGC 0.53(mm) |
| MB 480-273207/3 | | 11/05/2015 08:28 | 1 | 3_69023.D | RTX-VGC 0.53(mm) |
| LCS 480-273207/4 | | 11/05/2015 09:00 | 1 | 3_69024.D | RTX-VGC 0.53(mm) |
| LCS 480-273207/4 | | 11/05/2015 09:00 | 1 | 3_69024.D | RTX-VGC 0.53(mm) |
| LCSD 480-273207/5 | | 11/05/2015 09:31 | 1 | 3_69025.D | RTX-VGC 0.53(mm) |
| LCSD 480-273207/5 | | 11/05/2015 09:31 | 1 | 3_69025.D | RTX-VGC 0.53(mm) |
| 480-89467-1 | WW-01-101514-1120 | 11/05/2015 11:33 | 200 | 3_69027.D | RTX-VGC 0.53(mm) |
| 480-89467-1 | WW-01-101514-1120 | 11/05/2015 11:33 | 200 | 3_69027.D | RTX-VGC 0.53(mm) |
| 480-89467-3 | WW-01-031915-1550 | 11/05/2015 12:05 | 800 | 3_69028.D | RTX-VGC 0.53(mm) |
| 480-89467-3 | WW-01-031915-1550 | 11/05/2015 12:05 | 800 | 3_69028.D | RTX-VGC 0.53(mm) |
| 480-89467-4 | WW-01-041415-1640 | 11/05/2015 12:38 | 200 | 3_69029.D | RTX-VGC 0.53(mm) |
| 480-89467-4 | WW-01-041415-1640 | 11/05/2015 12:38 | 200 | 3_69029.D | RTX-VGC 0.53(mm) |
| 480-89467-7 | WW-01-050615-1552 | 11/05/2015 13:10 | 200 | 3_69030.D | RTX-VGC 0.53(mm) |
| 480-89467-7 | WW-01-050615-1552 | 11/05/2015 13:10 | 200 | 3_69030.D | RTX-VGC 0.53(mm) |
| CCV 480-273207/12 | | 11/05/2015 14:14 | 1 | 3_69032.D | RTX-VGC 0.53(mm) |
| CCV 480-273207/12 | | 11/05/2015 14:14 | 1 | 3_69032.D | RTX-VGC 0.53(mm) |
| 480-89467-11 | P-01-031315-1531 | 11/05/2015 15:10 | 2000 | 3_69033.D | RTX-VGC 0.53(mm) |
| 480-89467-11 | P-01-031315-1531 | 11/05/2015 15:10 | 2000 | 3_69033.D | RTX-VGC 0.53(mm) |
| 480-89467-12 | P-01-050615-1552 | 11/05/2015 16:14 | 400 | 3_69035.D | RTX-VGC 0.53(mm) |
| 480-89467-12 | P-01-050615-1552 | 11/05/2015 16:14 | 400 | 3_69035.D | RTX-VGC 0.53(mm) |
| 480-89467-21 | P-01-040115-1600 | 11/05/2015 16:45 | 800 | 3_69036.D | RTX-VGC 0.53(mm) |
| 480-89467-21 | P-01-040115-1600 | 11/05/2015 16:45 | 800 | 3_69036.D | RTX-VGC 0.53(mm) |
| 480-89467-9 | WW-01-052015-1500 | 11/05/2015 18:41 | 200 | 3_69039.D | RTX-VGC 0.53(mm) |
| 480-89467-9 | WW-01-052015-1500 | 11/05/2015 18:41 | 200 | 3_69039.D | RTX-VGC 0.53(mm) |
| 480-89467-23 | P-01-012215-0948 | 11/05/2015 19:13 | 800 | 3_69040.D | RTX-VGC 0.53(mm) |
| 480-89467-23 | P-01-012215-0948 | 11/05/2015 19:13 | 800 | 3_69040.D | RTX-VGC 0.53(mm) |
| 480-89467-24 | WW-01-031315-1531 | 11/05/2015 19:44 | 200 | 3_69041.D | RTX-VGC 0.53(mm) |
| 480-89467-24 | WW-01-031315-1531 | 11/05/2015 19:44 | 200 | 3_69041.D | RTX-VGC 0.53(mm) |
| CCV 480-273207/22 | | 11/05/2015 20:16 | 1 | 3_69042.D | RTX-VGC 0.53(mm) |
| CCV 480-273207/22 | | 11/05/2015 20:16 | 1 | 3_69042.D | RTX-VGC 0.53(mm) |

# Shipping and Receiving Documents

# Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Temperature on Receipt _____
Drinking Water? Yes☐ No☐

TAL-4124 (1007)

89473

| Client | Project Manager | Date | Chain of Custody Number |
|---|---|---|---|
| USACE | STEVEN COSPER | | 284252 |
| Address | Telephone Number (Area Code)/Fax Number | Lab Number | Page 1 of 2 |
| City / State / Zip Code | Site Contact | Lab Contact: B FISCHER | Analysis (Attach list if more space is needed) |
| Project Name and Location (State): * 12846 | Carrier/Waybill Number | | |
| Contract/Purchase Order/Quote No. | | | |

| Sample I.D. No. and Description (Containers for each sample may be combined on one line) | Date | Time | Matrix: Air | Aqueous | Sed. | Soil | Containers & Preservatives: Unpres. | H2SO4 | HNO3 | HCl | NaOH | ZnAc/NaOH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WW-01-101514-1120 | | | | | | | | | | | | |
| WW-02-030515-1557 | | | | | | | | | | | | |
| WW-01-031915-1550 | | | | | | | | | | | | |
| WW-01 041415-1640 | | | | | | | | | | | | |
| WW-01-030515-1352 | | | | | | | | | | | | |
| WW-01-042815-1600 | | | | | | | | | | | | |
| WW-01-050615-1552 | | | | | | | | | | | | |
| WW-01-050715-1600 | | | | | | | | | | | | |
| WW-01-052015-1500 | | | | | | | | | | | | |
| D-01-030515-1557 | | | | | | | | | | | | |
| D-01-031315-1531 | | | | | | | | | | | | |
| D-01-050615-1552 | | | | | | | | | | | | |

Special Instructions/ Conditions of Receipt
89467
COND H20
↓
CONDENSATE
↓
POLISHER
↓

480-89473 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
(A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

| | Date | Time |
|---|---|---|
| 1. Relinquished By | | |
| 2. Relinquished By | | |
| 3. Relinquished By | | |

| | Date | Time |
|---|---|---|
| 1. Received By: TESTAMERICA | 10/20/15 | 0920 |
| 2. Received By | | |
| 3. Received By | | |

Comments
20.0°C, NO ICE, #1

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

11/13/2015

Page 322 of 326

(P) (E)

# Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

**TestAmerica**
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

| Client | Project Manager | Date | Chain of Custody Number |
|---|---|---|---|
| USACE | STEVEN COSPER | | 284253 |
| **Address** | **Telephone Number (Area Code)/Fax Number** | **Lab Number** | **Page 2 of 2** |
| **City / State / Zip Code** | **Site Contact** | **Lab Contact** B FISCHER | **Analysis (Attach list if more space is needed)** |
| **Project Name and Location (State)** * 12946 | **Carrier/Waybill Number** | | |
| **Contract/Purchase Order/Quote No.** | | | |

| Sample I.D. No. and Description (Containers for each sample may be combined on one line) | Date | Time | Matrix: Air | Aqueous | Sed. | Soil | Containers & Preservatives: Unpres. | $H_2SO_4$ | $HNO_3$ | HCl | NaOH | ZnAc/NaOH | Special Instructions/ Conditions of Receipt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P-01-051315-1530 | | | | | | | | | | | | | 19467 |
| OS-01-031815-1530 | | | | | | | | | | | | | POLISHER |
| OS-01-042415-1600 | | | | | | | | | | | | | SCRUBBING OIL |
| OS-01-042815-1600 | | | | | | | | | | | | | ↓ |
| OS-01-050715-1630 | | | | | | | | | | | | | ↓ |
| P-01-101514-0910 | | | | | | | | | | | | | POLISHER / LIQUOR |
| P-01-100814-1120 | | | | | | | | | | | | | ↓ |
| P-01-013015-0915 | | | | | | | | | | | | | ↓ |
| P-01-040115-1600 | | | | | | | | | | | | | QUENCH OIL |
| OS-01-101514-0910 | | | | | | | | | | | | | INITIAL |
| P-01-012215-0948 | | | | | | | | | | | | | WW |
| WW-01-031315-1531 | | | | | | | | | | | | | |

**Possible Hazard Identification**
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

**Sample Disposal**
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

**Turn Around Time Required**
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

**QC Requirements (Specify)**

| | Date | Time | | Date | Time |
|---|---|---|---|---|---|
| 1. Relinquished By | | | 1. Received By TA BUFFALO | 10/20/15 | 0920 |
| 2. Relinquished By | | | 2. Received By | | |
| 3. Relinquished By | | | 3. Received By | | |

Comments: 20.0°C, NO ICE, #1

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

| | | |

| Test Specification | Date | Feedstock | Sample Type | Sample I.D. | ALS Diesel Range Organics by GC - 8015B | ALS Gasoline Range Organics by GC - 8015B | ALS Prox and Ult | TA PAH CW12 | TA PAH SW13 | TA TCLP metals SW57 | TA RCRA metals SW59 | TA BTEX SW18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TSS-111314-01 | 13/Nov/2014 | SERDP Long Term Mix | Ash Sample | A-01-111314-1622 | | | | | | | | |
| TSS-012215-01 | 22/Jan/2015 | SERDP Long Term Mix | Ash Sample | A-01-012215-1500 | | | | | | | | |
| TSS-012915-01 | 29/Jan/2015 | SERDP Long Term Mix | Ash Sample | A-01-012915-1600 | | | | | | | | |
| TSS-013015-01 | 30/Jan/2015 | SERDP Long Term Mix | Ash Sample | A-01-013015-1600 | | | | | | | | |
| TSS-020415-01 | 4/Feb/2015 | SERDP Long Term Mix | Ash Sample | A-01-020415-1600 | | | | | | | | |
| TSS-021915-01 | 19/Feb/2015 | SERDP Long Term Mix | Ash Sample | A-01-021915-1600 | | | | | | $ 69.45 | $ 78.53 | |
| TSS-030415-01 | 4/Mar/2015 | SERDP 100% Construction MD | Ash Sample | A-01-030415-1545 | | | | | | | | |
| TSS-030515-01 | 5/Mar/2015 | SERDP 50% Plastics Mix | Ash Sample | A-01-030515-1557 | | | | | | $ 69.45 | $ 78.53 | |
| TSS-031115-01 | 11/Mar/2015 | SERDP 50% Food Mix | Ash Sample | A-01-031115-1520 | | | | | | | | |
| TSS-031315-01 | 13/Mar/2015 | SERDP 33% POL Mix | Ash Sample | A-01-031315-1531 | | | | | | | | |
| TSS-031815-01 | 18/Mar/2015 | SERDP 40% Tires Mix | Ash Sample | A-01-031815-1426 | | | | | | | | |
| TSS-031915-01 | 19/Mar/2015 | SERDP Long Term Mix | Ash Sample | A-01-031915-1600 | | | | | | $ 69.45 | $ 78.53 | |
| TSS-040115-01 | 1/Apr/2015 | SERDP Long Term Mix | Ash Sample | A-01-040115-1600 | | | | | | | | |
| TSS-040215-01 | 2/Apr/2015 | SERDP 100% Construction MD | Ash Sample | A-01-040213-1505 | | | | | | $ 69.45 | $ 78.53 | |
| TSS-041415-01 | 14/Apr/2015 | SERDP 40% Tires Mix | Ash Sample | A-01-041415-1640 | | | | | | | | |
| TSS-042315-01 | 23/Apr/2015 | SERDP 50% Food Mix | Ash Sample | A-01-042315-1605 | | | | | | | | |
| TSS-042415-01 | 24/Apr/2015 | SERDP 33% POL Mix | Ash Sample | A-01-042415-1600 | | | | | | | | |
| TSS-042715-01 | 27/Apr/2015 | SERDP Long Term Mix | Ash Sample | A-01-042715-1538 | | | | | | | | |
| TSS-042815-01 | 28/Apr/2015 | SERDP Long Term Mix | Ash Sample | A-01-042815-1600 | | | | | | | | |
| TSS-050715-01 | 7/May/2015 | SERDP Long Term Mix | Ash Sample | A-01-050715-1600 | | | | | | | | |
| TSS-050815-01 | 8/May/2015 | SERDP Long Term Mix | Ash Sample | A-01-050815-1600 | | | | | | $ 69.45 | $ 78.53 | |
| TSS-051315-01 | 13/May/2015 | SERDP Long Term Mix | Ash Sample | A-01-051315-1530 | | | | | | | | |
| TSS-052015-01 | 20/May/2015 | SERDP Long Term Mix | Ash Sample | A-01-052015-1500 | | | | | | | | |
| TSS-052115-01 | 21/May/2015 | SERDP Long Term Mix | Ash Sample | A-01-052115-1430 | | | | | | | | |
| TSS-100814-01 | 8/Oct/2014 | SERDP Long Term Mix | Ash Sample 1 | A-01-100814-1525 | | | | | | | | |
| TSS-100814-01 | 8/Oct/2014 | SERDP Long Term Mix | Ash Sample 2 | A-01-100814-1526 | | | | | | | | |
| TSS-101514-01 | 15/Oct/2014 | SERDP Long Term Mix | Condensate Sample | MW-01-101514-1320 | | | | | | | | $ 58.36 |
| TSS-013015-02 | 30/Jan/2015 | SERDP Long Term Mix | Condensate Sample | MW-01-013015-1400 | $ 65.00 | $ 65.00 | | | | | | |
| TSS-030415-02 | 4/Mar/2015 | SERDP 100% Construction MD | Condensate Sample | MW-01-030415-1545 | | | | | | | | |
| TSS-031315-01 | 13/Mar/2015 | SERDP 33% POL Mix | Condensate Sample | MW-01-031315-1531 | | | | | | | | $ 58.36 |
| TSS-031815-01 | 18/Mar/2015 | SERDP 40% Tires Mix | Condensate Sample | MW-01-031815-1426 | $ 65.00 | $ 65.00 | | | | | | |
| TSS-031915-01 | 19/Mar/2015 | SERDP Long Term Mix | Condensate Sample | MW-01-031915-1600 | | | | | | | | $ 58.36 |
| TSS-040115-01 | 1/Apr/2015 | SERDP Long Term Mix | Condensate Sample | MW-01-040115-1600 | $ 65.00 | $ 65.00 | | | | | | |
| TSS-040215-01 | 2/Apr/2015 | SERDP 100% Construction MD | Condensate Sample | MW-01-040225-1505 | | | | | | | | |
| TSS-041415-01 | 14/Apr/2015 | SERDP 40% Tires Mix | Condensate Sample | MW-01-041415-1640 | | | | | | | | |
| TSS-042315-01 | 23/Apr/2015 | SERDP 50% Food Mix | Condensate Sample | MW-01-042315-1605 | | | | | | | | $ 58.36 |
| TSS-042415-01 | 24/Apr/2015 | SERDP 33% POL Mix | Condensate Sample | MW-01-042415-1600 | | | | | | | | |
| TSS-042715-01 | 27/Apr/2015 | SERDP Long Term Mix | Condensate Sample | MW-01-042715-1538 | | | | | | | | |
| TSS-042815-01 | 28/Apr/2015 | SERDP Long Term Mix | Condensate Sample | MW-01-042815-1600 | | | | $100.75 | | | | |
| TSS-050615-01 | 6/May/2015 | SERDP Long Term Mix | Condensate Sample | MW-01-050615-1552 | | | | | | | | |
| TSS-050715-01 | 7/May/2015 | SERDP Long Term Mix | Condensate Sample | MW-01-050715-1600 | | | | $100.75 | | | | $ 58.36 |
| TSS-050815-01 | 8/May/2015 | SERDP Long Term Mix | Condensate Sample | MW-01-050815-1600 | | | | | | | | |
| TSS-051315-01 | 13/May/2015 | SERDP Long Term Mix | Condensate Sample | MW-01-051315-1556 | | | | | | | | |
| TSS-052015-01 | 20/May/2015 | SERDP Long Term Mix | Condensate Sample | MW-01-052015-1500 | | | | | | | | $ 58.36 |
| TSS-052115-01 | 21/May/2015 | SERDP Long Term Mix | Condensate Sample | MW-01-052115-1430 | | | | | | | | |
| TSS-031115-01 | 11/Mar/2015 | SERDP 50% Food Mix | Condensate Sample | MW-01-031115-1520 | | | | | | | | |
| TSS-100814-02 | 8/Oct/2014 | SERDP Long Term Mix | Condensate Sample 1 | MW-01-100814-1315 | $ 65.00 | $ 65.00 | | | | | | |
| TSS-030515-01 | 5/Mar/2015 | SERDP 50% Plastics Mix | Condensate Sample 2 | MW-01-030515-1352 | | | | $100.75 | | | | |
| TSS-100814-02 | 8/Oct/2014 | SERDP Long Term Mix | Condensate Sample 2 | MW-02-100814-1335 | | | | | | | | |
| TSS-030515-01 | 5/Mar/2015 | SERDP 50% Plastics Mix | Condensate Sample 2 | MW-02-030515-1557 | | | | $100.75 | | | | |
| TSS-100814-01 | 8/Oct/2014 | SERDP Long Term Mix | Condensate Sample 3 | MW-03-100814-1443 | | | | | | | | |
| TSS-100814-01 | 8/Oct/2014 | SERDP Long Term Mix | Condensate Sample 4 | MW-04-100814-1523 | | | | | | | | |

## Login Sample Receipt Checklist

Client: U.S. Army Construction Engineering Resea

Job Number: 480-89467-1

**Login Number: 89467**
**List Number: 1**
**Creator: Kinecki, Kenneth P**

**List Source: TestAmerica Buffalo**

| Question | Answer | Comment |
|---|---|---|
| Radioactivity either was not measured or, if measured, is at or below background | True | |
| The cooler's custody seal, if present, is intact. | True | |
| The cooler or samples do not appear to have been compromised or tampered with. | True | |
| Samples were received on ice. | False | |
| Cooler Temperature is acceptable | False | |
| Cooler Temperature is recorded. | True | |
| COC is present. | True | Filled out by TA Buffalo personnel |
| COC is filled out in ink and legible. | True | |
| COC is filled out with all pertinent information | True | |
| Is the Field Sampler's name present on COC? | False | |
| There are no discrepancies between the sample IDs on the containers and the COC. | True | |
| Samples are received within Holding Time. | False | |
| Sample containers have legible labels. | True | |
| Containers are not broken or leaking. | True | |
| Sample collection date/times are provided. | True | |
| Appropriate sample containers are used. | False | Canning Jars |
| Sample bottles are completely filled. | False | |
| Sample Preservation Verified | True | |
| There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs | True | |
| VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter. | True | All containers have headspace |
| If necessary, staff have been informed of any short hold time or quick TAT needs | True | |
| Multiphasic samples are not present. | True | |
| Samples do not require splitting or compositing. | True | |
| Sampling Company provided. | True | USACE |
| Samples received within 48 hours of sampling. | True | |
| Samples requiring field filtration have been filtered in the field. | N/A | |
| Chlorine Residual checked. | N/A | |

# Appendix H: Diesel Engine Disassembly and Inspection Report

## Rotary Kiln Gasification of Solid Waste for Base Camps

## SERDP Project Number WP-2211

# Diesel Engine Disassembly and Inspection Report

**July 2015**

**Table of Contents:**

Executive Summary……..……..…..3

Summary of Engine Clock Hours……3

Introduction……..……4

Engine Removal, Disassembly, Rebuild, and Re-Install.....6

Engine Data……..9

Work Summary……9

Appendix A- Compression Test Results……11

Appendix B- Engine Specifications and Disassembly Measurements……..……13

Appendix C- Photo Documentation……...27

Appendix D - *Oil Scan* Oil Analysis……..….44

Appendix E - Engine Measurement Specifications and Procedures……..45

Appendix F - Replacement Parts and Receipt……...61

THIS PAGE INTENTIONALLY LEFT BLANK

## Executive Summary

A 60 kW electrical power generator was used for all test runs and was driven by a John Deere 5030HF270 diesel engine. This engine was disassembled at the conclusion of testing, inspected, cleaned, and reassembled to factory rebuilt condition in July 2015. The engine had 480.8 hours on the engine run clock at the time of disassembly. The majority of this time (470.8 hours) was run dual fueled on waste derived synthetic gas.

The engine was in surprisingly good condition. The engine performance was tested prior to disassembly and was found to produce full rated power. Each cylinder was within the rated compression pressure specification and the critical internal engine components were found to be within factory specifications. A sample of the crankcase oil was analyzed and was found to be within normal tolerances (see appendix D).

Significant observations include the following:

1. Carbon build up was observed on the intake valve stems (attributed to excessive cooling of syngas by cold intake air during winter operations).
2. Slight wear was observed on the valve guides (attributed to carbon build-up).
3. Slight pitting on exhaust valves (attributed to high moisture content in syngas fuel).
4. Slight impression on cylinder #1 piston (attributed to foreign object passing through engine).
5. Scouring on cylinder #5 piston (attributed to overheating during early trials).
6. Metal shavings were found in the crankcase oil pan directly under the turbo charger oil drain (attributed to aspirating syngas through the turbo charger compressor).

## Summary of Engine Clock Hours

- Hours – 0 to 10 – Initial break in and load center debug.
- Hours 10 to 248.6 hours – DoD III system development and run testing – dual fueled on syngas. Engine overheated and stopped during this testing. Not part of SERDP, but engine was operated on syngas for these clock hours prior to the disassembly inspection at 480.8 hours.
- Hours – 248.6 to 480.8 hours – SERDP run testing on the composite mixes – Total operating hours for SERDP mixes dual fueled on syngas 232.2 hours.
- Hour = 480.8 hours – Engine was removed from generator housing, disassembled, inspected, and reassembled. Engine was rebuilt to new condition.
- Hours - 480.8 to 485 hours – Engine operated on 100% diesel fuel – debug and break in.
- Hours – 485 to 496.3 hours – Engine operated an additional 11.3 hours on syngas using SERDP standard mix.

Total hours operating on SERDP mixes = 243.5 hours.

Total hours operating dual fueled on waste derived syngas prior to disassembly = 470.8 hours.

Total hours operating dual fueled on waste derived syngas = 482.1 hours.

**Introduction:**

All SERDP run testing was conducted using a 60 kW diesel engine driven generator that was packaged by Central Maine Diesel. The generator is equipped with a John Deere 5030HF270 diesel engine rated for generator drive service. The engine has a prime crankshaft power rating of 87 brake horsepower, providing enough power to generate a maximum of 53 kW.

The engine is equipped with a precision mechanical governor that maintains the crankshaft speed at a constant synchronous speed of 1800 rpm. The engine also has an auxiliary power take off that is located on the right hand side of the engine. This power take off was used to drive a hydraulic gear pump rated for a constant displacement of 21.9 gallon per minute at 1500 psig (22.7 BHP at 85% efficiency). This pump provides the power to operate the gasification system components, including the hydraulically driven reactor rotary drive, main aspiration blower, and polisher pump.

The entire gasification system is controlled by a 24 VDC automation system. Power to operate this system is provided by the battery charging system and the engine alternator. The total power to drive the alternator and radiator cooling fan was 5.8 BHP. The total loss of crankshaft power is 28.5 BHP, which includes the hydraulic gear pump operating by the power take-off. The maximum amount of electrical power the generator can provide is 40.4 kW at 100% prime rated crankshaft power. Sustained operation at this level was not possible and the engine consistently overheated due to overloading. Lugging at this load also occurred when operating on low quality winter mix fuel (low heating value) during winter months.

SERDP hot tests were conducted at various electrical loads between 20 kW (67% of maximum prime rated crankshaft power) and 30 kW (84% of maximum prime rated crankshaft power). The majority of tests were conducted at 25 kW, which loaded the engine at 75% of maximum rated crankshaft power and provided reliable operation. The stated electrical loads are net available usable power that was consumed by a 3 phase 480 VAC load bank.

One significant problem observed during testing was the engine was too small for the gasifier. An engine with at least 50% more horsepower could have been used to achieve the full 60 kW usable electrical power output. The gas flow from the gasifier had to be reduced to match the fueling needs of the generator. 60 kW Tactical Quiet Generating Sets have an engine power rating of at least 135 BHP (55% power increase over engine tested) to allow full power output under all operating conditions (such as high elevation and 50 Hz).

SERDP hot testing on the waste mixes continued throughout the winter, spring, and early summer of 2015. The intent was to maximize the engine run time prior to the loss of funding. The engine was subjected to brutal weather conditions. A significant amount of testing was conducted in the winter, where ambient temperatures varied between -15 and 20 degrees F, with high winds (25 MPH) and blowing snow. Testing also occurred during the summer months, where the ambient temperatures were in excess of 90 degrees F. Operations were conducted in every foreseeable weather condition, including downpours, electrical storms, high winds, ice,

and snow storms.

The engine was removed from the generator housing and was disassembled in July 2015. SUNY Cobleskill's Agricultural Engineering Department, at Curtis Mott Hall has completed the disassembly, inspection, and rebuild of this engine at their facility. A total of 480.8 hours of performance testing was accumulated on the engine. During run time, the engine was fueled with both low sulfur diesel and a synthetic gas (syngas) produced by gasification of various base camp waste mixes.

On average, the engine was operated between 50% and 65% gaseous fueling rate, with the balance provided by liquid low sulfur diesel fuel (as determined on a low heating value basis). The engine operated normal, reliably, and provided full power at less than 65% gaseous fueling rate. The engine was operated for short terms at 79% gaseous fueling rate (79% reduction in liquid fuel consumption), but required intensive monitoring and supervision. High engine knock was also observed.

Increasing the gaseous fueling rate into the engine increases the crankshaft speed. The engine speed control governor reduces the rate of liquid fuel injection to maintain the synchronous speed of 1800 RPM. The energy value of the syngas fuel can vary as the raw feedstock tumbles within the reactor. Researchers feel sustained operation above 65% gaseous fueling rate is not reliable due to the significant risk of a crash stop if the engine speed governor completely stops the liquid fuel injection rate in the event the syngas heating value suddenly increases.

The engine was also intentionally subjected to an exceptionally high amount of moisture within the syngas. Researchers determined a method to reduce or eliminate the production condensate water by raising the syngas temperature and allowing full evaporation into the syngas stream. Saturated syngas was re-heated to about 20 degrees higher than the saturation temperature. Tests conducted after March 15$^{th}$, 2015 focused on testing this method of condensate water disposal. The water evaporates into the syngas stream and combusts as superheated steam within the engine. No significant change in engine performance was observed, other than an increase in visible diesel particulate matter in the exhaust due to oxygen deprivation. The only adverse indication within the engine due to this moisture was slight pitting was observed on the seat contact area of exhaust valve.

The syngas was mixed with the aspiration air upstream of the turbo charger compressor. This configuration forced a mixture of syngas and air to pass through the turbo compressor, pass through the charge air cooler, and then to the intake manifold. No carbon or tar build-up was observed in the syngas piping upstream of the mix point, but a build-up was observed at the mix point and all points downstream. The build-up occurred only on cool surfaces (no accumulation on the turbo compressor blades) and was not a problem during operations. The main problem was the build-up restricted turbo rotation and required daily cleaning. Mechanical damage to the turbo occurred during cleaning, which resulted in noticeable metal debris accumulating in the oil pan directly under the turbo oil drain. This configuration would never be used again due to these problems. The syngas pressure would be boosted separately and fed directly into the intake manifold downstream of the turbo charger and charge air cooler.

**Engine Removal, Disassembly, Rebuild, and Re-Install**

The engine was removed on July 16th, 2015. Disassembly commenced shortly after. Any abnormal wear and deposits found during disassembly will be noted along with all applicable component measurements and photos. The engine was assembled and installed back into the GENSET on August 3rd, 2015.

*Photo Documentation – Engine Removal from GENSET*





*Engine Removal from GENSET Continued..*





*Photo Documentation – Reassembly of Engine to GENSET August 3rd, 2015*



*Reassembly of Engine to GENSET Continued..*




CAT



**Engine Data:**

Make: **John Deere**

Model: **5030HF270**

Serial No.: **PE5030H191337**

Displacement: **3.05 Liters**

No. of Cylinders: **5**

No. of Valves: **10**

Fuel Rate (prime rating):

| Engine % Load | Crankshaft Brake Horsepower | Fuel Consumption lb/hr | Fuel Consumption gal/hr |
|---|---|---|---|
| **25%** | 21.8 | 7.9 | 1.11 |
| **50%** | 43.5 | 15.9 | 2.24 |
| **75%** | 65.3 | 23.8 | 3.35 |
| **100%** | 87 | 31.7 | 4.46 |

**Work Summary:**

1. Engine received and information was documented
2. Engine oil sample was taken for Oil Scan analysis
3. Compression test completed on 5 of 5 cylinders (dry)
    a. Wet compression test was not required since compression was within allowance.
4. External component removal
    a. Fuel pump and filter
    b. Alternator
    c. Muffler
    d. Turbocharger
    e. Starting system
5. Valve cover removal
6. Injector removal
7. Valve lash verification
8. Head removal
9. Valve train removal
    a. Valve train component inspection
10. Oil Pan Removal

11. Piston and connecting rod removal
    a. Piston inspection
    b. Connecting rod wear evaluation
12. Cylinder wear evaluation
13. Crank removal
    a. Crank wear evaluation
    b. Crankshaft main and connecting rod running clearance
14. Cam removal
    a. Cam wear evaluation

## Appendix A- Compression Test Results

### Cylinder Compression Test

| Specification |
| --- |
| Engine Compression Pressure: 345 - 405 PSI<br>Maximum Difference Between Cylinders: 50 PSI |

| Cylinder | Compression (PSI) |
| --- | --- |
| 1 | 375 |
| 2 | 380 |
| 3 | 385 |
| 4 | 395 |
| 5 | 385 |

**Remarks:**

The tested compression of each cylinder was within specified range. A wet compression test using oil was not necessary.

*Photo Documentation of Compression Test*

A-1 Compression Testing Equipment

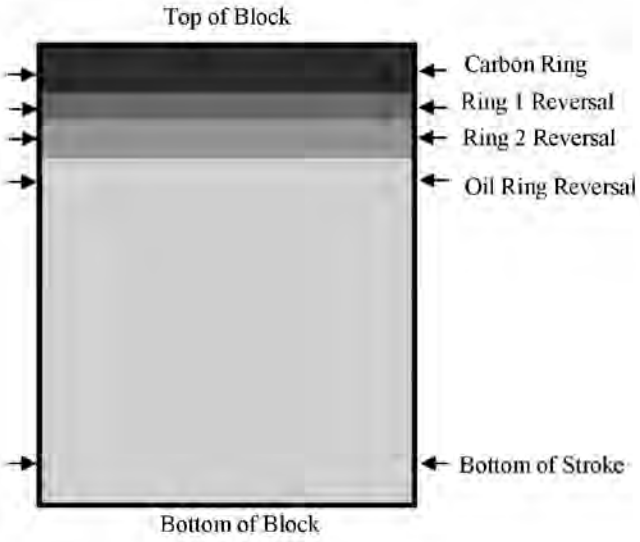


A-2 Compression Test on Cylinder 1



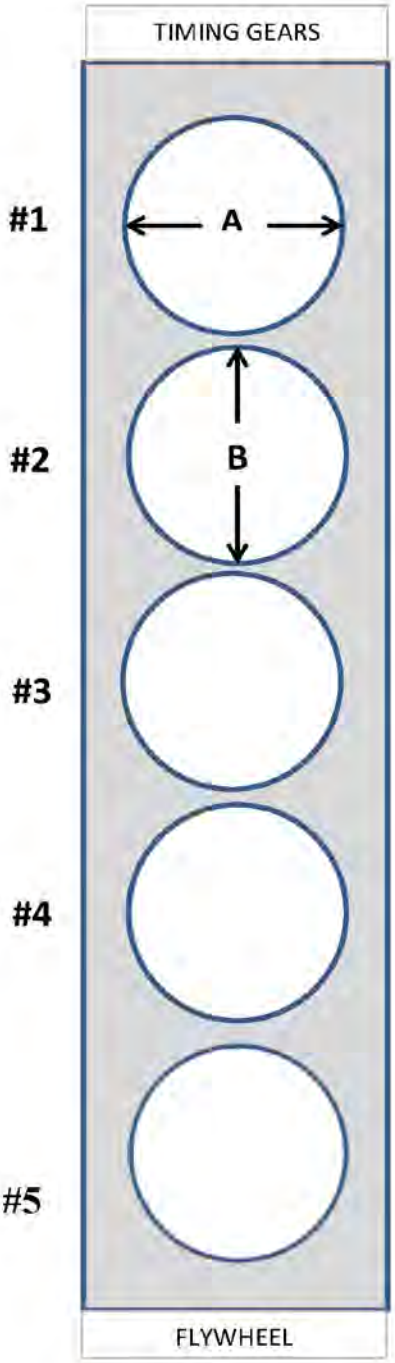
## Appendix B: Engine Specifications and Disassembly Measurements:

### Cylinder Bore



## Cylinder Bore

| Specification |
| --- |
| Standard Bore Inside Diameter (Inches): 3.385 – 3.386 |



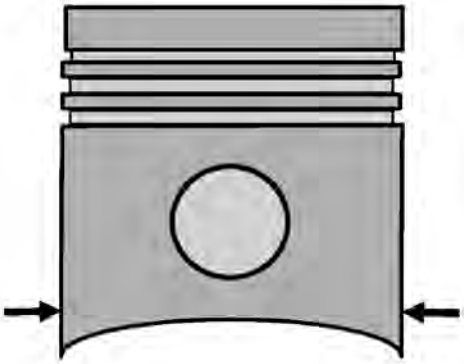

| | Position: | A (Inches) | B (Inches) |
| --- | --- | --- | --- |
| Cylinder 1 | CR | 3.3850 | 3.3860 |
| | R1 | 3.3860 | 3.3865 |
| | R2 | 3.3860 | 3.3865 |
| | OR | 3.3860 | 3.3865 |
| | BCD | 3.3860 | 3.3865 |
| Cylinder 2 | CR | 3.3860 | 3.3860 |
| | R1 | 3.3860 | 3.3865 |
| | R2 | 3.3865 | 3.3865 |
| | OR | 3.3865 | 3.3865 |
| | BCD | 3.3865 | 3.3865 |
| Cylinder 3 | CR | 3.3860 | 3.3860 |
| | R1 | 3.3865 | 3.3865 |
| | R2 | 3.3865 | 3.3865 |
| | OR | 3.3865 | 3.3865 |
| | BCD | 3.3870 | 3.3870 |
| Cylinder 4 | CR | 3.3860 | 3.3865 |
| | R1 | 3.3865 | 3.3865 |
| | R2 | 3.3865 | 3.3865 |
| | OR | 3.3865 | 3.3865 |
| | BCD | 3.3865 | 3.3870 |
| Cylinder 5 | CR | 3.3860 | 3.3860 |
| | R1 | 3.3865 | 3.3870 |
| | R2 | 3.3865 | 3.3870 |
| | OR | 3.3865 | 3.3870 |
| | BCD | 3.3865 | 3.3875 |

**Piston Skirt Diameter**

| Specification |
|---|
| Piston O.D. Wear Limit (Inches): 3.381 - 3.382 |

| Position | Diameter (Inches) |
|---|---|
| Cylinder 1 | 3.382 |
| Cylinder 2 | 3.382 |
| Cylinder 3 | 3.382 |
| Cylinder 4 | 3.382 |
| Cylinder 5 | 3.382 |

The piston skirt diameter was taken 0.5 inches from the bottom of the piston.



**Piston Skirt Running Clearance**

Piston skirt running clearances are calculated by the following equation:

*(Ring 1 Inside Diameter) – (Piston Skirt Outside Diameter) = Piston Skirt Running Clearance*

| Position | Running Clearance (Inches) |
|---|---|
| Cylinder 1 | 0.0040 |
| Cylinder 2 | 0.0040 |
| Cylinder 3 | 0.0045 |
| Cylinder 4 | 0.0045 |
| Cylinder 5 | 0.0045 |

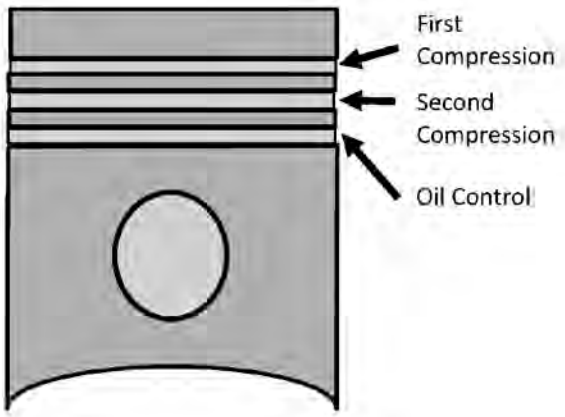
| Specification |
|---|
| Piston Skirt Running Clearance (Inches): 0.003 - 0.005 |

**Remarks:**

The piston O.D. wear limit and running clearance were within specification. Recorded piston skirt measurement for cylinder 5 was not taken over the scoring marks, but over an average wear portion of the skirt. A measurement of the diameter of cylinder 5 piston was taken over the damaged area right under the oil ring. The resulted diameter was 3.375 inches, about 7 thousandths smaller than the specified wear limit.

**Ring Side Clearance**

| Specification |
|---|
| First Ring: Ring-to-Groove Clearance - 0.005 Inches |
| Second Ring: Ring-to-Groove Clearance - 0.004 Inches |
| Oil Ring: Ring-to-Groove Clearance - 0.004 Inches |



| Cylinder | Ring Position | Side Clearance (Inches) |
|---|---|---|
| 1 | Top Compression | > .004 ; < .005 |
| | Second Compression | ~ .002 |
| | Oil Control | ~ .002 |
| 2 | Top Compression | > .004 ; < .005 |
| | Second Compression | ~ .002 |
| | Oil Control | ~ .0025 |
| 3 | Top Compression | > .004 ; < .005 |
| | Second Compression | ~ .002 |
| | Oil Control | ~ .0025 |
| 4 | Top Compression | > .004 ; < .005 |
| | Second Compression | ~ .002 |
| | Oil Control | ~ .0025 |
| 5 | Top Compression | > .004 ; < .005 |
| | Second Compression | ~ .002 |
| | Oil Control | ~ .003 |

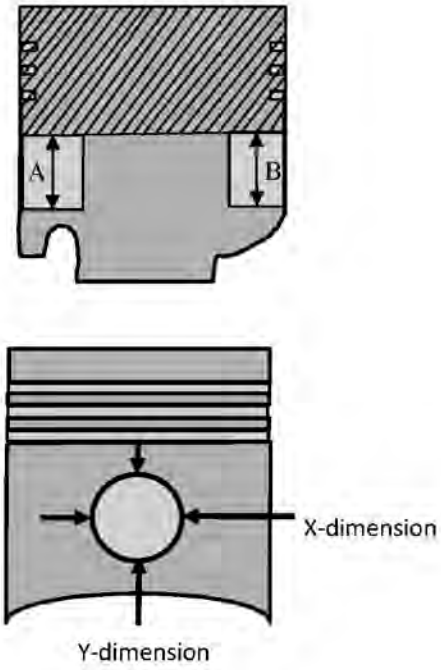
**Remarks:**

The ring side clearance for the first, second, and oil ring were all slightly under specification. This may be from carbon build up. The rings were free in the groove and gave good compression.

**Piston Pin Bore, Inside Diameter**

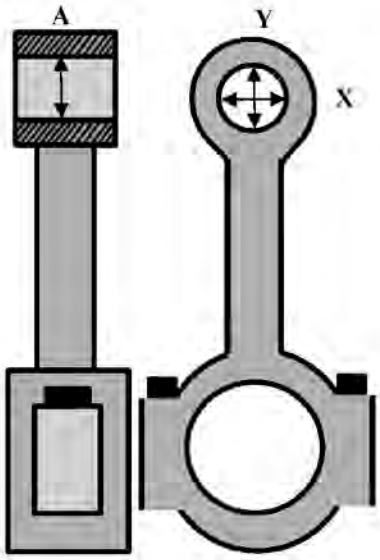
| Specification |
|---|
| Wear Limit: 1.1812 - 1.1815 Inches |

| Pin Bore from Cylinder # | A (Inches) | | B (Inches) | |
|---|---|---|---|---|
| | X | Y | X | Y |
| 1 | 1.1800 | 1.1800 | 1.1800 | 1.1800 |
| 2 | 1.1815 | 1.1815 | 1.1815 | 1.1815 |
| 3 | 1.1820 | 1.1820 | 1.1815 | 1.1820 |
| 4 | 1.1820 | 1.1820 | 1.1820 | 1.1820 |
| 5 | 1.1830 | 1.1825 | 1.1825 | 1.1825 |



## Connecting Rod Piston Pin Bearing Bore

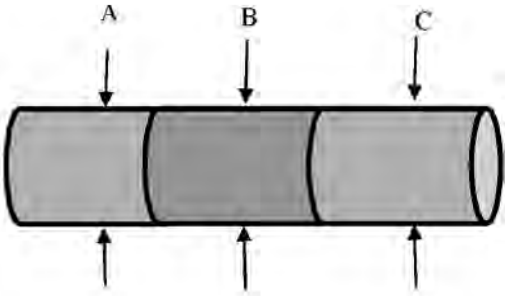
| Specification |
|---|
| Wear Limit: 1.1812 – 1.1815 Inches |




| Connecting Rod from Cylinder # | A (Inches) | |
|---|---|---|
| | X | Y |
| 1 | 1.1820 | 1.1820 |
| 2 | 1.1820 | 1.1820 |
| 3 | 1.1820 | 1.1815 |
| 4 | 1.1820 | 1.1825 |
| 5 | 1.1820 | 1.1820 |

## Piston Pin

| Specification |
|---|
| Wear Limit: 1.1809 - 1.1811 Inches |




| Pin From Cylinder # | A (Inches) | B (Inches) | C (Inches) |
|---|---|---|---|
| 1 | 1.1815 | 1.1810 | 1.1815 |
| 2 | 1.1815 | 1.1810 | 1.1815 |
| 3 | 1.1815 | 1.1810 | 1.1815 |
| 4 | 1.1810 | 1.1810 | 1.1810 |
| 5 | 1.1815 | 1.1810 | 1.1815 |

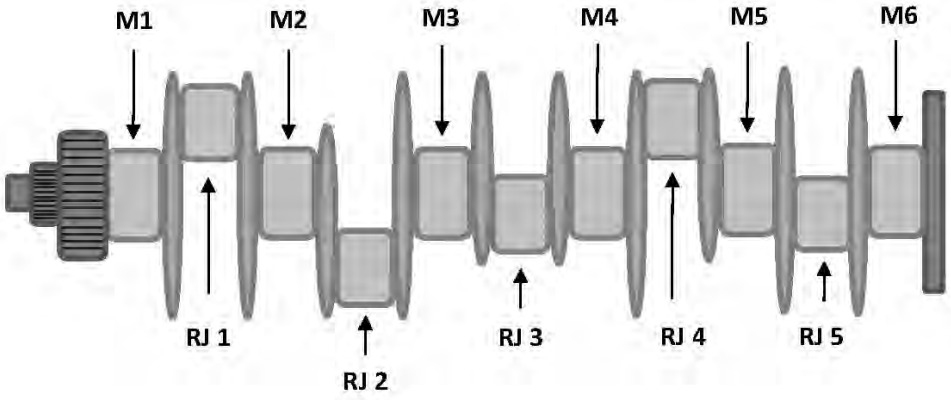
## Crankshaft Main Journal Outside Diameter

| Specification |
|---|
| Journal Outside Diameter: 2.9522 – 2.9533 Inches |

| Position | X (Inches) | Y (Inches) |
|---|---|---|
| M1 | 2.953 | 2.953 |
| M2 | 2.953 | 2.953 |
| M3 | 2.953 | 2.953 |
| M4 | 2.953 | 2.953 |
| M5 | 2.953 | 2.953 |
| M6 | 2.953 | 2.953 |

**Remarks:**

There was no measureable wear on the crankshaft. Minor scratches were observed on the journal surface, but this wear is typical for an engine with 480 hours.




**Journal Crankshaft Connecting Rod Outside Diameter**

| Specification |
|---|
| Connecting Rod Journal Outside Diameter: 2.36170 – 2.36270 Inches |

| Position | X | Y |
|---|---|---|
| Cylinder 1 | 2.3655 | 2.3655 |
| Cylinder 2 | 2.3630 | 2.3630 |
| Cylinder 3 | 2.3625 | 2.3625 |
| Cylinder 4 | 2.3630 | 2.3630 |
| Cylinder 5 | 2.3625 | 2.3625 |

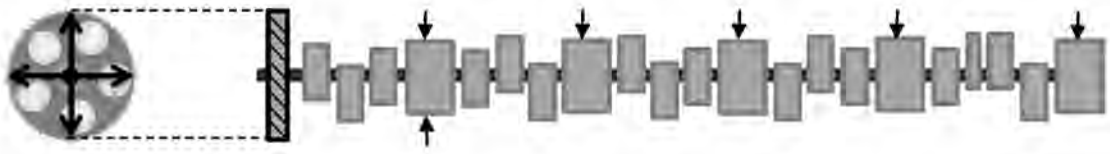
**Remarks:**

There was a slight difference in size between rods. Minimal wear and scratches were observed on the main journals. Minor polishing was required for rebuild.

**Cam Shaft Journal Outside Diameters**

| Specification |
|---|
| Cam Shaft Journal O.D. : 2.3617 – 2.3627 Inches |

| Journal | Position | X | Y |
|---|---|---|---|
| J1 | A | 2.3625 | 2.3625 |
| J2 | A | 2.3625 | 2.3625 |
| J3 | A | 2.3625 | 2.3625 |
| J4 | A | 2.3625 | 2.3625 |
| J5 | A | 2.3625 | 2.3625 |



**Cam Bearing and Parent Bores**

| Specification |
|---|
| Cam Bearing and Parent Bores Clearance: 2.3642 – 2.3672 Inches |

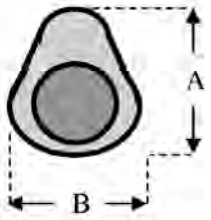
| Bearing and Bores | X | Y |
|---|---|---|
| J1 | 2.3650 | 2.3650 |
| J2 | 2.3640 | 2.3640 |
| J3 | 2.3650 | 2.3650 |
| J4 | 2.3650 | 2.3650 |
| J5 | 2.3650 | 2.3645 |

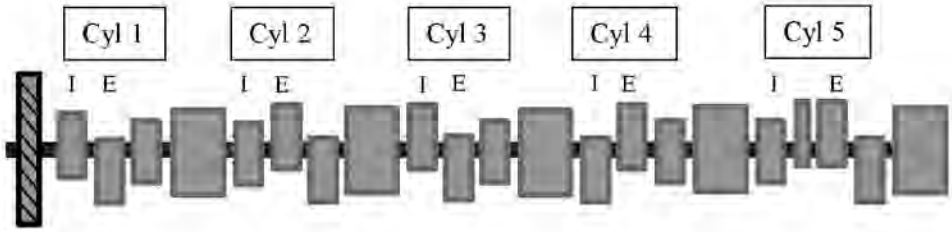
**Remarks:**

Minimal wear, cam shaft journals did not have abnormal wear for the hours. All measurements were within specification.

**Cam Lobes**

| Specifications |
|---|
| Cam Lobe Height: 0.278 – 0.288 Inches |



| Journal | Position | A | B | Lobe Height (A-B) |
|---|---|---|---|---|
| Cyl 1 | I | 2.0480 | 1.811 | 0.2370 |
| | E | 2.0500 | 1.811 | 0.2390 |
| Cyl 2 | I | 2.0495 | 1.811 | 0.2385 |
| | E | 2.0500 | 1.809 | 0.2410 |
| Cyl 3 | I | 2.0475 | 1.808 | 0.2395 |
| | E | 2.0490 | 1.809 | 0.2400 |
| Cyl 4 | I | 2.0465 | 1.808 | 0.2385 |
| | E | 2.0480 | 1.808 | 0.2400 |
| Cyl 5 | I | 2.0420 | 1.804 | 0.2380 |
| | E | 2.0460 | 1.803 | 0.2430 |

**Remarks:**

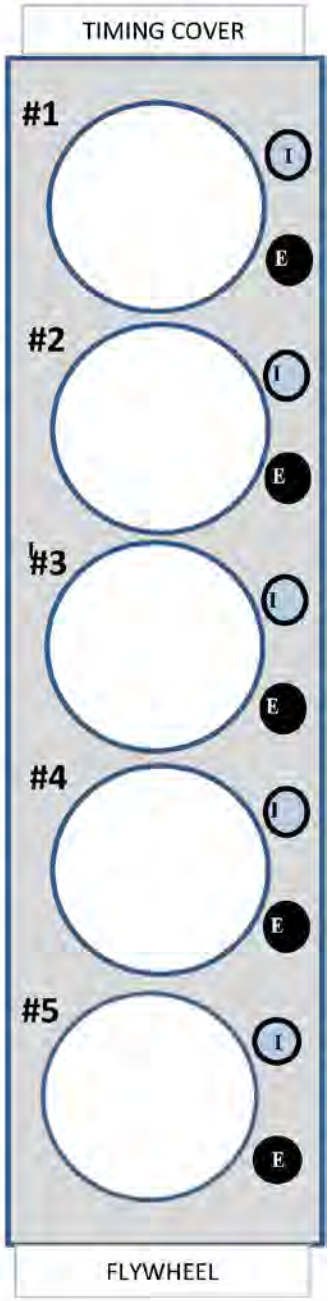
The cam lobes did not look worn, but did not meet specifications. The measurement specifications provided may not be valid. No abnormal wear was observed on cams lobes. The lobes may have been undersized from the factory.

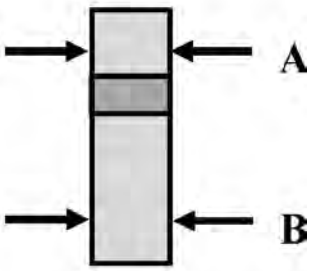
**Cam Follower Stem O.D.**

| Specification: |
|---|
| Wear limit: 0.8422 – 0.8427 Inches |

| Cylinder | Valve Type | Position on Stem | Diameter (Inches) |
|---|---|---|---|
| 1 | Intake | A | 0.842 |
| | | B | 0.842 |
| 2 | Intake | A | 0.842 |
| | | B | 0.842 |
| 3 | Intake | A | 0.842 |
| | | B | 0.842 |
| 4 | Intake | A | 0.842 |
| | | B | 0.842 |
| 5 | Intake | A | 0.842 |
| | | B | 0.842 |

| Cylinder | Valve Type | Position on Stem | Diameter (Inches) |
|---|---|---|---|
| 1 | Exhaust | A | 0.842 |
| | | B | 0.842 |
| 2 | Exhaust | A | 0.842 |
| | | B | 0.842 |
| 3 | Exhaust | A | 0.842 |
| | | B | 0.842 |
| 4 | Exhaust | A | 0.842 |
| | | B | 0.842 |
| 5 | Exhaust | A | 0.842 |
| | | B | 0.842 |




**Remarks:**

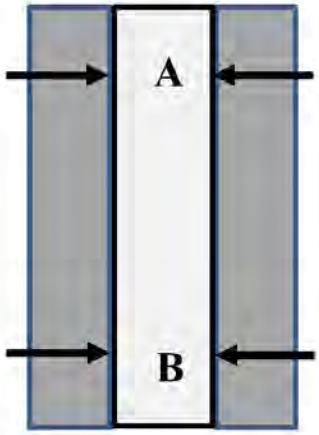
There were some visible scruff marks and minor wear marks on the cam surface, but no measureable wear.

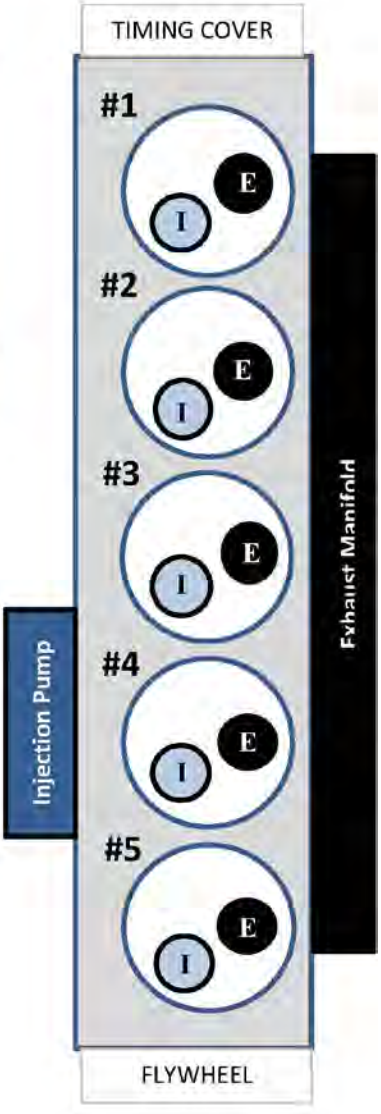
## Valve Guide Measurements

| Specifications |
|---|
| Measurements were taken at A (initial) and B (final). The difference between these two points should be zero in its new state. To calculate the difference, subtract the initial from the final measurement (B-A). |

| Cylinder | Valve Type | Difference (Inches) |
|---|---|---|
| 1 | Intake | 0.0025 |
| 2 | Intake | 0.0015 |
| 3 | Intake | 0.0025 |
| 4 | Intake | 0.0020 |
| 5 | Intake | 0.0010 |

| Cylinder | Valve Type | Difference (Inches) |
|---|---|---|
| 1 | Exhaust | 0.0015 |
| 2 | Exhaust | 0.0025 |
| 3 | Exhaust | 0.0010 |
| 4 | Exhaust | 0.0010 |
| 5 | Exhaust | 0.0020 |



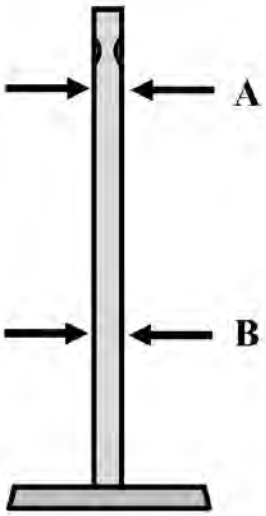




**Remarks:**

There was a taper found on all the valve guides. This may be from carbon build up on valve stems that coated the inside on the valve guides. Wear may have occurred from the carbon build up on the intake valves. Metal inside the valve guide is missing in the B area.

**Valve Stem Diameter**

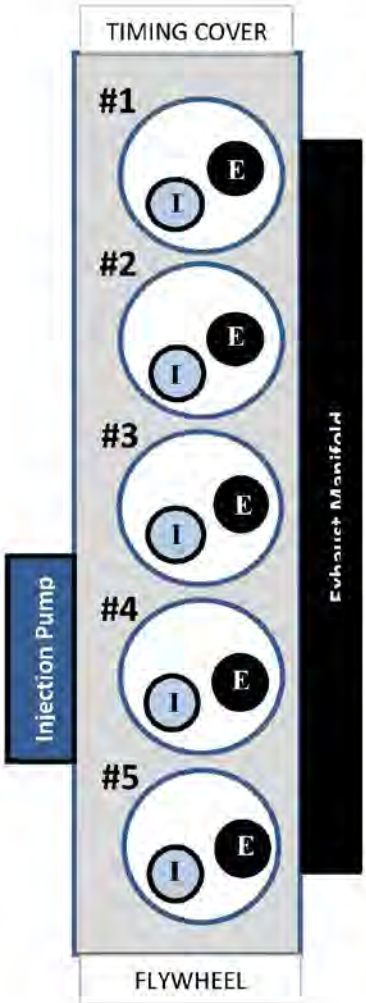
| Specification |
|---|
| Intake Valve Stem O.D. : 0.2751 – 0.2761 Inches |
| Exhaust Valve Stem O.D. : 0.2746 – 0.2755 Inches |




| Cylinder | Valve Type | Position of Guide | Measurement (Inches) |
|---|---|---|---|
| 1 | Intake | A | 0.2755 |
| | | B | 0.2755 |
| 2 | Intake | A | 0.2755 |
| | | B | 0.2755 |
| 3 | Intake | A | 0.2755 |
| | | B | 0.2755 |
| 4 | Intake | A | 0.2755 |
| | | B | 0.2755 |
| 5 | Intake | A | 0.2755 |
| | | B | 0.2755 |

| Cylinder | Valve Type | Position of Guide | Measurement (Inches) |
|---|---|---|---|
| 1 | Exhaust | A | 0.2745 |
| | | B | 0.2745 |
| 2 | Exhaust | A | 0.2750 |
| | | B | 0.2755 |
| 3 | Exhaust | A | 0.2752 |
| | | B | 0.2753 |
| 4 | Exhaust | A | 0.2752 |
| | | B | 0.2754 |
| 5 | Exhaust | A | 0.2751 |
| | | B | 0.2752 |

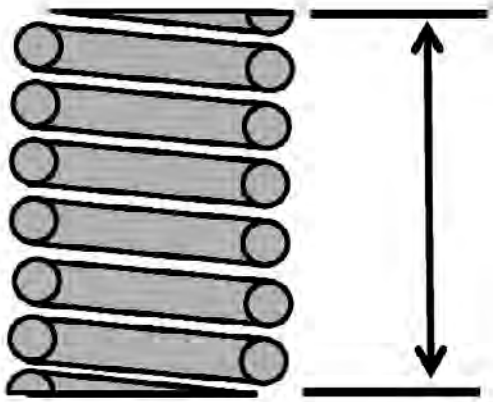
**Remarks:** Within specifications.



**Spring Free Length**

| Specification |
|---|
| Minimum Free Length: 1.818 Inches |

| Cylinder | Valve | Length (Inches) |
|---|---|---|
| 1 | I | 1.842 |
| | E | 1.830 |
| 2 | I | 1.830 |
| | E | 1.831 |
| 3 | I | 1.813 |
| | E | 1.832 |
| 4 | I | 1.823 |
| | E | 1.831 |
| 5 | I | 1.830 |
| | E | 1.834 |



**Spring Compressed Length**

| Specification |
|---|
| Spring Compressed Length: 1.4 Inches @ 56 lbs of Force |

| Cylinder | Valve | Force (lbs) at 14 In. |
|---|---|---|
| 1 | I | 56 |
| | E | 56 |
| 2 | I | 57 |
| | E | 56 |
| 3 | I | 54 |
| | E | 56 |
| 4 | I | 56 |
| | E | 57 |
| 5 | I | 55 |
| | E | 56 |

**Remarks:** Cylinder 3 intake spring force was slightly weak. The free length was under minimum and was under the 56 lbs of rated force at 1.4 inches.

**Valve Seat Width**

| Specification |
|---|
| Intake Seat Width: 0.077 Inches<br>Exhaust Seat Width: 0.072 Inches |

| Cylinder | Intake | Exhaust |
|---|---|---|
| 1 | 0.079 | 0.088 |
| 2 | 0.088 | 0.099 |
| 3 | 0.087 | 0.078 |
| 4 | 0.085 | 0.084 |
| 5 | 0.089 | 0.082 |

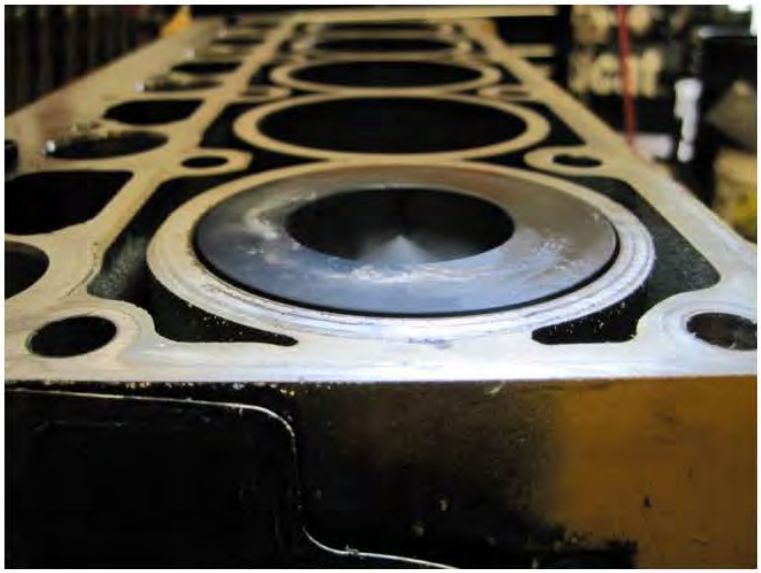
**Remarks:** Acceptable.

## Appendix C: Photo Documentation

**C-1** John Deere Serial Plate Number




**C-2** Combustion System



**C-3** Cylinder 2 – Representative of Cylinders 1, 2, 3, & 4



**C-4** Scoring Seen on Cylinder 5 Wall (overheating during initial trials)



**C-5** Discoloring Found on Cylinder 2 Piston Skirt – Representative of Pistons 1, 2, 3, & 4 (indication of overheating)



**C-6** Scoring Found on Cylinder 5 Piston Skirt (indication of overheating due to overloading)



**C-7** Cylinder 5 Piston Skirt (indication of overheating due to overloading)



**C-8** Piston Rings are Free with Normal Wear – Representative of Cylinders 1, 2, 3, 4, & 5



**C-9** Cylinder 3 Piston Head – Representative of Pistons 3, 4, & 5




**C-10** Cylinder 2 Piston Head – Minor Ding (foreign material passed through engine)



**C-11** Cylinder 1 Piston Head



**C-12** Cylinder 1 Piston Head (foreign material such as nut or washer passed through engine)



**C-13** Piston Rod Bearing – Representative of Cylinders 1, 2, 3, 4, & 5



**C-14** Mechanical Engine Speed Governor Fly Weights and Cam Shaft Gear



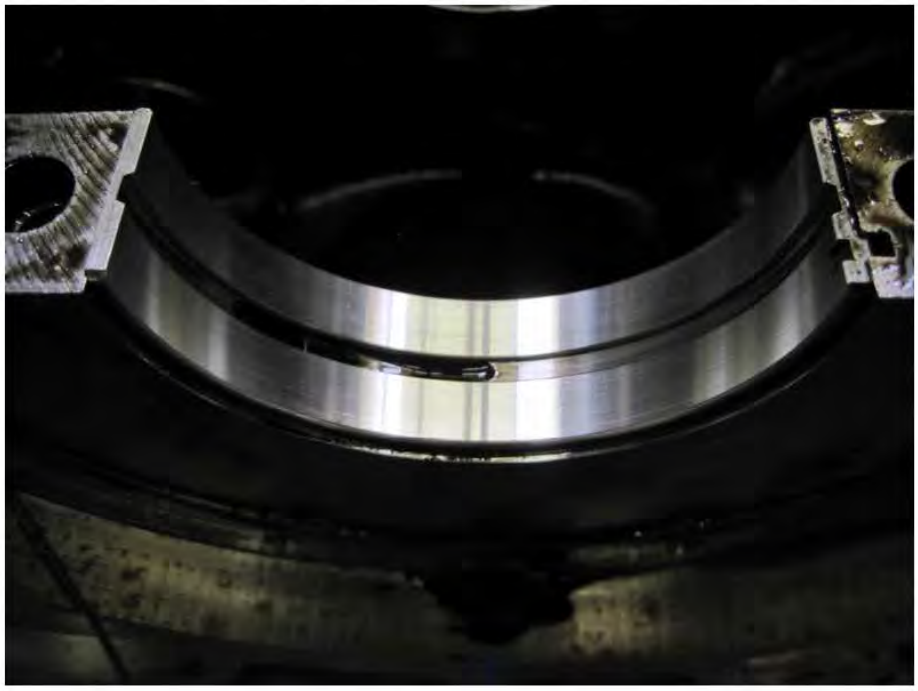
**C-15** Crankshaft



**C-16** Lower Main Bearing 5 – Representative of Lower Main Bearings 1, 2, 3, 4, 5, & 6



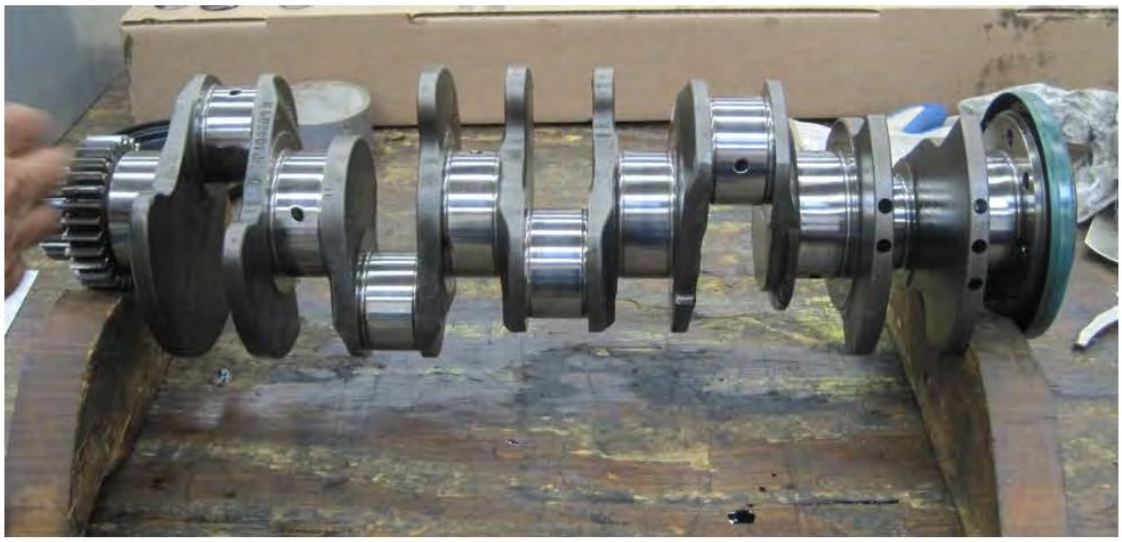
**C-17** Upper Main Bearing 6 – Representative of Upper Main Bearings 1, 2, 3, 4, 5, & 6



**C-18** Upper Main Bearings



**C-19** Crankshaft Journals



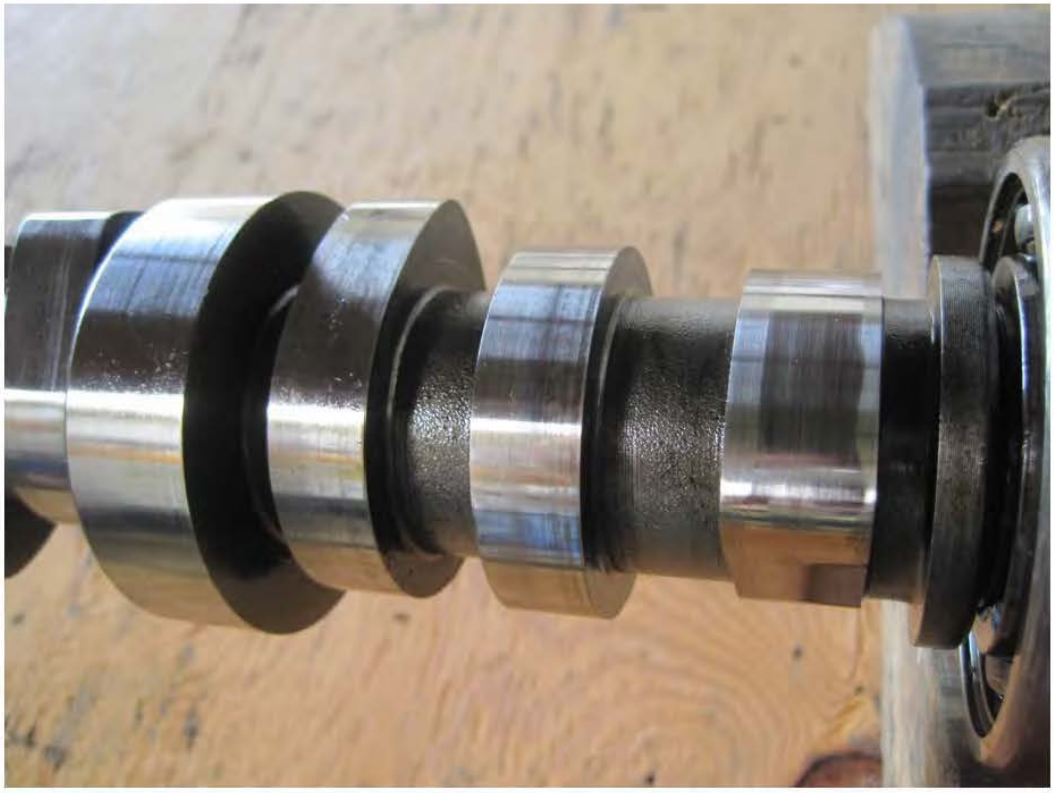
**C-20** Rod Journal 1 – Representative of Rod Journals 1, 2, 3, 4, & 5



**C-21** Cam Shaft Journals



**C-22** Cylinder 1 Intake, Exhaust, & Injector Lobes; Cam Journal 1
Representative of Cylinders 1, 2, 3, 4, & 5



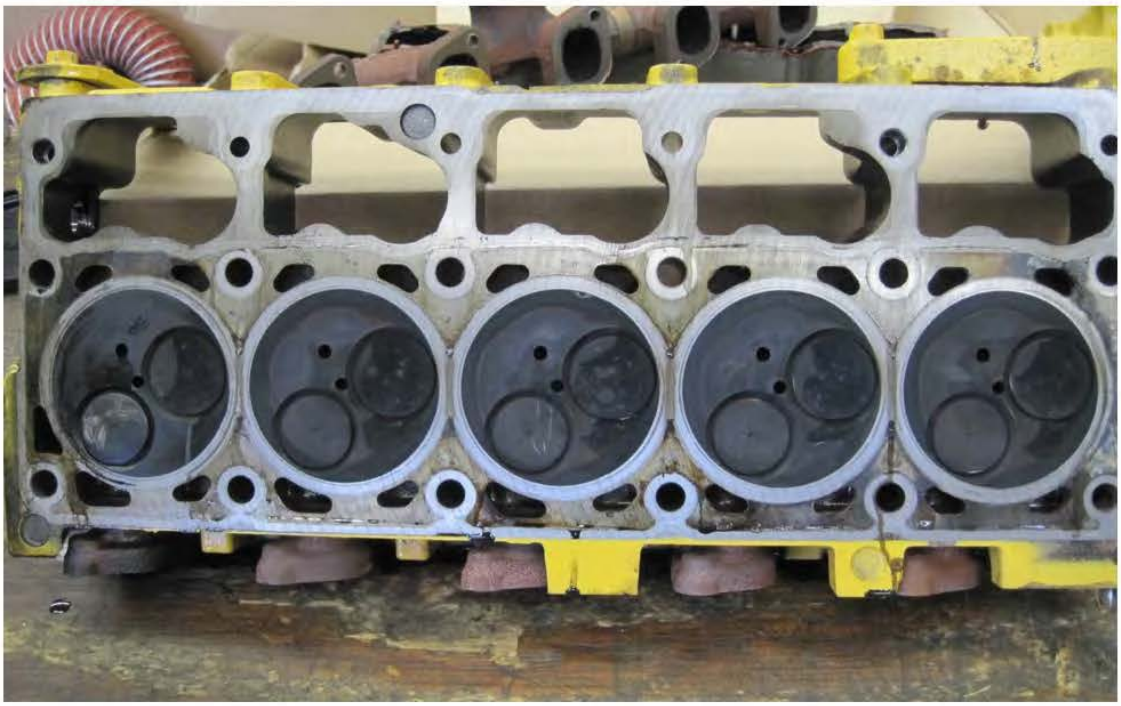
**C-23** Cam Follower Stem – Representative of Cylinders 1, 2, 3, 4, & 5



**C-24** Injector Nozzle – Representative of Cylinders 1, 2, 3, 4, & 5



**C-25** Engine Head



**C-26** Engine Head Underside



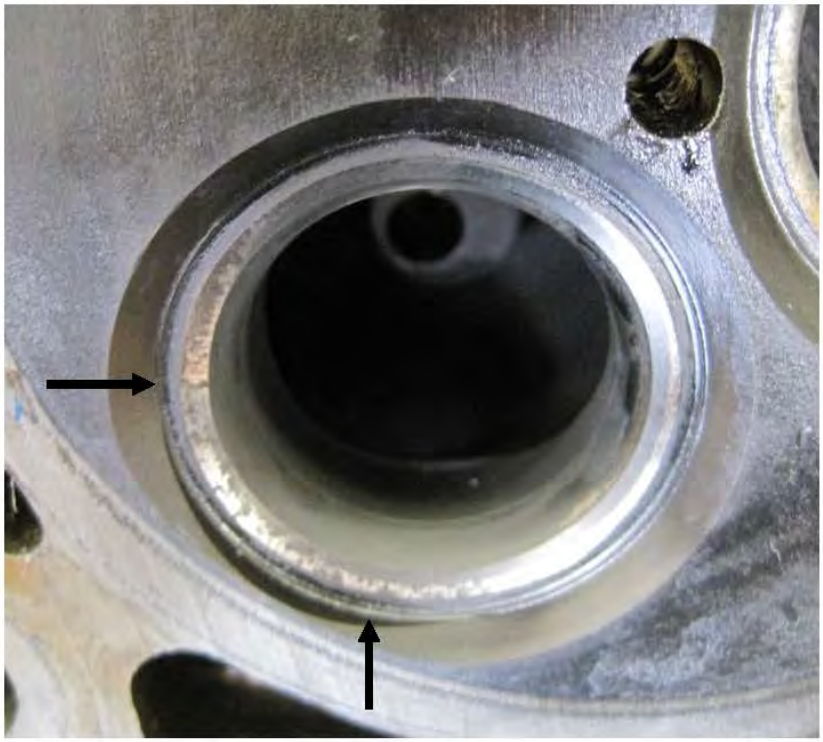
**C-27** Carbon Build Up on Intake Valve Housing; Cylinder 1
Representative of Cylinders 1, 2, 3, 4, & 5



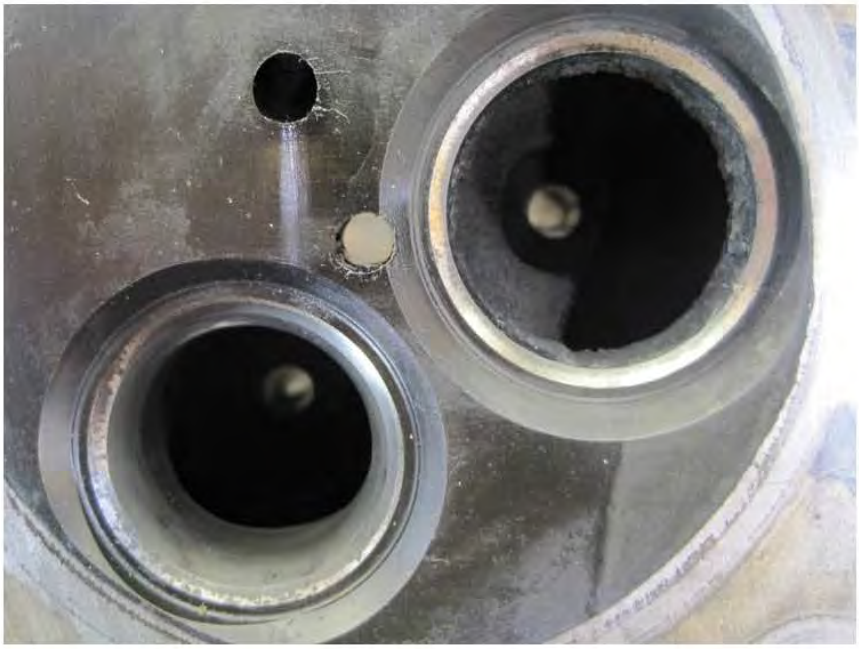
**C-28** Carbon Build Up on Intake Valve; Cylinder 1- Representative of Cylinders 1, 2, 3, 4, & 5



**C-29** Cylinder 5 Exhaust Valve Seat – Pitting Found on Lower Left Surface Representative of Exhaust Valves 1, 2, 3, 4, & 5



**C-30** Cylinder 5 Exhaust and Intake Valve Seats



**C-31** Exhaust Valve – Representative of Cylinders 1, 2, 3, 4, & 5



**C-32** Exhaust Valve and Stem – Representative of Cylinders 1, 2, 3, 4, & 5



**C-33** Turbo Charger



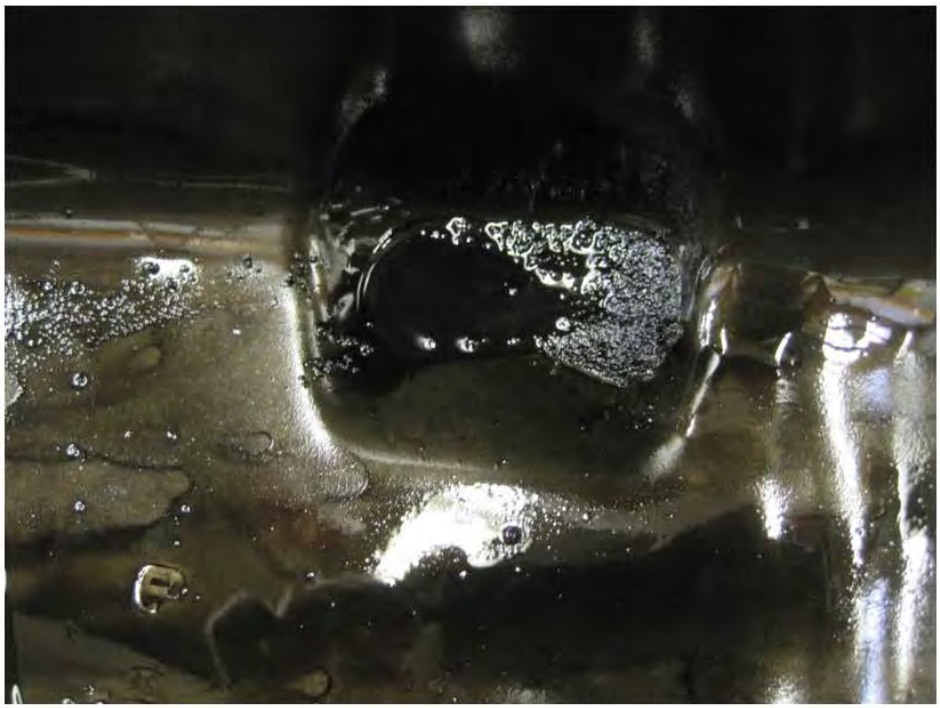
**C-34** Turbo Charger Intake



**C-35** Oil Pan



**C-36** Oil Pan – Metallic Flakes and Heavy Particulate Found Under Turbo Return Area



## Appendix D - *Oil Scan* Oil Analysis

OILSCAN®

Analysts, Inc. | ISO 17025 Accredited | 2450 Hassell Rd, Hoffman Estates, IL, 60169
Phone: 800-222-0071

Analysis Report

Status: NORMAL on Jul 23 2015



**Cobleskill College**
**Ray Roes**
**CURTIS-MOTT HALL 118**
**COBLESKILL, NY, 12043**

Unit ID: **PE5030H191337** Unit Worksite: Comp. Ref. NO.: **6491963**

Component Type: **DIESEL ENGINE** Component: **ENGINE**

Unit Manufacturer and Model: **DEERE 5030** Oil Type: **SHELL ROTELLA 15W40**

Component Manufacturer and Model: **DEERE 5030** Component Serial Number: **191337**

**Maintenance Recommendations for Lab No. 201508071091** Reported On: Aug 11 2015

From: Suny Cobleskill - **JDI Cobleskill, NY**

ANALYSIS INDICATES COMPONENT & OIL ARE IN SATISFACTORY CONDITION. RESAMPLE at normal interval.

### SPECTROCHEMICAL ANALYSIS IN PARTS PER MILLION

| EVAL ID MLABENNE / LAB NO. | Iron | Chromium | Nickel | Aluminum | Lead | Copper | Tin | Silver | Titanium | Silicon | Boron | Sodium | Potassium | Molybdenum | Phosphorus | Zinc | Calcium | Barium | Magnesium | Antimony | Vanadium | Sample Drawn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1091 | 77 | 2 | 4 | 20 | 1 | 11 | <1 | <0.1 | <1 | 58 | 27 | 30 | 15 | 14 | 917 | 1215 | 2311 | <1 | 31 | 1 | <1 | 07/23/15 |

### SAMPLE INFORMATION

| LAB NO. | MMR Unit | MMR Oil | Oil Add | FLTR CHG | Oil CHG |
|---|---|---|---|---|---|
| 1091 | 482 | 300 | 0 | - | S |

### PHYSICAL TEST RESULTS

| LAB NO. | Water % | Viscosity 100 °C | Visc Grade | Fuel % | T/S % vol |
|---|---|---|---|---|---|
| 1091 | <0.1 | 15.8 | 40 | <0.50 | 0.2 |

Notice: This analysis is intended as an aid in predicting mechanical wear. Test results, maintenance recommendations and accuracy are effected by customer-provided samples, equipment identification and maintenance history. No guarantee, expressed or implied, is made against failure of this piece of equipment or a component thereof. The ultimate responsibility for the maintenance of this piece of equipment and all of its components is the responsibility of the equipment owner.

N/R = Test not performed

© Copyright 2012, Analysts, Inc.

## Appendix E - Engine Measurement Specifications and Procedures



# CTM301 - 2.4L and 3.0L Diesel Engines
# Cylinder Head and Valves Specifications

### Cylinder Head and Valves Specifications

| Item | Measurement | Specification |
|---|---|---|
| Unit Pump Clamp | Torque | 50 N•m (37 lb-ft) |
| Glow Plug | Torque | 13 N•m (9 lb-ft) |
| Glow Plug Wire Harness Nut | Torque | 3.5 N•m (31 lb-in.) |
| Cylinder Head Cap Screw/Glow Plug Wire Harness | Torque | 28 N•m (21 lb-ft) |
| Intake Valve | Recess in Cylinder Head | 0.72—1.48 mm (0.028—0.058 in.) |
| Exhaust Valve | Recess in Cylinder Head | 0.72—1.48 mm (0.028—0.058 in.) |
| Spring Free Length 0 N (0 lb-force) [Free length may vary slightly between valve springs.] | Height | 46.2 mm (1.818 in.) |
| Spring Compressed 166 N (37 lb-force) | Height | 37.2 mm (1.46 in.) |
| Spring Compressed 356 N (80 lb-force) | Height | 27.0 mm (1.06 in.) |
| Intake Valve Head | OD | 36.87—37.13 mm (1.452—1.462 in.) |
| Exhaust Valve Head | OD | 33.87—34.13 mm (1.333—1.344 in.) |
| Intake Valve Stem | OD | 6.987—7.013 mm (0.2751—0.2761 in.) |
| Exhaust Valve Stem | OD | 6.974—7.000 mm (0.2746—0.2755 in.) |
| Valve Face | Maximum Runout (Intake and Exhaust) | 0.038 mm (0.0015 in.) |
| Valves | Face Angle | 29.25° ± 0.25° |
| Initial Cylinder Head Cap Screw (4-cylinder) | Torque | 110 N•m (81 ft-lb) |
| Final Cylinder Head Cap Screws No.1 - No.8 (4-cylinder) | Torque | 70 N•m (52 ft-lb) plus 150° +10/-0 |
| Final Cylinder Head Cap Screws No.9 - No.10 (4-cylinder) | Torque | 70N•m (52 ft-lb) plus 120° +10°/-0° |
| Initial Cylinder Head Cap Screw (5-cylinder) | Torque | 110 N•m (81 ft-lb) |
| Final Cylinder Head Cap Screws No.1 - No.10 (5-cylinder) | Torque | 70 N•m (52 ft-lb) plus 150° +10°/-0° |
| Final Cylinder Head Cap Screws No.11 - No.12 (5-cylinder) | Torque | 70N•m (52 ft-lb) plus 120° +10°/-0° |
| Unit Pump Clamp | Torque | 50 N•m (37 lb-ft) |
| Top of valve spring retainer to cylinder head | Height | 37.0 mm (1.46 in.) minimum |
| Rocker Arm Capscrew | Torque | 40 N.m (30 lb-ft) |

RG41183,000005C-19-20041012

# CTM301 - 2.4L and 3.0L Diesel Engines
# Camshaft, Balancer Shafts and Timing Gear Train Specifications

## Camshaft, Balancer Shafts and Timing Gear Train Specifications

| Item | Measurement | Specification |
|---|---|---|
| Camshaft | End Play | 0.08—0.23 mm (0.003—0.009 in.) |
| Balancer Shaft | End Play | 0.08—0.38 mm (0.003—0.015 in.) |
| Camshaft Journal | OD | 55.872—55.898 mm (2.1997—2.2007 in.) |
| Camshaft Bore, Front No. 1(Ball Bearing) | ID | 55.961—55.987 mm (2.2031—2.2042 in.) |
| Camshaft Bore, All Except No. 1 | ID | 55.986—56.012 mm (2.2042—2.2052 in.) |
| Camshaft Journal-to-Bushing, No. 1 Bore (With Bushing) | Oil Clearance | 0.063—0.115 mm (0.0025—0.0045 in.) |
| Camshaft Intake Lobe | Height | 7.05—7.31 mm (0.278—0.288 in.) |
| Camshaft Exhaust Lobe | Height | 6.89—7.15 mm (0.271—0.281 in.) |
| Fuel Supply Pump Camshaft Lobe | Diameter | 42.67—42.93 mm (1.68—1.69 in.) |
| Camshaft Follower | OD | 31.61—31.64 mm (1.245—1.246 in.) |
| Camshaft Follower Bore in Block | ID | 31.70—31.75 mm (1.248—1.250 in.) |
| Camshaft Follower-to-Bore | Clearance | 0.06—0.13 mm (0.002—0.005 in.) |
| Balancer Shaft Bushing (New) | ID | 30.038—30.104 mm (1.1826—1.1852 in.) |
| Balancer Shaft Journal | OD | 29.987—30.013 mm (1.1806—1.1816 in.) |
| Balancer Shaft Journal-to-Bushing | Oil Clearance | 0.025—0.117 mm (0.0009—0.0046 in.) |
| Cylinder Block Bore for Balancer Shaft Bushing | ID | 33.500—33.526 mm (1.3189—1.3199 in.) |
| Balancer Shaft Thrust Plate (New) | End Play | Not to Exceed 0.45 mm (0.02 in.) |

RG41183,000005F-19-20040430

# CTM301 - 2.4L and 3.0L Diesel Engines
# Cylinder Block, Liners, Pistons, and Rods Specifications

## Cylinder Block, Liners, Pistons, and Rods Specifications

| Item | Measurement | Specification |
|---|---|---|
| Piston Ring-to-Groove Clearance—New Piston Ring (First Compression Ring Groove) | Maximum Clearance | 0.12 mm (0.005 in.) |
| Piston Ring-to-Groove Clearance—New Piston Ring (Second Compression Ring Groove) | Maximum Clearance | 0.098 mm (0.004 in.) |
| Piston Ring-to-Groove Clearance—New Piston Ring (Third Oil Control Ring Groove, Standard Ring) | Maximum Clearance | 0.09 mm (0.004 in.) |
| Piston Pin Bore | ID | 30.003—30.009 mm (1.1812—1.1815 in.) |
| Piston Skirt (Measurement Taken at Bottom of Skirt 12 mm (0.5 in.) from Bottom of Piston) | Diameter | 85.876—85.908 mm (3.381—3.382 in.) |
| Piston — Turbocharged Engines | Height | 53.415—53.465 mm (2.103—2.105 in.) |
| Cylinder Bore | ID | 85.987—86.013 mm (3.385—3.386 in.) |
| Piston-to-Cylinder Bore Clearance (Measured at Bottom of Piston Skirt) | Clearance | 0.079—0.137 mm (0.003—0.005 in.) |
| Crankshaft Journal | OD | 59.987—60.013 mm (2.361—2.363 in.) |
| Assembled Rod Bearing | ID | 60.030—60.073 mm (2.363—2.365 in.) |
| Connecting Rod Bearing-to-Journal Minimum | Clearance | 0.017 mm (0.001in.) |
| Maximum | Clearance | 0.086 mm (0.003 in.) |
| Connecting Rod Bore (Without Bearing Inserts) | ID | 63.437—63.463 mm (2.498—2.499 in.) |
| Piston Pin | OD | 29.994—30.000 mm (1.1809—1.1811 in.) |
| | OD Wear Limit | 29.980 mm (1.1808 in.) |
| Piston Pin | Length | 67.75—68.00 mm (2.667—2.677 in.) |
| Rod Bearing Bore-to-Piston Pin Bushing Bore (Center-to-Center) | Measurement | 170 mm (6.69 in.) |
| Plug (Oil Gallery) | Torque | 15 N·m (11 lb-ft) |
| Camshaft Follower Bore in Block | ID | 21.428—21.454 mm (0.8436—0.8446 in.) |
| Camshaft Follower (New) | OD | 21.392—21.404 mm (0.8422—0.8427 in.) |
| Connecting Rod Cap Screws | Initial Torque | 35 N·m (18 lb-ft) |
| Connecting Rod Cap Screws | Torque-Turn | 1/4 Turn (90—100°) After Initial Torque |

RG41183,000005D-19-20091012

# CTM301 - 2.4L and 3.0L Diesel Engines
# Crankshaft, Main Bearings, and Flywheel Specifications

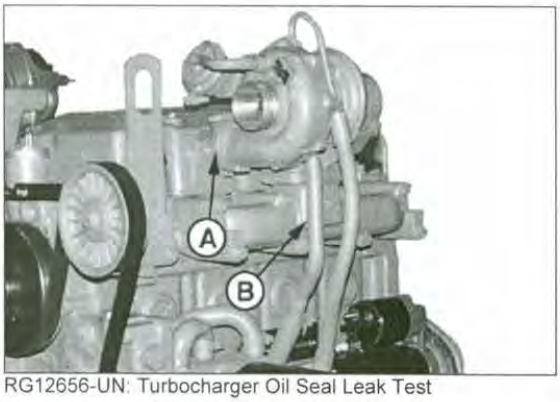
## Crankshaft, Main Bearings, and Flywheel Specifications

| Item | Measurement | Specification |
|---|---|---|
| Damper | Maximum Radial Runout (Concentricity) | 1.00 mm (0.040 in.) |
| Damper Pulley Outer Ring | Wobble (Maximum) | 1.50 mm (0.060 in.) |
| Damper Pulley Inner Ring | Wobble (Maximum) | 0.5 mm (0.020 in.) |
| Starter Motor Mounting Cap Screws | Torque | 80 N·m (59 lb-ft) |
| Initial Pulley Mounting Cap Screw | Torque | 100 N·m (74 lb-ft) |
| Final Pulley Mounting Cap Screw | Torque Turn | 50 N·m + 90° (37 lb-ft + 90°) |
| Crankshaft | End Play | 0.089—0.396 mm (0.004—0.016 in.) |
| Flywheel Face Flatness | Maximum Variation | 0.23 mm (0.009 in.) |
| | Maximum Variation per 25 mm (1.0 in.) of Travel | 0.013 mm (0.0005 in.) |
| Flywheel Bearing Bore Concentricity | Maximum Variation | 0.127 mm (0.005 in.) |
| Rear Oil Seal Housing Cap Screws | Torque | 17 N·m (13 lb-ft) |
| Crankshaft Main Bearing Cap Screws | Torque | 80 N·m (59 lb-ft) |
| Crankshaft Main Bearing-to-Journal | Oil Clearance | 0.021—0.090 mm (0.0008—0.0035 in.) |
| Main Bearing Cap Screws | Torque | 80 N·m (59 lb-ft) |
| Crankshaft Main Bearing | ID | 75.034—75.077 mm (2.9541—2.9558 in.) |
| Crankshaft Main Journal | OD | 74.987—75.013 mm (2.9522—2.9533 in.) |
| Crankshaft Rod Journal | OD | 59.987—60.013 mm (2.36170—2.3627 in.) |
| Crankshaft Main or Rod Journal | Maximum Taper | 0.010 mm (0.0004 in.) |
| Crankshaft Main or Rod Journal | Maximum Out-of-Round | 0.008 mm (0.0003 in.) |
| Crankshaft Main Thrust Bearing Journal Width | Width | 31.302—31.378 mm (1.2340—1.2350 in.) |
| Crankshaft Main Thrust Washer | Overall Thickness | 2.95—3.05 mm (0.120—0.116 in.) |
| Crankshaft Main Bearing Bore (Without Bearings) | ID | 79.892—79.918 mm (3.1454—3.1464 in.) |
| Crankshaft Main Bearing Cap Screws | Torque | 80 N·m (59 lb-ft) |
| Crankshaft | End Play | 0.089—.396 mm (0.004—0.016 in.) |
| Initial Flywheel Housing Cap Screws | Torque | 35 N·m (26 lb-ft) |
| Final Flywheel Housing Cap Screws | Torque | 140 N·m (105 lb-ft) |
| Initial Flywheel Mounting Cap Screws | Torque | 30 N·m (20 lb-ft) |
| Final Flywheel Mounting Cap Screws | Torque | 110 N·m (80 lb-ft) |
| Balancer Shaft Weight Cap Screws | Torque | 16.5 N·m (12 lb-ft) |

RG41183,000005E-19-20070109

# CTM101019 - PowerTech™ E 2.4L and 3.0L Diesel Engines
# Turbocharger Oil Seal — Leak Check

## Turbocharger Oil Seal — Leak Check




RG12656-UN: Turbocharger Oil Seal Leak Test

LEGEND

A - Inlet Hose
B - Oil Return Line

Seals are used on both sides of the turbocharger rotor assembly. The seals are used to prevent exhaust gasses and air from entering the turbocharger housing. Oil leakage past the seals is uncommon but can occur.

A restricted or damaged turbocharger oil return line can cause the housing to pressurize, causing oil to leak by the seals. Additionally, intake or exhaust restrictions can cause a vacuum between the compressor and turbocharger housing, causing oil to leak by the seals.

1. Remove exhaust pipe (shown removed) and inlet hose (A).
2. Inspect the turbine casing and inlet hose for evidence of oil leakage.

   If oil leakage is present, perform the following:

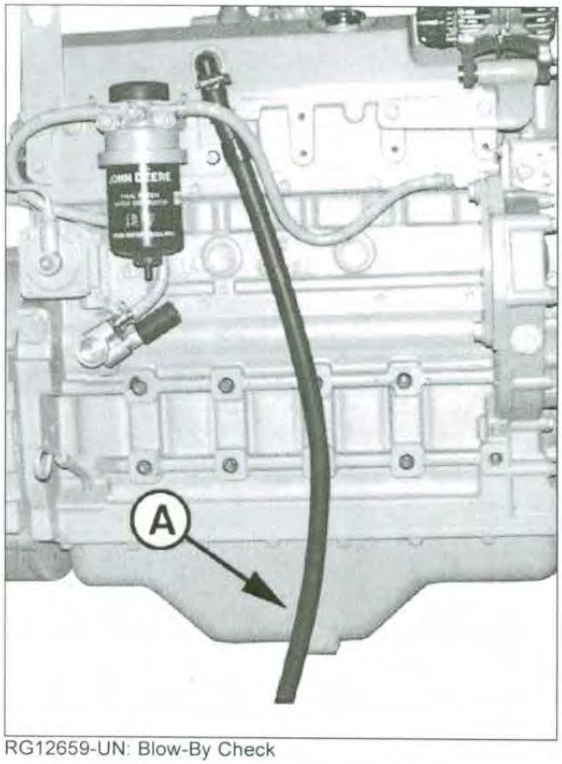
   - Inspect turbocharger oil return line (B) for kinks or damage. Replace if necessary.
   - Check the air intake filter, hoses, and inlet hose for restrictions.
   - Check the exhaust system for restrictions to include position of exhaust outlet.

3. Perform necessary repairs and repeat test.

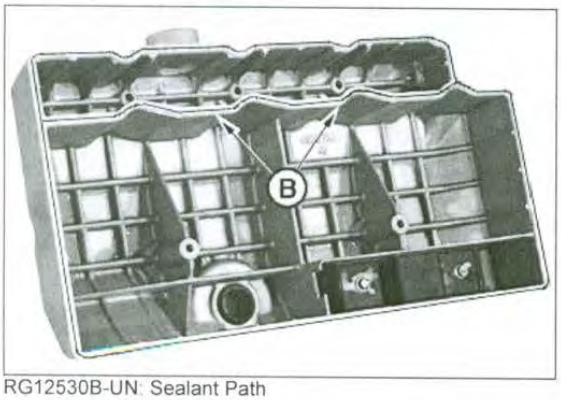
MK41968,000005E-19-20091217

# CTM101019 - PowerTech™ E 2.4L and 3.0L Diesel Engines
# Crankcase Pressure Blow-By Test

Crankcase Pressure Blow-By Test




RG12659-UN: Blow-By Check




RG12530B-UN: Sealant Path

LEGEND:

A - Breather Tube
B - Sealant Path

Excessive blow-by coming out of the crankcase breather tube (A) indicates that either the turbocharger (if equipped) seals are faulty or the piston rings and cylinder bores are not adequately sealing off the combustion chamber. This is a comparative check that requires some experience to determine when blow-by is excessive

Run engine at high idle and check crankcase breather tube. Look for significant fumes and/or dripping oil coming out of the breather tube at fast idle, with no load.

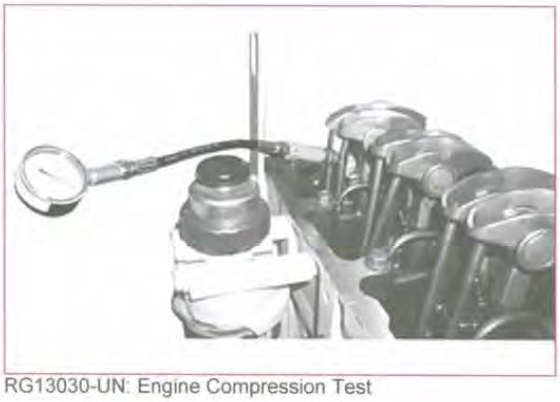
If excessive blow-by is observed, perform the following to determine if the turbocharger (if equipped) is causing the blow-by:

1. Remove the turbocharger oil drain line where it connects to the engine block and run line into a bucket.
2. Run engine at high idle, slightly loaded, and determine if boost pressure is forcing oil through the drain line. Check crankcase breather tube to determine if blow-by has decreased.
3. If it appears that boost pressure is forcing oil through the drain line, and/or blow-by decreases with the drain line disconnected from block, replace the turbocharger, and retest.
4. Remove rocker arm cover and inspect sealant path (B) for areas showing possible blow-by. Clean ssurface and apply sealant as shown and and reinstall. Allow sealant to completely cure. Run engine at high idle and check crankcase breather tube.

MK41968,0000054-19-20100415

# CTM101019 - PowerTech™ E 2.4L and 3.0L Diesel Engines Mechanical Compression Test

## Mechanical Compression Test



RG13030-UN: Engine Compression Test

IMPORTANT:

**Compression pressures are affected by the cranking speed of the engine. Before beginning test, ensure that batteries are fully charged.**

1. Start engine and run at rated speed until it warms up to normal operating temperature. (From a cold start, operate engine 10—15 minutes at slow idle.)
2. Shut off engine and remove the rocker arm cover. See Rocker Arm Cover — Installation and Removal in Group 20.
3. Shut off fuel supply and remove glow plugs. See Glow Plugs — Removal in Section 20.
4. Install JDG1687 into glow plug bore in the cylinder head and tighten to specification. Attach 45° quick disconnect fitting to compression adapter and install compression gauge to adapter. Do not tighten adapter to more than glow plug torque specification.

| Item | Measurement | Specification |
|---|---|---|
| Glow Plug | Torque | 13 N·m (10 lb-ft) |

5. Set rocker arm cover on top of cylinder head to reduce oil spray from push rods.

## Compression Test

1. Push throttle lever to "STOP" position. Turn crankshaft for 10—15 seconds with starter motor (minimum cranking speed—150 rpm cold/200 rpm hot).
2. Compare readings from all cylinders. Compression pressure must be within specification.

| Item | Measurement | Specification |
|---|---|---|
| Engine Compression Pressure Test | Engine Compression Pressure | 2379—2792 kPa (24—28 bar) (345—405 psi) |
| | Maximum Difference between Cylinders | 350 kPa (3.5 bar) (50 psi) |

*NOTE:*

*Pressure given was taken at 183 m (600 ft) above sea level. A 3.6 percent reduction in gauge pressure will result for each additional 300 m (1000 ft) nse in altitude.*

*All cylinders within an engine should have approximately the same pressure. There should be less than 340 kPa (3.4 bar) (50 psi) difference between cylinders.*

3. If pressure is much lower than shown, remove gauge and apply oil to ring area of piston through injection nozzle or glow plug bore. Do not use too much oil. Do not get oil on the valves.

4. Test compression pressure again.

   If pressure is high, worn or stuck rings are indicated, replace piston rings or install new piston set as needed. See Piston Rings — Installation , Piston and Connecting Rod — Reassemble and Piston and Connecting Rod Assembly — Installation in Section 02, Group 030.

   If pressure is low, valves could be worn or sticking. Recondition cylinder head as required. (See Cylinder Head — Thickness Check in Section 02, Group 020.)

5. Measure compression pressure in all remaining cylinders and compare readings. Recondition cylinders and valves as required.

   **IMPORTANT:**

   **When testing is completed, use a clean lint free rag to clean all oil from intake manifold ports.**

MK41968,00000A8-19-20100601

# CTM301 - 2.4L and 3.0L Diesel Engines
# Turbocharger Inspection

## Turbocharger Inspection

The following inspection procedure is recommended for systematic failure analysis of a suspected failed turbocharger. This procedure will help to identify when a turbocharger has failed, and why it has failed so the primary cause of the failure can be corrected.

Proper diagnosis of a non-failed turbocharger is important for two reasons. First, identification of a non-failed turbocharger will lead to further investigation and repair of the cause of a performance complaint.

Second, proper diagnosis eliminates the unnecessary expense incurred when a non-failed turbocharger is replaced.

The recommended inspection steps, which are explained in detail on following pages, are:

- Compressor Housing Inlet and Compressor Wheel
- Compressor Housing Outlet
- Turbine Housing Inlet
- Turbine Housing Outlet and Turbine Wheel
- External Center Housing and Joints
- Perform Axial End Play Test

*NOTE:*

*To enhance the turbocharger inspection, an inspection sheet (Form No. DF-2280 available from Distribution Service Center—English only) can be used that lists the inspection steps in the proper order and shows potential failure modes for each step. Check off each step as you complete the inspection and record any details or problems obtained during inspection. Retain this with the work order for future reference.*

## Compressor Housing Inlet and Compressor Wheel




RG12517-UN: Checking Inlet and Compressor Wheel

LEGEND:

A - Compressor Wheel

1. Check compressor inlet and compressor wheel (A) for foreign object damage.

*NOTE:*

*Foreign object damage may be extensive or minor. In either case, the source of the foreign object must be found and corrected to eliminate further damage.*

2. Mark findings on your checklist and continue the inspection.

3. *NOTE*

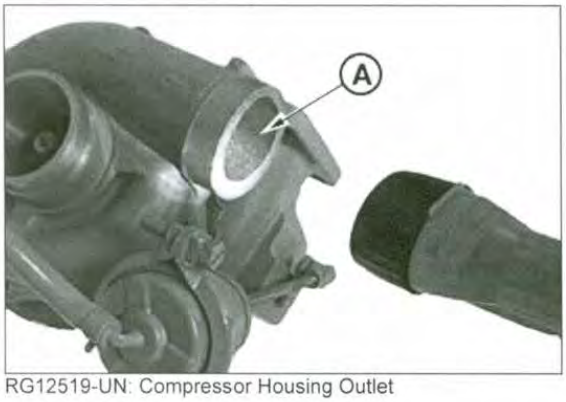
*You will need a good light source for this check.*



RG12518-UN: Checking Compressor Inlet

Check compressor inlet for wheel rub on the housing (arrow). Look very closely for any score marks on the housing itself and check the tips of the compressor wheel blades for damage.

**Compressor Housing Outlet**




RG12519-UN: Compressor Housing Outlet

LEGEND:

A - Compressor Housing Outlet

1. Check compressor housing outlet (A). The outlet should be clean and free of dirt or oil.
2. Mark it on your checklist if dirt or oil is found and continue the inspection.

**Turbine Housing Inlet**



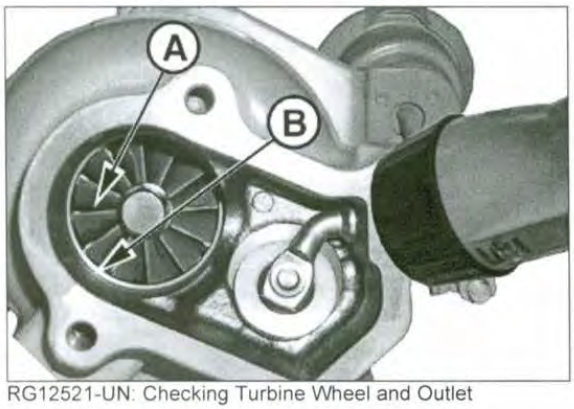
RG12523-UN: Checking Turbine Housing Inlet

Check the turbine housing inlet (arrow) for oil in housing, excessive carbon deposit.

*NOTE:*

*If the inlet is wet with oil, or has excessive carbon deposits, an engine problem is likely.*

**Turbine Housing Outlet and Turbine Wheel**




RG12521-UN: Checking Turbine Wheel and Outlet

LEGEND:

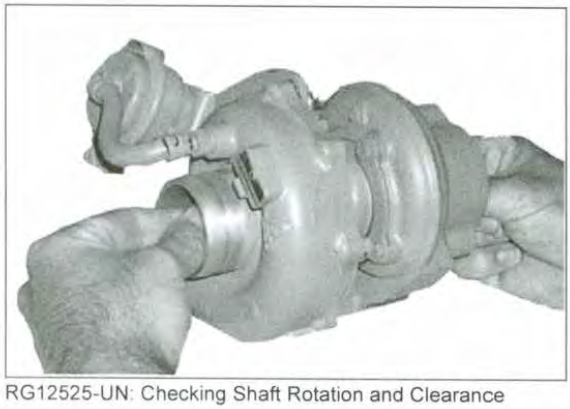
A - Blades
B - Turbine Housing Outlet

1. Use a flashlight to look up inside the turbine housing outlet (A) and check blades (B) for foreign object damage.

2. 

RG12524-UN: Checking Turbine Wheel Blades

Inspect the wheel blades and housing for evidence of wheel rub (arrow). Wheel rub can bend the tips of the blades with the housing showing wear or damage.

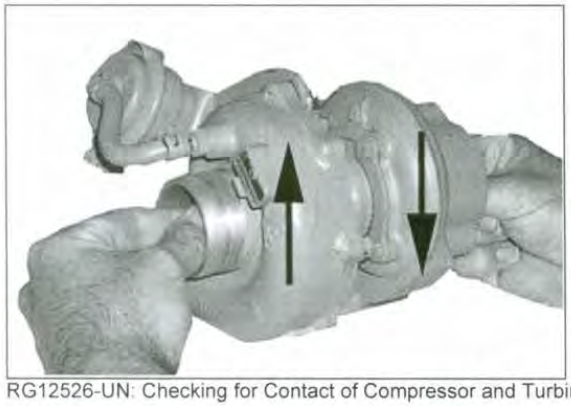
3. 

RG12525-UN: Checking Shaft Rotation and Clearance

Rotate the shaft, using both hands, to check rotation and clearance. The shaft should turn freely, however, there may be a slight amount of drag.

4. **IMPORTANT:**

**Use only moderate hand force (3-4 pounds) on each end of shaft.**



RG12526-UN: Checking for Contact of Compressor and Turbine Wheels

Next, pull up on the compressor end of the shaft and press down on the turbine end while rotating shaft. Neither the compressor wheel nor the turbine wheel should contact the housing at any point.

*NOTE*

*There will be some "play" because the bearings inside the center housing are free floating.*

### External Center Housing and Joints



RG12520-UN: Checking Center Housing

Visually check the outside of the center housing, all connections to the compressor, and turbine housing for oil.

*NOTE*

*If oil is present, make sure it is not coming from a leak at the oil supply or return line.*

**IMPORTANT:**

**Before you finalize your conclusion that the turbocharger has not failed, it is strongly recommended that the following procedures of checking radial bearing clearance and axial bearing endplay with a dial indicator be performed. These procedures are not required if a failure mode has already been identified.**

### Perform Axial Bearing End Play Test



RG12527-UN: Checking Axial Bearing End Play

This test will give an indication of the condition of the thrust bearing within the center housing and rotating assembly.

1. Mount magnetic base dial indicator so that indicator tip rests on flat surface on turbine end of shaft. Preload indicator tip and zero dial on indicator.
2. Move shaft axially back and forth by hand.
3. Observe and record total dial indicator movement.

| Item | Measurement | Specification |
|---|---|---|
| Turbocharger Shaft | Axial Bearing End Play | 0.064—0.114 mm (0.0025—0.0045 in.) |

If bearing end play is not within specification, install a replacement turbocharger.

4



RG12528-UN: Checking Shaft End Play

Next, check shaft endplay by moving the shaft back and forth (arrows) while rotating. There will be some endplay but not to the extent that the wheels contact the housings.

*NOTE:*

*These diagnostic procedures will allow you to determine the condition of the turbocharger. If the turbocharger has failed, analysis of your inspection notes should direct you to the specific areas of the engine to correct the problems causing the turbocharger failure. It is not unusual to find that a turbocharger has not failed. If your turbocharger passes all the inspections, the problem lies somewhere*

## Appendix F - Replacement Parts and Receipt

HRT
THE HUDSON RIVER TRACTOR COMPANY
hudsonrivertractorcompany.com

The Hudson River Tractor Company, LLC
3021 State Highway 5s
P O Box 368
Fultonville, NY 12072
p. 518-853-3405 f. 518-853-8697

Goshen, NY
p. 845-294-2500

Chatham, NY
p. 518-392-2505

Clifton Park, NY
p. 518-877-5059

Schaghticoke, NY
p. 518-692-2676

JOHN DEERE

**PARTS INVOICE**

**Invoice To Account No.:** 54971

THE RESEARCH FOUNDATION OF
SUNY COBLESKILL
WARNER HALL 206
192 ALBANY AVE
COBLESKILL NY 12043

**Home Phone:**

**Deliver To Account No.:** 54971

THE RESEARCH FOUNDATION OF
SUNY COBLESKILL
WARNER HALL 206
192 ALBANY AVE
COBLESKILL NY 12043

**Cell Phone:**

| | |
|---|---|
| **Invoice No:** | **237208** |
| Date: | 7/30/2015 |
| Page: | 1 of 2 |
| Payment Type: | Credit Card |

| Supplied Quantity | Back Order Quantity | Part Number | Part Description | Bin Loc | List Price | Net Price | Extended Price | Tax Ind |
|---|---|---|---|---|---|---|---|---|
| 6.00 | 0.00 | 19M8986 | .SCREW | E386-2 | 2.78 | 2.78 | $16.68 | N |
| 2.00 | 0.00 | 21M7536 | Screw | | 0.70 | 0.70 | $1.40 | N |
| 6.00 | 0.00 | 40M1855 | .SnSNAP RING | C141 | 2.65 | 2.65 | $15.90 | N |
| 2.00 | 0.00 | L157372 | .Screw | E455 | 1.00 | 1.00 | $2.00 | N |
| 5.00 | 0.00 | R502454 | Intake Valve | | 38.26 | 38.26 | $191.30 | N |
| 5.00 | 0.00 | R502455 | Exhaust Valve | | 38.26 | 38.26 | $191.30 | N |
| 10.00 | 0.00 | R502503 | Screw | | 2.05 | 2.05 | $20.50 | N |
| 2.00 | 0.00 | R516692 | .SCREW | | 17.94 | 17.94 | $35.88 | N |
| 10.00 | 0.00 | R516693 | .SCREW | | 8.56 | 8.56 | $85.60 | N |
| 2.00 | 0.00 | R522728 | Spring | | 5.45 | 5.45 | $10.90 | N |
| 1.00 | 0.00 | RE44574 | SEAL | B654 | 40.30 | 40.30 | $40.30 | N |
| 1.00 | 0.00 | RE508202 | FUEL FILTE | B308 | 29.13 | 29.13 | $29.13 | N |
| 1.00 | 0.00 | RE519626 | OIL FILTER | B713 | 10.69 | 10.69 | $10.69 | N |
| 2.00 | 0.00 | RE520936 | Piston Replacement Kit | | 65.52 | 65.52 | $131.04 | N |
| 5.00 | 0.00 | RE520937 | Bearing Kit | | 20.33 | 20.33 | $101.65 | N |
| 1.00 | 0.00 | RE524593 | Gasket Kit | | 155.00 | 155.00 | $155.00 | N |
| 1.00 | 0.00 | RE528707 | Engine Cylinder Head Gasket | | 60.19 | 60.19 | $60.19 | N |
| 10.00 | 0.00 | RE532712 | Seal | | 4.45 | 4.45 | $44.50 | N |
| 3.00 | 0.00 | RE543439 | Piston Ring Kit | | 21.04 | 21.04 | $63.12 | N |
| 1.00 | 0.00 | RE547148 | GASKET KIT | | 122.82 | 122.82 | $122.82 | N |

HRT
THE HUDSON RIVER TRACTOR COMPANY
hudsonrivertractorcompany.com

The Hudson River Tractor Company, LLC
3021 State Highway 5s
P.O. Box 368
Fultonville, NY 12072
p. 518-853-3405 f. 518-853-8697

Goshen, NY
p. 845-294-2500

Chatham, NY
p. 518-392-2505

Clifton Park, NY
p. 518-877-5059

Schaghticoke, NY
p. 518-692-2676

JOHN DEERE

# PARTS INVOICE

**Invoice To Account No.:** 54971

THE RESEARCH FOUNDATION OF
SUNY COBLESKILL
WARNER HALL 206
192 ALBANY AVE
COBLESKILL NY 12043

**Home Phone:**

**Deliver To Account No.:** 54971

THE RESEARCH FOUNDATION OF
SUNY COBLESKILL
WARNER HALL 206
192 ALBANY AVE
COBLESKILL NY 12043

**Cell Phone:**

| | |
|---|---|
| **Invoice No:** | **237208** |
| Date: | 7/30/2015 |
| Page: | 2 of 2 |
| Payment Type: | Credit Card |

| Supplied Quantity | Back Order Quantity | Part Number | Part Description | Bin Loc | List Price | Net Price | Extended Price | Tax Ind |
|---|---|---|---|---|---|---|---|---|
| 1.00 | 0.00 | 3750 | FREIGHT | | 18.70 | 18.70 | $18.70 | N |

**Credit Card Information**

**Customer PO No:**
**Tax Exempt No:** ST-125 ON FILE
**Salesperson:** JIM FURMAN

**Type:** Credit Card
**Auth No:** v022337
**Amount:** $1,348.60

| | |
|---|---|
| **Parts:** | $1,329.90 |
| **Misc:** | $18.70 |
| **Sales Tax:** | $0.00 |
| **Deposit:** | $0.00 |
| **Total:** | $1,348.60 |



**TERMS AND CONDITIONS**

Terms net cash. All accounts not paid by the 10th of the month following purchase are subject to a Finance Charge at a monthly rate of 1.75%, which is an annual rate of 21%, applied to the previous balance without deducting current payments and/or credits.

All parts returned must be accompanied by this invoice and returned within 30 days. No returns of electrical parts. 20% restocking fee on all special order parts returned.

Received by: ..... Date: ..... Date: 7/30/2015

**THE HUDSON RIVER TRACTOR CO FULT**
**3021 STATE HIGHWAY 5 S**
**FULTONVILLE, NY - 12072**

Merchant Number: 008013032829

**== Transaction Approved ==**

Receipt #: 1462607475.53A2
Invoice #: 146260747553A2

Card Number: **********9898
Date: July 30, 2015
Card Type: VISA
Input Type: KEYED
Trans Type: Purchase
Auth #: 022337

Total: $1348.60

Signature X _____

*I agree to pay above total amount according to card issuer agreement*

Print Back