AREA 1, PHASE 1 DETAILED DEVELOPMENT PLAN

Baltimore Works Site
Baltimore, Maryland

August 2013

By:
Harbor Point Development LLC
Beatty Harvey Coco Architects, LLP
Mueser Rutledge Consulting Engineers
Environmental Resources Management, Inc.
Rummel, Klepper & Kahl

For:
Environmental Protection Agency – Region III
Maryland Department of the Environment

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 PROJECT TEAM / ROLES 3

3.0 EXISTING ENVIRONMENTAL REMEDIATION SYSTEM (ERS) 5

3.1 MULTIMEDIA CAP (AREA 1) 5

3.1.1 Cap Function and Features 5
3.1.2 Ground Conditions Below Cap 6
3.1.3 Methane Gas Venting System 6
3.1.4 Perimeter Drain (Toe Drain) 6

3.2 AREA 2 SOIL CAP 7

3.3 AREA 3 SOIL CAP 7

3.4 HYDRAULIC BARRIER 8

3.5 HEAD MAINTENANCE SYSTEM 9

3.5.1 Extraction System 9
3.5.2 Monitoring and Control System 10
3.5.3 Conveyance System 11
3.5.4 Transfer Station 11
3.5.5 Transfer Station Truck Pad 12

3.6 OUTBOARD EMBANKMENT AND WATERSIDE PERIMETER 13

3.7 MONITORING OF REMEDIAL COMPONENTS AND ENVIRONMENTAL MEDIA 14

3.7.1 Environmental Media Monitoring Plan 15
3.7.2 Surface Soil Monitoring Plan 15
3.7.3 Groundwater Gradient Monitoring Plan 16

4.0 DEVELOPMENT PLAN AND SCHEDULE 18

4.1 SCOPE OF PROJECT 18

4.1.1 Exelon Tower and Trading Floor Garage 18
4.1.2 Plaza Parking Garage 18
4.1.3 Transfer Station Revisions 18
4.1.4 Roadways & Plaza 19
4.1.5 Central Avenue Bridge 19

4.2 SCHEDULE *20*

5.0 DEVELOPMENT IMPLEMENTATION ACTIVITIES *21*

5.1 EARTHWORK *21*
5.1.1 Excavations *21*
5.1.2 Dewatering (Groundwater and Surface Water) *22*
5.1.3 Obstruction Removal *23*
5.1.4 Fill Placement / Raised Grades *24*
5.1.5 Cap Settlement Estimates and Importance to Cap Function *25*

5.2 FOUNDATIONS *27*
5.2.1 Pile Selection *27*
5.2.2 Pile Caps *28*
5.2.3 Shear Wall Foundations *28*
5.2.4 Slab on Grade *28*
5.2.5 Shallow Foundations Above the Cap Synthetic Layers *29*
5.2.6 Structural Ground Floor Slabs *29*

5.3 UTILITIES *29*
5.3.1 Site Utilities (General) *29*
5.3.2 Sanitary Sewer *30*
5.3.3 Storm Drain *30*
5.3.4 Domestic and Fire Water *32*
5.3.5 Gas *32*
5.3.6 Electric and Telecommunications Conduits *32*
5.3.7 Diesel Fuel Storage During Construction *32*

5.4 ROADS, STREETS AND PARKING *33*

5.5 STRUCTURES *33*
5.5.1 Honeywell Office Building Demolition *34*
5.5.2 Existing Structural Foundations *34*
5.5.3 Stages of Foundation Demolition and Effect on Use of Transfer Pad *34*
5.5.4 Pile Driving Adjacent to Existing Groundwater Storage Tanks and Equipment *35*
5.5.5 New Loading Dock *35*

6.0 DESIGN MEASURES TO PROTECT THE ENVIRONMENTAL REMEDIATION SYSTEM *37*

6.1 HYDRAULIC BARRIER *37*

6.2 MULTIMEDIA CAP (AREA 1) 37
6.2.1 Excavation of Impacted Soil 39
6.2.2 Foundation Penetrations and Repair 39

6.3 HEAD MAINTENANCE SYSTEM 40
6.3.1 Transfer Station Design 40
6.3.2 HMS Design Changes 41
6.3.3 Transfer Station and HMS Operations During Construction 43

6.4 OUTBOARD EMBANKMENT AND WATERSIDE PERIMETER 44

7.0 PROJECT-SPECIFIC ENGINEERING, CONSTRUCTION AND ENVIRONMENTAL CONTROLS AND MONITORING 46

7.1 CONSTRUCTION QUALITY ASSURANCE/ QUALITY CONTROL 46

7.2 CONSTRUCTION AND ENVIRONMENTAL CONTROLS 49
7.2.1 Air Monitoring and Dust Control 49
7.2.2 Erosion and Sediment Control and Storm Water Management 50
7.2.3 Storm Water Pollution Prevention 51
7.2.4 Spill Prevention and Response Plan 52
7.2.5 Optical Survey 53
7.2.6 Vibration Monitoring 54
7.2.7 Settlement Monitoring 54
7.2.8 Head Maintenance Pumping Quantity Monitoring 55
7.2.9 Material Handling & Management Plan 55

7.3 PROGRESS SUBMISSIONS AND REPORTING 58
7.3.1 Documentation 58
7.3.2 Modifications to the DDP or Consent Decree Work Plans 59
7.3.3 Construction Completion Report 60

8.0 PROJECT-SPECIFIC HEALTH AND SAFETY 61

9.0 REMEDY PERFORMANCE MONITORING DURING AND AFTER CONSTRUCTION 62

LIST OF APPENDICES

A Table A

B Project Control Documents

C Drawing Index

1.0 INTRODUCTION

Harbor Point Development LLC (HPD) and its consultants have prepared this Detailed Development Plan (DDP) for Phase 1 of development on Area 1 of the former AlliedSignal Baltimore Works Site (or "Site"), located in Baltimore, Maryland. This Phase of the development project consists of the Exelon Tower and Trading Floor Garage, the Central Plaza Garage, modifications to the existing Transfer Station, general site development (streets, sidewalks, etc.) and utilities, foundations, roadways, and other related site development elements and remedy restorations for development.

The Site is located on a peninsula on the northeast shore of the Patapsco River of the Inner Harbor in the Fells Point section of Baltimore City. The Site consists of three Areas. Area 1 is the principal site of Honeywell's (formerly AlliedSignal) Baltimore Works Facility which included chromium processing production and support buildings on an area that covered approximately 14 acres. Prior to acquisition by Honeywell, Areas 2 and 3 were used for various industrial and warehousing operations, including chromate ore storage (Area 2) and brass foundry casting, oil blending and storage, coating/plastics production, lumber storage and foundry (Area 3). Areas 2 and 3 currently include the Thames Street Wharf Office Building, and its associated parking lots, constructed in 2010 to the east. The Site is surrounded by water on the north, west and south and the Living Classrooms campus to the north.

The majority of planned construction will occur in the northeast region of Area 1, located west of Wills Street and south of Dock Street. The Living Classroom educational facility is located north of Dock Street. The development to the east of Area 1 is the Thames Street Wharf Office Building and parking lots owned by HPD. Drawing DDP-C1.00 is an existing conditions plan showing Area 1, Area 2 and Area 3, the existing Environmental Remediation System (ERS), and other pertinent Site features.

The principal contaminant of concern in Area 1 is hexavalent chromium (CrVI). An Environmental Remediation System (ERS) is maintained and operated by Honeywell International Inc. (Honeywell) to contain CrVI-impacted groundwater in Area 1 and control the potential for human exposure to affected soil. The ERS consists of a Multimedia cap (MMC), Hydraulic barrier, Head Maintenance System (HMS), a groundwater storage and transfer system, and Outboard Embankment. The HMS maintains an inward groundwater gradient to mitigate the migration of chromium-impacted groundwater from the Site.

The Site development must not interfere with the efficacy of the corrective measures or Honeywell's ability to comply with the performance standards defined in the Consent Decree between Honeywell, the U.S. Department of Justice, USEPA and the MDE, the Groundwater Gradient Monitoring Plan, the Surface Water Monitoring Plan, and the Environmental Media Monitoring Plan. This DDP describes the redevelopment improvements and the means and methods that will be implemented to meet the requirements established in the Consent Decree and its appendices, as amended, as well as the Owner/Developer covenants. Honeywell retains responsibility for operating the ERS and monitoring environmental media to demonstrate continued attainment of Consent Decree performance criteria.

Phase 1 Development on Area 1 is the first of multiple phases of construction/development planned for the property. The schedule for Phase 1 Development is aggressive, with the Certificate of Occupancy milestone of June 2015. The ground floor space consists of the residential lobby, retail spaces, plaza garage entry, service docks and the Honeywell transfer station and offices.

The planned foundations include driven, environmental concentric closed-end pipe piles filled with concrete and with concrete pile caps on top of them. The one-story Central Plaza Garage, Dock Street deck, and Point and Wills Street elevated deck structures will be supported on pipe piles constructed concentric with column locations so that pile caps are not required. After piles are driven, a new geomembrane will be sealed to the pile wall below the pile caps.

The planned site utility systems include storm water drainage, sanitary sewer, domestic water, natural gas, electric, and telecommunications. Storm water will be discharged to Baltimore Harbor, or will be allowed to infiltrate into the soils to the east of Area 1 to facilitate recharge of shallow sand strata. Utilities will generally follow the proposed roadway network, or be suspended from the ceiling of the parking garage connecting the proposed structures to the existing infrastructure in Block Street, Caroline Street and future Central Avenue Bridge.

2.0 PROJECT TEAM / ROLES

The individual stakeholders responsible for the preparation, review and approval of this DDP are identified below:

U.S. Environmental Protection Agency – Region III (EPA)
1650 Arch Street
Office of Remediation 3LC20
Philadelphia, PA 19103
Russell Fish, Project Coordinator
(215) 814-3226

Maryland Department of the Environment (MDE)
1800 Washington Boulevard
Baltimore, MD 21230
Ed Dexter (Hazardous Waste Program)
(410) 537-3376
Barbara Brown (Voluntary Cleanup Program)
(410) 537-3493

Honeywell (Land Owner/RCRA Corrective Action Permittee)
101 Columbia Road
Morristown, NJ 07960
Chris French (Project Coordinator)
(973) 216-7506

Harbor Point Development LLC (Owner/Developer)
1300 Thames Street, Suite 10
Baltimore, MD 21231
Jonathan Flesher (Senior Development Director)
(443) 463-3937

Consultants responsible for the Designs include:

Beatty Harvey Coco Architects, LLP (Architect)
650 South Exeter Street
Baltimore, MD 21202
Todd Harvey (Partner in Charge)
410-752-2759

Mueser Rutledge Consulting Engineers (Geotechnical Engineer and Foundation Designer)
225 W. 34th Street
New York, NY 10122
Peter Deming (Partner in Charge)
(917) 339-9300

Environmental Resources Management, Inc. (Environmental Engineer)
200 Harry S. Truman Parkway, Suite 400
Annapolis, MD 21401
Darren Quillen (Project Manager)
(410) 266-0006

Rummel, Klepper & Kahl (Civil Engineer)
81 Mosher Street
Baltimore, MD 21217
Chris Krupinski (Project Engineer)
(410) 462-9303

Vanderweil Engineers (Mechanical, Electrical, and Plumbing Engineer)
625 N. Washington Street
Alexandria, VA 22314
Sam Bohsali (Project Engineer)
(703) 683-9700

3.0 EXISTING ENVIRONMENTAL REMEDIATION SYSTEM (ERS)

The ERS consists of the following components (collectively referred to herein as "ERS Components"):

1. Multimedia cap (MMC) in Area 1;
2. Layered Soil Cap (LSC) – Area 2;
3. Soil Cap (SC) – Area 3;
4. Hydraulic Barrier;
5. Head Maintenance System (HMS);
6. Groundwater Storage (Tank Room);
7. Transfer Station; and
8. Outboard Embankment.

3.1 MULTIMEDIA CAP (AREA 1)

3.1.1 Cap Function and Features

The MMC is designed (i) to mitigate upward migration of contaminants and limit the potential for direct exposure to contaminated soils or groundwater and (ii) to reduce infiltration to the groundwater within Area 1. Multimedia Cap components are illustrated in Drawing DDP-F1.30 Detail 1 (see DDP Appendix A, Table A for analysis of cap features).

The MMC was constructed in 1998 using both a synthetic geomembrane liner (60 mil [0.06-inch thick] Linear Low Density Polyethylene [LLDPE]) and a geosynthetic clay liner (GCL). An underlying granular capillary break was installed to prevent upward migration of chromium. High-density polyethylene (HDPE) drainage net was placed above the geomembrane liner to collect and convey infiltration to the Harbor. The drainage net and membranes are protected by a thick non-woven geotextile cushion above and below. These synthetic layers are covered with 24 inches or more of granular cover soil cover and six inches of crushed stone (30 inches total cover) to protect against mechanical damage

and to reduce thermal changes at the synthetic layers. Some areas of the Area 1 multimedia cap are covered with asphalt pavement.

The geomembrane is crowned at the center of the Site and slopes down towards the perimeter. The drainage net conveys collected water to a collection pipe at the land perimeter and to the embankment at the waterfront perimeter of Area 1 outboard of the hydraulic barrier. The MMC grades were established to promote runoff by placing a controlled fill below the cap over the abandoned foundations and asphalt cover. The planned development places roof and independent storm water control structures over the crown of the geomembrane.

3.1.2 Ground Conditions Below Cap

Much of Area 1 Phase 1 development area that is underlain by compressible clay of Stratum O (Drawing DDP F1.11 for Stratum O locations) was pre-loaded to support the MMC and existing structures without pile foundations. Vertical drains and surcharge fill techniques were used to consolidate the compressible clay to allow construction of the cap and Transfer Station with minimal settlement. These ground improvement areas are illustrated in Drawing DDP F1.12.

3.1.3 Methane Gas Venting System

The organic clay of Stratum O may generate methane gas as decomposition of the organic components continues over time. A vent pipe was placed in the capillary break gravel, at the high point of the multimedia cap, to vent methane gas which may collect below the geomembrane.

3.1.4 Perimeter Drain (Toe Drain)

The perimeter toe drain is perforated polyvinyl chloride (PVC) pipe on the landward perimeter and HDPE drain tubing or stone infiltration without pipe at the waterfront perimeter. The pipes were placed in a stone-filled infiltration trench at the perimeter of the geomembrane outboard of the hydraulic barrier. The perimeter drain allows storm water infiltration within the cap drainage layer (i.e., above the geomembrane layer of the cap) to drain into the embankment outboard of the Perimeter hydraulic barrier.

3.2 AREA 2 SOIL CAP

The Layered Soil Cap (LSC) in Area 2 was designed and constructed to limit exposure pathways by preventing the generation of airborne particulates, dermal contact with underlying soil, ingestion of surface soils, and storm water erosion of soil. The cap components from bottom to top are a non-woven geotextile, capillary break layer, non-woven geotextile, a crushed stone sub-base, and an asphalt surface. The major elements of the cap are described further below:

Capillary Break Layer - A capillary break layer is the bottom layer of the LSC. The capillary break minimizes the potential for upward migration of chromium contaminated water potentially present in the capillary fringe above groundwater. Groundwater is located at a depth of greater than 5 feet below the LSC. The capillary break consists of a layer of coarse gravel, which limits capillary action. This layer has a minimum thickness of 6 inches. AASHTO No. 5 stone is used for the capillary break. To protect the capillary break from the intrusion of fine-grained soils, a non-woven geotextile filter was installed on the prepared sub-grade under the capillary break stone. An upper geotextile was installed prior to the placement of any dissimilar soil material on the capillary break surface.

Asphalt Surface - The LSC surface is comprised of an aggregate base overlain by bituminous asphalt. A 6-inch thick course of RC-6 aggregate base material was placed above the capillary break upper geotextile to form the support for the asphalt surface. The asphalt was placed over the RC-6 base. The asphalt was installed consistent with Baltimore City Specification Article 20.12. Bituminous asphalt constitutes a hydrophobic layer that further inhibits capillary rise.

Sediment and Erosion Control Structures - Storm water flows across the asphalt surface of the LSC and is directed toward the harbor. The asphalt and the stone revetment at the harbor edge are non-erosive and therefore no additional erosion control structures are necessary.

3.3 AREA 3 SOIL CAP

Area 3, also referred to as "Silver North" and "Silver South", is capped with two feet of clean fill that overlies a synthetic visual warning layer. Area 3 is divided by Block Street and is also currently asphalt paved and used as parking lots.

3.4 HYDRAULIC BARRIER

The Consent Decree requires Honeywell to maintain an inward gradient in the coarse sand and gravel of Stratum S-4 and in the shallow S-1, S-2, and S-3 sand strata along Wills Street. The inward gradient is intended to prevent the release of hexavalent chromium from Area 1 to the groundwater and surface water surrounding the site. The inward gradient is maintained by extraction of groundwater by the Head Maintenance System (HMS).

The hydraulic barrier was placed at the perimeter of Area 1 to isolate groundwater below Area 1 from Harbor surface water and the surrounding groundwater. The hydraulic barrier reduces the amount of groundwater that must be extracted by the HMS to maintain an inward hydraulic gradient.

The hydraulic barrier is a soil-bentonite backfilled slurry trench. It was constructed by excavating a 36-inch wide trench to the top of decomposed rock (between 60 and 85 feet below construction grade), and placing low permeability backfill in the trench as the permanent barrier. The backfill was prepared from the trench excavation spoils, bentonite slurry, and dry bentonite addition. Laboratory testing demonstrated low permeability of the backfill before placement. The designed top of the hydraulic barrier is at an Elevation +5 at the waterside perimeter, and is Elevation +7 and at Elevation +12 at the land perimeter (Wills Street).

Trench excavation, cleaning, and backfill placement for the hydraulic barrier were carefully controlled to exclude excavation debris and thickened slurry from the backfill profile. Backfill was placed at a slump of 4 to 5 inches. Because the backfill is confined within a narrow trench and is protected from evaporation, it is expected to have the same physical characteristics today as when it was placed.

HPD understands that during hydraulic barrier installation, the side wall of a portion of the slurry wall in Wills Street sloughed during installation. Additionally, the wall in the area of the Dock and Wills Street intersection settled under pre-load in the area of the Transfer Station. Any impact that this may have on the installation of the proposed sheet pile is discussed in Section 6.1.

At the embankment perimeter, the backfill contains a substantial amount of crushed stone from the embankment portion of the excavation spoils. As much as 50 percent of the backfill material, by dry weight, was allowed to be gravel size. However, the trench was first constructed on Wills Street (starting at the Block Street intersection) so that the Wills Street

portion of the barrier has lower gravel content than does the embankment at the waterside perimeter. The higher gravel content will reduce backfill compressibility, reducing settlement potential of the backfill.

3.5 HEAD MAINTENANCE SYSTEM

The HMS withdraws groundwater from within Area 1 to maintain a groundwater level within the hydraulic barrier that is lower than the water table outside of the hydraulic barrier (i.e., maintain an inward groundwater gradient). The HMS is comprised of (i) the Extraction System, (ii) the Monitoring and Control System, (iii) the Conveyance System, (iv) the Transfer Station and (v) the Transfer Station Truck Pad. The Groundwater Gradient Monitoring Plan (GGMP) documents the means and methods used by Honeywell to monitor compliance with the Groundwater Gradient Performance Standard and assess the performance of the HMS.

Paired piezometers measure the water levels inboard and outboard of the perimeter barrier and activate the adjacent extraction wells to maintain the inward gradient if the outboard water levels drop relative to inboard levels. The quantity of groundwater extracted is controlled by changes in the outboard water levels, which are influenced by the tidal, seasonal and wind-blown tide effects. The extracted groundwater is conveyed to the storage tanks located at the Transfer Station for periodic loading into tanker trucks for off-site treatment and disposal at a licensed hazardous waste treatment facility, currently the Environmental Quality (EQ) Company of Baltimore, Maryland.

3.5.1 Extraction System

The groundwater extraction system consists of 12 deep and 4 shallow extraction wells installed at approximately equal spacing around the perimeter of Area 1. The extraction wells are housed inside concrete vaults and contain pneumatic pumps and water level measurement devices. Single and double well vaults exist at the Site below the MMC synthetic layers. The inside dimensions for the double extraction well vaults vary from 11 feet long by 7 feet wide by 7 feet high to 14 feet long by 7 feet wide by 9 feet high. The single well vaults have dimensions of 8 feet long by 8 feet wide by 7 feet high.

The extraction wells include 12 deep wells designated DW1 through DW12. The remaining 4 extraction wells are shallow wells designated as SWl through SW4. The shallow wells are located on the land perimeter

(Wills Street) of Area 1. The well and piezometer locations are shown in Drawing DDP- EN1.01. Soil profiles are shown in Drawing DDP-F1.11.

The deep wells are screened in the Cretaceous Sand (designated as Stratum S-4 in the project documents) at a depth of approximately 50 to 80 feet below ground surface (bgs). The shallow wells are screened in the Pleistocene Sands (designated as Strata S-2 and S-3 in the project documents) at a depth of approximately 20 to 40 feet bgs.

All extraction wells consist of 6-inch diameter well screens and casing. Each well includes a filter piezometer that is intended to allow for a method to assess the condition and maintain the filter pack of the well.

Each extraction well contains a water level transducer and a pneumatic pump. The transducers are used to monitor the level of water in the well to prevent damage to the pump during operation. Compressed air is supplied to the pneumatic pumps through l-inch inside diameter pipe. The air supply is provided by a compressor located in the Transfer Station loading dock.

Electric sump pumps are located in each extraction well vault. The sumps extend below the bottom of the vault to extract shallow groundwater from immediately below the vault. Rainwater that may enter the vault access hatches is also managed by these sump pumps. The pumps are actuated by a water level indicator in the sump. The sumps primarily maintain the vault in a dewatered condition and provide contingency control of shallow water level in the fill beneath the vaults. In addition, the HMS conduit sub-grade fill drains to the sumps so that the perimeter HMS pipe trenches to function as collectors as a contingency for shallow groundwater control at the perimeter of the Site.

3.5.2 Monitoring and Control System

The HMS monitoring and control system provides a means to remotely check and execute HMS system controls. The system includes remote intelligent controllers (RIC) or nodes in the vaults for input/output connections. The system is monitored with the Master Supervisory Station (MSS) located in the Transfer Station.

The system includes twin paired piezometers (one inside and one outside of the hydraulic barrier) for measurement of water levels across the hydraulic barrier. The piezometers are located approximately 10 feet away from the hydraulic barrier. The piezometer pairs are located at midpoints between extraction wells and are screened in the same stratum

pumped by the extraction wells. The pairs are numbered 1 through 12 and 1S through 4S (shallow), similar to the extraction well numbering.

When the gradient measured at any piezometer pair is above the minimum inward gradient criteria and an additional factor of safety, the RIC in the vault activates the pumps on either side of that piezometer pair, until the measured gradient meets the established criteria. The RIC controller sends signals to solenoid valves that control the pumps.

This MSS enables Honeywell to record and view the hydraulic gradient and pumping activity at each extraction well real-time. The MSS can activate alarms related to maintenance and operational needs.

3.5.3 Conveyance System

Head maintenance system piping connecting the pumping vaults was placed below the MMC synthetic layers. Oversized 8-inch conduits were installed between the vaults to house the groundwater conveyance pipes. The 8-inch conduits and pipes are below the MMC geomembrane. The groundwater conveyance pipes are comprised of three 1 ½-inch diameter HDPE continuous pipes, placed within the 8-inch diameter HDPE pipe which provides secondary containment. Three additional conduits, two 4" and one 3" are provided to allow a 480V electrical supply loop, a 1" compressed air supply loop and several low voltage lines allowing communication between the RICs and the MSS and security systems wiring.

The conduit and pressurized force main design allows some differential settlement of the HMS force main pipes. Redundant conduit capacity allows replacement of the air and electrical lines between the vaults, if required.

3.5.4 Transfer Station

The Transfer Station handles storage of extracted groundwater with two 10,000-gallon storage tanks, and includes the air compressor, filters, a desiccant dryer, air storage tank which supply the pneumatic extraction pumps. The two groundwater storage tanks are used to provide excess storage capacity and to facilitate maintenance. The storage tanks are located in a concrete secondary containment basin to contain spills. The inside dimensions of the containment basin are 28 feet by 30 feet by 3 feet high. The volume within the containment area is 12,000 gallons, having the ability to safely contain the entire contents of one-10,000 gallon storage tank.

The conveyance system consists of a duplicate system of header pipes around the perimeter for contingency and maintenance purposes. Water from the two header pipes can be separated into different tanks. Separation by water quality is possible with the existing vault pipe valve system. This option is used if site conditions arise that may require separation of water flows based on chromium concentration, pH, or other water quality criteria.

Water levels in the storage tanks are remotely monitored. The monitoring and control system generate an alarm at high water levels in the storage tanks and stop pumping if the maximum water level is reached in the active storage tank.

A clean water supply is used to periodically flush the conveyance pipes and remove any precipitation buildup. Water is pumped into the pipes from the Transfer Station. The water supply has adequate pressure for flow around the perimeter and back to the storage tank location. Process water from pipe flushing is discharged to a storage tank. The piping system is constructed to allow flushing of alternate conveyance pipes while the other is in use to convey extracted groundwater.

3.5.5 Transfer Station Truck Pad

Extracted groundwater stored at the Transfer Station is transferred into tanker trucks for off-site treatment and disposal. Tanker-truck loading activities occur in an outdoor containment area (i.e., Truck Pad) adjacent to the Transfer Station. Within the containment area, concrete curbing and steel bollards protect aboveground process piping and tank fittings.

For loading trucks, a hose from the vacuum tank truck is attached to a port at the unloading station and groundwater is pulled from the storage tanks to the tank truck. During transfer operations, containers are placed beneath pipe and valve joints to collect small volume spillage. Authorized and trained Honeywell personnel supervise the truck filling and emptying of the storage tanks. A warning sign is posted in the area to prevent vehicular departure before complete disconnection of the transfer lines.

The Truck Pad is furnished with a trench drain and sump for spill containment and conveyance purposes outside of the building. In the event of a spill, flow is collected via the trench drain to a sump pit. From there, a sump pump directs the water to either one of the 10,000 gallon storage tanks within the Transfer Station.

The frequency with which groundwater is transported from the facility is based on the groundwater extraction rate, which is somewhat dependent on the seasonal tidal elevations. Shipments for off-site treatment occur when a tanker truck volume of water is accumulated and before the regulatory 90-day storage limit is exceeded.

3.6 OUTBOARD EMBANKMENT AND WATERSIDE PERIMETER

The north, west, and south perimeters of the Site were defined by bulkhead structures along the Patapsco River and the Inner Harbor. These structures were part of the original construction, dating from 1890's to 1950's.

The north and west bulkheads were comprised of timber piles at low water supporting granite block gravity headwalls, with timber pile dead-men and timber ties for lateral restraint. These bulkhead structures were left in place below the MMC. To protect against failure of these original perimeter structures during or after installation of the ERS described above, a section of fill was placed to the water side of those structures.

Soft compressible Stratum O clay was dredged for embankment fill placement. The embankment fill was placed in organized lifts. "Wall Zone" fill placed against the bulkhead was sand and gravel sized crushed stone blend designed to enable construction of the hydraulic barrier Larger sized "Core Stone" was placed outboard to construct the bulk of the embankment volume.

Rip rap was placed for erosion control above Elevation -10 feet mean sea level (msl), in the wave zone. The embankment fill included a coarse filter stone gradation to separate fine gravel sized Wall Zone fill from coarse core stone in the tidal region. The embankment is generally west of the planned Exelon development area. The planned Central Avenue Bridge crosses over the embankment just west of the Living Classrooms' Center Pier structure.

The former Back Basin is north of the planned Exelon Tower and Garage development. The Back Basin contains a thick deposit of Stratum O clay below low tide. These soft compressible deposits were isolated from the Harbor by a steel sheet pile retaining wall, visible today, aligned with the west end of the Center Pier retaining wall. The compressible deposits were stabilized with vertical wick drains and pre-loading.

Compressible Stratum O deposits below the existing Transfer Station and adjacent areas were stabilized with vertical wick drains and pre-loading prior to MMC construction. The timber 1890's Dock Street bulkhead was abandoned in place below the interim cap. HMS Vaults V11, V12, and MJ1 were supported on the 1890's era timbers, and the HMS conveyance pipes were placed above these structures.

3.7 MONITORING OF REMEDIAL COMPONENTS AND ENVIRONMENTAL MEDIA

The integrity of the remedial components is demonstrated through routine monitoring of remedial components and testing of environmental media, i.e., air, surface water, groundwater and sediment, and drainage layer effluent samples. The monitoring program is designed to demonstrate that the performance goals of the MMC, the HMS, and the Hydraulic Barrier are maintained. The performance goals are summarized below.

1. The MMC serves two major purposes: (1) to prevent upward migration of contaminants and limit the potential for direct exposure to contaminated soils or groundwater; and (2) to reduce infiltration to the groundwater table.

2. The HMS monitoring program maintains an inward hydraulic gradient as determined by monthly average head gradients based on hourly water level measurements at each piezometer pair around the site perimeter. Automated monitoring and control by the HMS enables these criteria to be met with minimal groundwater extraction. Data collection and control signals are coordinated as part of the control logic to alert the site personnel if malfunctions occur in the system.

3. The Hydraulic Barrier was placed at the perimeter of Area 1 to isolate site groundwater from the Harbor surface water and surrounding groundwater. The hydraulic barrier effectively reduces the amount of groundwater that must be extracted by the HMS to maintain an inward hydraulic gradient. Hydraulic barrier performance is monitored by observation of the quantity of groundwater extracted to maintain the inward gradient.

3.7.1 Environmental Media Monitoring Plan

The Environmental Media Monitoring Plan (EMMP) defines the monitoring program for air, surface water, groundwater and sediment.

The current monitoring program consists of the following:

- Air sampling for total chromium, hexavalent chromium, total dust and asbestos whenever the synthetic layers of the MMC are penetrated.

- Surface water is sampled quarterly at the top, middle (where depths are sufficient) and bottom of the water column at 18 locations around the perimeter of the site and two background locations. The Consent Decree, Section V, Part 12, establishes the Surface Water Performance Standard: "The surface water performance standard […] for total chromium shall be 50 parts per billion (ppb), calculated for each sample location by arithmetically averaging the samples taken at all depths over 4 consecutive days." In October of 2002 the sample frequency was amended to be 1 day of sampling at each sampling location per quarter. In addition, the EMMP states that Honeywell will review analytical data for results greater than 11 ppb of dissolved hexavalent chromium.

- Groundwater is sampled semi-annually and analyzed for chromium and, in specific locations, for cyanide.

- Sediment continued to be sampled every three years after the completion of remedial construction until the requirements for this monitoring period were met. The results of the sampling rounds are compared to data reported from prior sampling events.

3.7.2 Surface Soil Monitoring Plan

The Surface Soil Monitoring Plan (SSMP) documents the methodology used to monitor the MMC performance, and its ability to prevent the upward migration of contaminants. Monitoring areas include the MMC, drainage layer sampling points, drainage layer, settlement points, surface covers, and cap penetrations.

The SSMP does not address the post-development cap foundations and pile penetrations, but allows the Plan to be revised to address development (see drawing DDP-F1.60 for development cap locations).

The SSMP inspections of the cap at penetrations focus on soil discoloration, seepage, erosion, and settlement. Soil discoloration is a sign of upward migration of contaminants (chromium would impart a yellow color and crystallize at the moisture drying front). Seepage, erosion, and settlement all indicate a migration of soil particles by piping mechanism.

MMC Cap Components: Restoration of GCL. The SSMP describes the base functions of each component of the Area 1 MMC. The geomembrane and GCL are defined as an infiltration barrier: "The two components of this composite barrier layer are considered to function as one system in minimizing infiltration into the underlying contaminated soil" (P. 8, Part 2.1.2).

Settlement Monitoring. Settlement is monitored by repeat elevation survey of defined points (settlement monitoring plates). The Plan requires corrective action if settlement monitoring determines that the slope of the geomembrane/drainage layer is less than 1% outward from the center of the site.

Drainage Layer Sampling. Water from within the drainage layer is observed and sampled at four locations around the perimeter. Each location is examined for flow and examined for the presence of sediment. The water samples are tested for chromium and cyanide.

3.7.3 Groundwater Gradient Monitoring Plan

The Groundwater Gradient Monitoring Plan (GGMP) prepared by Black & Veatch Waste Science, Inc. August 1993, Revised June, 1995, and Addendum 1, August 10, 2001 describes the methods used to monitor compliance with the Groundwater Gradient Performance Standard and assess the performance of the deep vertical hydraulic barrier and head maintenance system (HMS). The principal components of the GGMP are described below.

Groundwater Monitoring Piezometers. Shallow and deep piezometers are used to monitor water levels inboard and outboard of the hydraulic barrier. Piezometers ISP1, OSP1, ISP2, OSP2, IP1, OP1, IP2, OP2, IP11, OP11, IP12, and OP12 are within the planned development area.

Groundwater level monitoring is performed by acoustic electronic sensor reading of the level water in the piezometers. Manual readings are periodically taken to confirm the electronic sensor readings and for purposes of calibration. The elevations of the piezometer casings are periodically confirmed by survey.

The Groundwater Gradient Performance Standard requires that for each pair of piezometers for a thirty day period, the average hydraulic head measured at the inside of the barrier shall be lower than the average hydraulic head measured outside of the barrier, and the absolute value of the average hydraulic head differential shall be greater than a value which represents the sum of 0.01 feet plus two times the maximum potential error of measurement of the hydraulic head in any one piezometer. The present performance calculation has been progressively refined over time and the current performance standard for the installed ultrasonic water level devices equals [0.01 foot + (2 × 0.031 measurement error)] = 0.072 foot.

4.0 DEVELOPMENT PLAN AND SCHEDULE

4.1 SCOPE OF PROJECT

The project on the Baltimore Works Site includes the Exelon Tower, the Plaza Parking Garage, modifications to the existing Transfer Station, general site development (plaza, streets, sidewalks, etc.), a new bridge connecting Central Avenue to the Site and related utilities, foundations, and other ancillary elements supporting the development as further described below.

4.1.1 Exelon Tower and Trading Floor Garage

The planned Exelon Tower is a 23-story structure with a footprint of approximately 70,249 square feet (sf) and top of the building projected at 364 feet above mean sea level (msl). Its footprint will comprise a full block on the northern edge of the Site (Drawings C.400 and A1.00.01). The ground floor of the building will be at Elevation +13 to +17 msl and includes the residential lobby, retail spaces, plaza garage entry, service docks and the Honeywell transfer station and offices. The second level will be at Elevation +28 with an office lobby and retail spaces opening onto the new Plaza on the south side and at Elevation +30 msl with mechanical and support spaces on the north side. Floors 3 to 7 will contain an enclosed parking garage with adjacent residential apartments on the west and south sides on each of these levels, and floors 8 to 23 will be commercial office space.

4.1.2 Plaza Parking Garage

Directly adjacent to the south of the Exelon building will be a new single level parking garage of approximately 71,000 sf with a structural deck supporting the new landscaped plaza, roads and sidewalks (Drawing DDP -A1.00.02). The garage will be at Elevation +13.75 msl on the northern edge sloping up to Elevation +14.75 msl on the southern end.

4.1.3 Transfer Station Revisions

The existing tank room and maintenance room of the Transfer Station will be retained, modified as required, and incorporated into the design of the new Exelon Trading floor garage structure. The support sections (i.e., office, conference rooms, etc.) of the existing building will be demolished during construction and new spaces will be reconstructed within the first floor level of the new structure (Drawing DDP- A1.31.00). A dedicated indoor loading dock for the Transfer Station will be constructed in the

lower level of the building on Dock Street. New, double walled piping will be installed connecting the new loading dock to the existing storage tanks.

4.1.4 Roadways & Plaza

This first phase will include the design and construction of new roadways, sidewalks, site utilities and related amenities (landscaping, signage, street furniture) along with the new pile supported elevated Central Plaza (see Drawing DDP-C4.00). Utilities from Central Avenue Bridge and Caroline Street access the site from the Dock Street and Wills Street. Dock Street and Wills Street grades are constructed of earth fill to provide for utility burial.

The MMC and Hydraulic Barrier remedial components underlie the south half of future Dock Street. Because compressible materials underlie Dock Street, a pile supported platform will be constructed to support the MMC, HMS, and earthwork fill. A retaining wall and platform structure will be constructed at the north side of Dock Street to retain fill and allow raised grades at the Point Street intersection with Dock Street. Point Street sloping up from the new Central Avenue Bridge to the new Central Plaza will be a structural deck above the Central Plaza Garage. Wills Street south of Dock Street will transition from earthwork fill to a structural deck above the Central Plaza Garage. Trees in the Dock Street and Wills Street fill will be planted in concrete planters to restrict root migration to the underlying MMC.

Shallow cutoff sheeting will be placed at the north edge of the Dock Street pile supported platform. The sheets will be connected to the platform for vertical and lateral restraint. The cutoff sheeting will retain soil surrounding the soil-bentonite barrier and provide embankment stability during utility excavations and pile driving for the new Central Avenue Bridge.

4.1.5 Central Avenue Bridge

A new vehicular bridge will be constructed connecting Harbor Point with Central Avenue to the north. The bridge will be completed under a Baltimore City Department of Transportation (BCDOT) Design/Build contract. The proposed bridge will land on Harbor Point at a bridge abutment off Site with a roadway connection to the Site at the intersection of the new Dock Street and Point Street. The bridge will also include the extension of the Promenade connecting the existing Promenade on Lancaster Street to the planned Promenade on the Site, which will be designed and constructed in a future phase. A temporary promenade

connection will be constructed as required by Baltimore City around the west end of the Site. Although the limits of the bridge are off Site, the Design/Build RFP will include historical and regulatory documentation for the bridge contractor to understand controls and standards applicable to working within the vicinity of the ERS.

4.2 SCHEDULE

The targeted date for occupancy of the Exelon trading floor is June 1, 2015. Project milestones through this date are listed below:

- Pile Load Test – May, 2013 ("Off-Cap" and completed);
- Detailed Design Plan (i.e., the DDP) – Submit to Agencies o/a August 9, 2013;
- Engineering Evaluation – Submit to Agencies o/a August 9, 2013;
- Agency Approval of the DDP – o/a September 30, 2013;
- Relocation of temporary Transfer Station – October 2013;
- Commence foundation construction – October, 2013;
- Commence Garage/Tower superstructure – March, 2014;
- Commence Roads, Utilities, Site Garage – May, 2014;
- Commence Tenant Interior Construction – November, 2014;
- Construction of new Transfer Station Office – December, 2014
- Exelon Trading Floor occupancy – June 1, 2015;
- Completion of roads, Central Plaza Garage, Central Ave. Bridge – September, 2015.

5.0 DEVELOPMENT IMPLEMENTATION ACTIVITIES

5.1 EARTHWORK

5.1.1 Excavations

The synthetic layers that comprise the MMC will be opened within the pile cap excavation zone. The MMC synthetic layers will not be disturbed between the new pile caps. The new pile caps and slab will have a new geomembrane sealed at each pile pipe penetration. The exposed MMC geomembrane will be protected while piles are installed. A new geomembrane will be placed after the piles are installed. The existing cover soil will remain in place to protect the MMC synthetic layers.

Tower cranes will be supported on piles. The MMC restoration below the crane pad will be similar to a pile cap with a new membrane beneath it (see Section 5.2.2). The piles will be driven during construction of the foundation within or adjacent to the building footprint. The piles will be left in place after the tower crane is dismantled (see Drawing F1.15 for crane pad location).

Excavation of the MMC cover soil will be required in all areas where foundations are constructed. Excavation will be performed with machine and labor methods to protect the synthetic layers.

Below the planned Exelon Trading Floor Garage, the MMC will be removed at individual pile cap locations. Below the Exelon Tower the cap will be excavated over a larger area where the future shear wall foundations will be constructed below the tower. Excavation will include demolition and removal of abandoned historic foundation and concrete floors that were left in place below the MMC. See Drawing DDP - F1.13 for obstruction locations and obstruction management requirements. Excavations will extend where necessary for obstruction demo or removal to drive piles and place pile caps below the MMC.

Suitable excavated materials may be used for backfill to fill voids left from obstruction removal below the repaired/restored MMC. Excavated clean cover soil from above the existing MMC will be temporarily stockpiled and covered daily in a controlled area for subsequent testing and beneficial re-use as "clean" fill above the MMC. Excavated materials from below the MMC will be direct loaded into lined, sealed containers for off-site disposal at an approved RCRA facility per the Material Management and Handling Plan (Appendix B). Workers engaged in these activities will follow the project-specific health and safety plan.

The excavations will be performed with a sequence and process designed to minimize storm water runoff and accumulation in excavations, to protect against dust generation, and to control exposure of Cr(VI) impacted soil from below the MMC to workers and clean materials above the MMC. The excavated surfaces will be covered with suitable excavated cover soil to reduce the potential for human contact and dust generation from impacted soil. The excavation slope will be covered with a geotextile for stability and protection.

Piles will be driven through the clean cover soil work surface. The clean soil will be left in place below the new development cap synthetic layers, capillary break layer and structural slab. See detailed pile cap construction sequence on Drawings DDP-F1.30. Other dust controls, such as wetting, will be used to manage and mitigate dust as appropriate.

5.1.2 Dewatering (Groundwater and Surface Water)

EE Memorandum No. 2 provides an analysis of storm water management under existing conditions, during construction, and post development. Surface water runoff will be diverted away from the excavations using diversion berms during construction (Drawings DDP-F1.30 and F1.31). Direct rainfall on disturbed construction sites will be contained from adjacent areas using containment berms. Suitable excavated cover soil may be used for berm construction per the Material Management and Handling Plan (Appendix B).

Storm water infiltration into the cap is collected in the synthetic drainage net above the geomembrane. The drainage net layer will be dammed on all faces along excavation perimeters (temporary and permanent details on Drawing DDP-F1.30). After the MMC geomembrane is removed, storm water collected in excavations will be managed to control water that contacts soil beneath the membrane from rising above the membrane. Storm water in the excavation will be collected, stored, and tested to determine disposal criteria pursuant to EE Memorandum 2.

Calculations for storm water collection for several open excavation scenarios required for the pile foundations as a result of a 25-year storm and 100 year flood are provided in the EE Memorandum No. 2. Water collected during construction storm events will be stored in tanks for testing to determine if it meets discharge criteria or must be managed as a waste requiring off-site transport and disposal. Separate tanks will be used for storm water collected above temporary membranes and storm water collected below the MMC synthetic layers. A general construction discharge permit will be obtained from MDE to establish discharge requirements for applicable constituents.

A storm drain outfall to the Baltimore Harbor will be constructed just east of the future Central Avenue Bridge landing at the elevation of low tide. The storm drain pipe is intended to carry storm water from the Central Plaza elevated deck and Trading Floor Garage roof. The storm drain will cross the hydraulic barrier at the intersection of Wills Street and Dock Street, and will continue to the west, outboard of the hydraulic barrier, in the Dock Street right of way. Compressible clay below the future Dock Street cannot support the planned fill and storm drain utility. A low level structural platform will be constructed east of the Point Street intersection to support fill and utilities. The low platform construction area will be within a sheet pile enclosure. Pumping will be required for platform and pipe construction. The perimeter sheeting will close with the underlying clay to provide ground water cutoff from the shallow Harbor water, but will not penetrate Stratum M. HMS outboard piezometer OP-11 is within the planned dewatering sheeting. This piezometer is isolated in Stratum S-4 below Stratum M. Dewatering for outfall construction may reflect in the piezometer, and trigger HMS pumping in this area. However, the pumping is short-term construction need and not a permanent condition.

5.1.3 Obstruction Removal

Concrete floor slabs, footings, and asphalt are expected below the existing MMC at many new foundation locations. These obstructions will be removed at pile locations, and where they interfere with pile cap geometry. Otherwise, abandoned foundations will be left in place below the future structures. Pit excavations will be used to determine the presence of obstructions to pile driving at the time of excavation. MDE-approved erosion and sediment control procedures will be followed to provide containment of open excavations.

At the planned Exelon Tower and Garage foundations, piles may be moved a few feet to avoid obstructions, but the pile cap may require enlargement to accommodate the wider spacing and provide column support without eccentric loading. At every pile cap location the MMC will be removed to allow obstruction demolition. See note on Drawing DDP F1.13. At the Plaza Garage, obstructions will be demolished or removed to provide for pile placement at the garage structure plan location.

Anticipated deep obstructions are indicated on Drawing DDP F1.13. Soil removal will be performed to manage displacement of the MMC surrounding each planned Plaza Garage pile as a consequence of pile penetration. The soil will be managed as described in the Material Management and Handling Plan in Appendix B.

Shallow obstructions will be broken up and left in place or removed to an approved off-site disposal facility at the time of excavation. Abandoned groundwater wells exposed during the excavation that present an open annulus (i.e., wells not previously abandoned in place) will be properly abandoned in-place or removed, as required, following Maryland's regulations. Dynamic hoe-ram or spud driving will be used to demolish obstructions encountered during pile driving. Excavation and removal will be used where necessary and will be performed with a sequence and process organized to protect against dust generation and cross-contamination of the cover soil as shown in Drawings DDP EN1.01.

5.1.4 Fill Placement / Raised Grades

The building structures and ground floor slabs of both the planned Exelon Tower and the Trading Floor Garage will be pile supported so that future settlement is mitigated. Estimated settlement due to raised grades is provided in the EE Memorandum No. 1.

Fill may be placed to raise grades in a few areas, including Wills Street and Dock Street. Fill materials may be recycled cover soil or imported clean soil or special aggregate. Imported fill materials placed above the synthetic layers must be deemed suitable and acceptable by the Field Engineer prior to placement. HMS components (vaults and piezometers) affected by the new grades will be modified or replaced to ensure access (Drawings DDP EN1.05, EN1.06 and EN1.06.01. Documentation requirements of imported soil are described in the Material Management and Handling Plan provided in Appendix B.

The historic waterfront perimeter of the former Baltimore Works site was constructed in the late 1800's by placing fill over compressible sediment to make land. Compressible soils and timber bulkhead structures are present at the site perimeter, outboard of the historic shoreline. The location of compressible soils is illustrated on Drawing DDP F1.12.

In the vicinity of the existing Transfer Station and Dock Street, surcharge fill was used to pre-load the compressible deposits and the bulkhead structure to reduce settlement of the HMS system, MMC and Transfer Station. The extent and magnitude of preloading are provided on Drawing DDP F1.12. The HMS and MMC were placed after the pre-loading. The pre-loading allows for fill placement for development with minimal risk of differential settlement if the development fill load is below the pre-load (EE Memorandum No. 1).

Arching of soil overburden to the timber bulkhead frame may have prevented consolidation of Stratum O clay present below the bulkhead as discussed in the EE Memorandum No. 1. Degradation of the timber frame with time would result in compression of the clay and settlement of the HMS, MMC, utilities and street. A pile-supported concrete slab is proposed above the abandoned Dock Street Bulkhead to support the HMS and MMC and development infrastructure (Drawing DDP F1.40; EE Memorandum No. 9). The pile-supported concrete slab will be constructed above the existing MMC synthetic layers, which will be abandoned in place. The HMS and a new MMC will be supported on the new structure. This design prevents sheet flow runoff from the drainage layer along the Dock Street perimeter as discussed in EE Memorandum No. 3. A new "valley drain" will be constructed up slope of the new Dock Street platform to replace/augment the existing "toe drain" which discharges infiltration to the embankment at sampling point SSMP-4. A new SSMP-4A will be established west of HMS Vault 11 to allow sampling of water collected in the valley drain (see Drawing DDP EN1.01 and Section 6.3.2, below).

Existing settlement monitoring point MP-1 at the intersection of Dock Street and Point Street will be abandoned, as the HMS and MMC structures will be supported on the new Dock Street platform in this area. A new settlement monitoring point MP-1A will be added below the Wills Street fill.

Observations for settlement of remedy features will be performed during construction. Up to two-to-four inches of settlement will be allowed, as long as the geomembrane or HMS conveyance piping is not compromised and positive slope is maintained for drainage within the synthetic drainage layer above the geomembrane (see EE Memorandum No. 3 for analysis). Where differential settlement occurs the synthetic layers will be exposed for inspection or repair, or addition of new synthetic layers in localized areas as appropriate (see Section 7.2.5 for settlement monitoring).

5.1.5 Cap Settlement Estimates and Importance to Cap Function

Fill placed in street areas of the proposed development reaches Elevation +18 msl (9 ft. of fill) at the intersection of Dock Street and Point Street and to Elevation +15 msl (4 ft. of fill) at the intersection of Dock Street and Wills Street. Utilities will connect to existing systems at Caroline and Dock Street, and new services will be provided at Dock Street and Point Street from the new Central Avenue Bridge. Significant portions of the Site are underlain by compressible clay deposits. In some areas of Dock Street and Wills Street, the compressible deposits were improved by pre-

loading before MMC construction. The pre-load areas and grades are outlined on Drawing DDP-F1.12. The HMS and MMC at Dock Street were placed over an abandoned 1890's era low water timber bulkhead structure. The SSMP requires settlement monitoring in this area. Where the raised grades are below the maximum pre-load elevation, the settlement will be negligible. Where the raised grades are higher than the pre-load or where there was no pre-load constructed, settlement under the planned grades will be unacceptable. If the abandoned timber bulkhead were to degrade with continued aging, settlement is estimated to range from 1 ft. to 2.5 ft. (EE Memorandum No. 1).

The development will use structural decks or will support fill on pile supported platforms where the pre-loading was not performed and where pre-load grades were lower than the proposed new grades:

1. See drawing DDP-F1.43 for location and DDP-F1.52 for Sections and Details of retaining wall and protective slab.

2. A pile-supported concrete slab will be constructed above the abandoned Dock Street Bulkhead from Vault 11 to MJ1 (Drawing DDP F1.40). The Dock Street structure will support fill at the Dock Street and Point Street intersection and will be the foundation for retaining walls at the edge of the fill. HMS vaults V11 and V12, and junction manhole MJ1 will be supported on this structure. HMS conveyance lines from vault V11 to MJ1 will also be supported on this structure. Synthetic layers of the MMC will be placed on top of the slab, and cover soil will provide the development street grades. This improvement reduces the risk of settlement to the HMS and MMC remedy components. Settlement monitoring point MP1 will be abandoned (Dock and Point St), and a new settlement monitoring point will be established over the HMS conveyance lines below the Wills Street fill. The new structure will be constructed above the existing membrane, and will obstruct MMC drainage net discharge to the toe drain. A collection pipe will be placed upslope of the new Dock Street structure to convey drainage net water to the perimeter toe drain or the embankment. A new sampling point for toe drain discharge will be constructed west of vault V11 (SSMP4A). See Drawing EN-1.01.

3. Lightweight Fill to Reduce Settlement

   Lightweight expanded shale aggregate or geofoam polystyrene block materials may be used to raise grades and reduce the weight of fill. Lightweight materials will be used above the elevated deck of the Plaza Garage, but are not contemplated in the present design for foundations and fill placement on the MMC.

5.2 FOUNDATIONS

Foundation selection was dependent on the subsurface conditions. Geologic sections are provided in Drawing DDP F1.11 and boring locations on Drawing F1.10.

Cap penetrations are needed for piles and pile caps. The developed cap below buildings and pile caps will be constructed in accordance with the feature requirements found in Table A of Appendix A.

5.2.1 Pile Selection

Piles will be closed-end pipe piles filled with concrete and capped with epoxy filler or steel plates, similar to the environmental piles utilized for the Thames Street Wharf structure on adjacent Area 2. Piles will be driven in clusters below columns, and large groups of piles will be placed below shear walls. Pipe piles are also proposed for the one-story Plaza Garage a single pile will be located at each column (concentric pile) to alleviate the need for pile caps, to reduce excavation below the geomembrane. A pile load test was performed to determine the most technically suitable and cost efficient pile. The pile driving and static load test program was performed to determine the performance of two pipe pile options (diameters, 16 inches and 18 inches with 0.5 inch wall). Dynamic PDA tests and static load tests demonstrated the 16 inch pipe pile can support allowable loads up to 250 tons and the 18 inch pipe pile can support allowable loads up to 287 tons.

Pipe piles will bear in Stratum M clay or the underlying Stratum S-4 sand and gravel. Penetration of Stratum M clay is not of environmental significance in Area 1, which is enclosed by the hydraulic barrier and is managed by pumping to maintain an inward gradient. However, the closed-end environmental pipe pile will allow the clay to seal the penetration due to high smooth wall and earth pressure resulting from soil displacement during pile driving.

Pipe piles will be filled with concrete for structural purposes. The concrete fill also prevents vertical conductance of water, which may penetrate the casing wall. High Strength Epoxy or steel plates will be placed as an evaporation barrier at the top of each pipe pile to reduce evaporation and the potential for capillary uptake of chromium from the pile to the concrete pile cap.

5.2.2 Pile Caps

Reinforced Concrete Pile caps will be placed below columns at the interior and perimeter of the planned Exelon Tower and Trading Floor Garage. The bottom of the majority of the pile caps is below the general membrane elevation surrounding the pile cap. Pile caps will be protected against potential chromium uptake by a new geomembrane and underlying capillary break. Infiltration in the drainage net will be permanently isolated from the pile cap depression.

5.2.3 Shear Wall Foundations

Shear wall pile caps will be placed below the planned Exelon Tower core and by the east wall of the Trading Garage to provide overturning resistance for the tower. The shear wall pile caps will be as thick as 8 feet. The elevator pits will be within the cap thickness. (For plans and sections of shear wall foundations see Drawings F1.50 and F1.51.)

Pile penetrations will be sealed with geomembrane boots. The boots will be mechanically clamped to the pipe pile wall with a gasket material between the pile and the boot. The boots will be welded to the geomembrane sheet by extrusion welding. The geomembrane will be supported on grade. Settlement is not anticipated to create a concern because the excavation required for shear wall pile cap construction substantially unloads the underlying clay. For more detailed construction sequence see Drawing DDP-F1.30.

5.2.4 Slab on Grade

The one story deck of the Central Plaza Garage and the platform structures on Point Street and Wills Street will be supported on "concentric" pipe piles. Equipment used to construct these elevated structures will be constructed using the existing cover soil thickness to support construction equipment. After the upper deck is completed, the cover soil will be removed for construction of the garage floor. The reinforced slab will provide mechanical protection and management control against geomembrane damage. The garage floor will be a 5-inch thick, 5,000 psi reinforced concrete slab on grade. The 5-inch thick slab

has been demonstrated to be capable of supporting the rear axle of a tow truck with automobile in tow, with a significant margin of safety against punching. Larger loads are not feasible because the garage space has a 7 ft. high headroom limitation. With reinforcing bar, the slab will perform to distribute wheel loads even with cracking. A 1-inch thick polystyrene insulation board will be placed below the slab on grade to protect the geomembrane against thermal expansion and contraction. For a detailed construction sequence see Drawing DDP F1.31.

EE Memorandum No. 6 provides an assessment of the Slab-on-Grade Development Cap at Central Plaza Garage.

5.2.5 Shallow Foundations Above the Cap Synthetic Layers

Shallow foundations may be constructed above the synthetic layers of the cap to support light-weight structures (with maximum bearing stress of 2,000 pounds per square foot (psf)), at the drainage net). The cover soil will also support pipes and conduits, with the protective concrete slab below.

5.2.6 Structural Ground Floor Slabs

Ground floor slabs in the Exelon and Trading Floor Garage structures will be supported on the pile caps and shear wall foundations, which support the overlying structure.

5.3 UTILITIES

5.3.1 Site Utilities (General)

The site utility systems include storm drains, sanitary sewer, domestic water, natural gas, electric and telecommunications. Their alignments will generally follow the proposed roadway network, connecting the planned building/garage to the public infrastructure in Caroline Street, Central Avenue, or discharging to the Inner Harbor (Patapsco River). A detailed utility plan is provided (Drawing DDP – C5.10) showing the planned utility network connecting the planned on-site utilities between the development parcel and existing utilities adjacent to the Site.

The first phase of the development will provide service to Area 1 and includes utility infrastructure that will serve future development parcels as well. The DDP utility profile design is focused on minimizing disturbance below the existing MMC geomembrane. The potential for disturbance below the existing MMC geomembrane is anticipated for the

proposed site utilities. As such, contingency details are provided for modifying the geomembrane layer where the utility vertical profile will require a "clean" corridor under roadways for future maintenance or repair. Clean utility corridor(s) will be constructed (Drawing DDP-F1.32) where utilities are placed below the existing MMC geomembrane. The utility design elevation at the soil bentonite (SB) wall crossing is Elevation +5 msl.

The majority of utility work required for this phase of development is within 30 feet of the centerline of the hydraulic barrier. All utilities will have service connections crossing over the hydraulic barrier and the HMS system. The vaults provide access for maintenance and replacement of HMS and wiring components, which are under the geomembrane (Drawing DDP-EN1.05). Protective slabs and concrete bridge over the S-B Barrier for utility crossings are shown on Drawing DDP F1.20 and sections and details on DDP F1.21 and DDP F1.22.

5.3.2 Sanitary Sewer

The sanitary sewer will discharge into a force main in the parking garage. The site sanitary sewer line will pick up at the east wall of the planned garage. Under this phase, the Exelon building sanitary sewer service will be routed through the garage to the intersection of Block/Wills Street. The sanitary line will then connect into the existing sanitary sewer in Block Street. In the future, a 12-inch sanitary line will collect additional service connections and direct all flow through a gravity system east on Block Street to an existing 12-inch sanitary line at Caroline Street). The projected Master Plan sewer demand has been submitted to Baltimore City so that they can evaluate the capacity of the downstream public sanitary sewer system.

5.3.3 Storm Drain

A storm water management analysis was completed in 2007 and approved by Baltimore City Department of Public Works. An updated storm water management analysis was completed in 2013, which has been submitted to Baltimore City for review. The quantity control goal of the storm water management plan is to discharge storm water, to the greatest extent possible, directly to the Harbor in lieu of discharging to the Caroline Street storm drain system. For the portion of Harbor Point that must drain to Caroline Street, the goal is to maintain runoff levels at existing conditions or no greater than a 10% increase.

Storm drainage will be collected in catch basins above the Central Plaza portion of the planned parking garage and pumped to the northwest and southeast outlet points. From there, the 24-inch to 30-inch site storm drain lines will carry the drainage north and south, respectively to the Northwest Branch of the Patapsco River. Also added to this discharge volume will be runoff from the proposed building and portions of Dock and Wills Streets. New storm drain outfalls will be constructed through the existing sheet pile wall at the south end of Wills Street and the new Central Avenue Bridge bulkhead to the north to accommodate the 24-inch and 30-inch lines.

A storm drain outfall to the Baltimore Harbor will be constructed just east of the future Central Avenue Bridge landing at the elevation of low tide. The storm drain pipe is intended to carry storm water from the Central Plaza elevated deck and Trading Floor Garage roof. The storm drain will cross the hydraulic barrier at the intersection of Wills Street and Dock Street, and will continue to the west outboard of the hydraulic barrier in the future Dock St right of way. Compressible clay below the future Dock Street cannot support the planned fill and storm drain utility. A low level structural platform will be constructed east of the Point Street intersection to support fill and utilities. The low platform construction area will be within a sheet pile enclosure. Pumping will be required for platform and pipe construction.

Storm drainage will be collected in catch basins above the Future Pad Site portion of the planned parking garage and pumped to the southeast corner. From there a temporary 8-inch site storm drain will discharge the runoff at grade on the existing asphalt parking lot.

The majority of the site storm water will be discharged to proposed outfalls into the Harbor at the Point/Dock Street intersection and at the south end of Wills Street. The remaining portion of the site (Dock Street east of Wills Street) discharges to an existing 30-inch storm drains in Caroline Street, which outfalls into the Harbor to the north of Caroline/Dock Street intersection. The proposed 30" storm drain line, east of the perimeter barrier, discharging at the south foot of Wills Street is a temporary line that will be replaced when Wills Street south of the Central Plaza is constructed in the future. This temporary line will be perforated to allow storm water runoff collected from the Central Plaza area to recharge groundwater levels east of the SB wall (Area 2).

As the grading plan Drawing DDP-C5.20 shows, runoff will sheet flow away from the open faces of the temporarily above-grade parking garage. This will be achieved by installing temporary low (1 to 3 feet) mechanically stabilized earth walls along the edge of the garage to

transition from existing cap grade outside the garage (i.e., Elevation +15 msl) down to the proposed garage grade (typical Elevation +13 msl), see Drawing DDP-F1.40 for plan and DDP-F1.54 for section. Storm drainage collection basins and eight water-tight sumps with pumps will be located within the garage as shown on Drawing DDP-A1.00.01. The sumps will be sealed within a small depression below the MMC geomembrane. Details for the construction of the sump will follow pile cap penetration details on Drawing DDP-F1.30.

5.3.4 Domestic and Fire Water

A 12-inch fire/domestic water loop is proposed off the existing 12-inch line in Caroline Street, making connections at the Dock Street/Caroline Street intersection. An extension across the proposed Central Avenue Bridge was also requested by Baltimore City. The proposed on-site water main loop will continue up Dock Street to the planned Central Avenue Bridge, up Point Street, up Wills Street and run the entire loop of the Central Plaza roadway. Service connections will be made as necessary. The line requires a minimum 4 feet of clean cover; however, if this cover cannot be maintained, alternate measures will be proposed such and heat tracing and/or insulation. The water main will also feed fire hydrants positioned around the site in accordance with Baltimore City standards.

5.3.5 Gas

A gas main extension will serve the development from the public main in Caroline Street with connections at the Dock Street intersection. The gas main extension in Dock Street will serve the northern half of the Site. A future Block Street extension will serve the south half of the Site. Service connections will be made as future development parcels are completed.

5.3.6 Electric and Telecommunications Conduits

Electric and telecommunications conduits will be looped through the Site from Baltimore City and Verizon duct banks at the intersections of Caroline Street with Block and Dock Streets. An additional duct bank extension across the planned Central Avenue Bridge is being considered that would connect with existing utilities in Central Avenue.

5.3.7 Diesel Fuel Storage During Construction

Fuel storage for construction equipment will be performed in accordance with regulations for containment and management. Construction equipment will be re-fueled within secondary containment as described in the Spill Prevention and Response Plan (SPRP). This secondary

containment is shown as a portable "collapse-a-tainer" system described as a Temporary Loading Dock on Drawing DDP-EN1.03.

5.4 ROADS, STREETS AND PARKING

The proposed roadway network connects to the surrounding existing roadway network. The proposed roadway network will also provide access to the ERS components below grade in these areas (i.e., hydraulic barrier and HMS System). All proposed roadways are 2-lane, 2-way except around the Central Plaza and the Central Avenue Bridge. The loop around the Central Plaza will be a 2-lane, 1-way road. The Central Avenue Bridge will be a 4-lane, 2-way road, facilitating traffic flow in and out of the Site. Parking will be provided via parallel parking spaces at street level and in proposed/future parking garages (Central Plaza Garage and Exelon Trading Floor Garage under Phase 1 Area 1).

The anticipated everyday users of the Site are vehicles as large as HS-20 delivery trucks down to passenger vehicles. A truck route will be proposed which excludes the loop around the Central Plaza.

Although the loads imposed by everyday vehicles are not a concern, extraordinary loading, such as from construction vehicles is an important consideration for the roadway construction. Record drawings indicate that portions of Wills Street and Dock Street already have protective concrete bridge slabs constructed over the hydraulic barrier. These slabs will be demolished during sheet pile wall installation and then reconstructed as shown in drawing F1.22 (see Drawing DDP-F1.20 for plan view). Extensions to the existing protective slab are required in select areas shown on the Development Cap Plan (Drawing DDP-F1.60) and the Civil Plan (Drawing DDP-C4.00) to provide further stress relief for the MMC, the hydraulic barrier, and the HMS system.

5.5 STRUCTURES

The existing tank room and maintenance room of the Transfer Station will be retained, modified as required, and incorporated into the design of the new Exelon Tower (Drawing DDP-A100.01). The support sections (i.e., office, conference rooms, etc.) of the existing building will be demolished during construction and new spaces will be reconstructed within the first floor level of the new Exelon Trading Floor Garage (Drawing DDP-A1.31.00). See drawings DDP-F1.16 and DDP-F1.17 for demolition of transfer station office building, foundations and truck pad.

5.5.1 Honeywell Office Building Demolition

The Honeywell Transfer Station consists of a two-story office building, a one-story section containing a Tank Room and a Mechanical Room and a Transfer Pad. The building is of steel frame construction, and is supported on spread foundations and slabs and a mat on grade. The foundation elements bear on cover soils over the MMC synthetic layers. HMS lines pass from vault V1 in the sidewalk of Wills Street above the geomembrane through the cover soil beneath the office portion of the building to the Tank Room.

As further discussed in Section 6.3.1, the office building will be demolished while the Tank Room, Mechanical Room and Transfer Pad will be protected and maintained. Demolition will be performed selectively, with caution to avoid damage to the building portions to remain, the HMS lines, and MMC. Transfer pad demolition will be performed within the sequence of foundation construction, so that the existing transfer pad can continue to function until the final transfer pad location is available for construction.

5.5.2 Existing Structural Foundations

The foundations consist of shallow strip footings, shallow isolated column footings and slabs on grade, all of which are founded above the multimedia cap synthetic layers. All demolition work will be performed above the multimedia cap and the synthetic layers will not be exposed. The bottom of existing footing elevations are approximately Elevation +11 and the elevation of synthetic layers vary from Elevation 8 to Elevation 10. The synthetic layers in this area of the site are protected by a concrete mud mat overlain by structural backfill.

5.5.3 Stages of Foundation Demolition and Effect on Use of Transfer Pad

Portions of the foundations to remain will be protected by using saw cuts to separate from the demolition areas. Partial Demolition will be carried out in two stages to minimize effect on loading dock use.

Stage 1 Demolition will commence after temporary relocation of select HMS components is complete. Stage 1 consists of saw cutting and removing all portions of the HMS in conflict with Trading Floor Garage foundations. The existing Transfer Pad will remain functional during Stage 1 demolition.

Stage 2 Demolition will commence after pile installation in the adjacent area is complete. Stage 2 consists of removing the existing Transfer Pad.

Based upon the construction schedule and sequence, Stage 2 Demolition will be performed during the winter months when the Transfer Pad use for groundwater transfer occurs more frequently. Operation of the Transfer Station during construction is discussed further in Section 6.3.3 and in the Contingency Plan provided in Appendix B. Upon demolition completion, proposed piles, pile caps, grade beams, slabs and new loading containment area will be constructed.

5.5.4 Pile Driving Adjacent to Existing Groundwater Storage Tanks and Equipment

The Trading Floor Garage structure is founded on pile foundations. The proposed piles and pile caps will be constructed adjacent to the Tank room. See Section 6.3 for the design and contingency plans regarding water storage during selective demolition and foundation construction.

Prior to pile installation, the MMC at the pile cap area will be excavated and the synthetic layers removed for obstruction demolition. After pile installation the synthetic layers will be repaired. The process of cutting and repair of synthetic layers is described in detail on drawing DDP-F1.31.

5.5.5 New Loading Dock

A dedicated indoor loading dock for the Transfer Station will be constructed on Dock Street adjacent to the transfer station (Drawing DDP-A1.31.00). New double-walled piping within conduits will be installed connecting the new loading dock to the existing storage tanks (Drawing DDP-EN1.07). The loading dock will be designed with similar features as the existing Transfer Pad to capture and contain spills or leaks, including secondary containment, trench and sump (Drawing DDP-F1.42). It should be noted that since the new loading dock will be indoors, the capacity of the trench and sump does not need to include provisions for precipitation.

The new loading dock slab will be constructed after completion of demolition of the existing loading dock and after installation of new piles and pile caps adjacent to the HMS. The new loading dock will be constructed to provide secondary containment for 5,790 gal, which is greater than the capacity of the transport tank truck (5,000 gal), see EE Memorandum No. 5 for analysis.

The new loading dock will be a structural concrete slab (approximately 57 feet long x 15 feet wide) supported on the Trading Floor Garage pile caps and grade beams. The slab will be 12 inches thick at the interface with sump pit and 15 inches deep at the perimeter providing a slope towards the sump pit to facilitate flow of potential spillage into the sump pit.

A collection sump pit 45 feet long x 6 feet wide x 2.5 feet deep will be constructed at the east side and below the loading dock. The new sump pit dimensions are shown on Drawing DDP F1.44. The sump pit provides 5,050 gallons of storage. The sloped slabs and drainage trough provide additional storage for 740 gallons.

The top of the loading dock slab slopes up from Elevation +13 at the sump pit to Elevation +13.25 at the perimeter on all four sides. The loading dock is enclosed on the east, west and south ends by walls that connect to adjacent floor slabs. On the North end the loading dock slab connects to the street. The walls on the three sides and the sloped slab in addition to the sump pit will contain a potential spill during transfer of groundwater from the tanks.

The sump pit and drainage trough will be covered with a series of metal gratings (similar to the one used at the Transfer Pad to be demolished) which allow access to the pit for cleaning and inspection. The sump pit base slab and the sump pit walls will be placed in one pour, and the loading dock slab will be constructed in a second pour to reduce the number of cold joints. Water stops will be used at all joints. In addition, the concrete for the slabs and walls will contain fiber reinforcement to control shrinkage cracking and the concrete mix design will be specified for shrinkage control. The hardened concrete will be coated with a corrosion inhibitor such as Silane Sealer or approved equal.

As substantiated by Calculation 1 in EE Memorandum No. 5, the total volume available for spill containment, including the sump pit and available storage volume above loading dock slab is more than adequate for the design spill of 5,000 gallons.

6.0 DESIGN MEASURES TO PROTECT THE ENVIRONMENTAL REMEDIATION SYSTEM

6.1 HYDRAULIC BARRIER

The perimeter hydraulic barrier (soil bentonite wall) effectively increases the efficiency for Honeywell to maintain its inward gradient obligation. To reduce vibration-related densification settlement of the S-B backfill, Honeywell requires monitoring and construction controls to curtail vibrations above 2 inches/second at the ground surface above the barrier. These same requirements prohibit installation of driven piles within 30 feet of the barrier. Other requirements include the measurement of ground surface above the barrier before and after pile driving to assess possible settlement occurrence.

The project design places piles closer than 30 feet to the barrier, and requires construction of permanent structures above the barrier alignment. Honeywell requires repair of the hydraulic barrier in the event pumping quantities increase with time. The preemptive repair designed for the redevelopment consists of driving a steel sheet pile to augment the barrier. The alignment proposed for sheet pile placement is indicated in Drawing DDP-F1.20. Details and Sections for sheet pile wall installation are provided on Drawings DDP-F1.21 and DDP-F1.22.

Steel sheet pile should be well protected against corrosion in the hydraulic barrier backfill which typically has a pH between 8 and 10, and burial in the barrier below the water table should prevent oxygen to access the steel. A corrosion rate of 0.05 millimeters per year (mm/yr.) is anticipated (Eurocode 3), which computes to complete corrosion loss of section in 170 years for standard carbon steel. An analysis of potential corrosion rates is presented in the EE Memorandum No. 4. Sheet pile joints will be sealed using a hydrophilic expansive rubber water stop. It is possible that sheet pairs will be shop welded to simplify installation and reduce the number of joints sealed on placement (EE Memorandum No. 4).

6.2 MULTIMEDIA CAP (AREA 1)

The MMC was designed to protect against storm water infiltration, and human exposure. In the planned developed Site, overlying building structures, roadways and storm drains will remove much of the storm water load from the Area 1 cap. Overlying hard structures and management control provided by development will protect against human exposure and errant excavation.

Where the MMC is removed for foundation construction, a new geomembrane will be placed below the concrete foundations, and sealed to the pile penetrations and existing geomembrane (Drawing DDP- F1.60 for membrane replacement locations). The existing MMC geomembrane will be connected to the geomembrane at the pile caps and the new membrane will be booted to each pile. Some synthetic layers such as the GCL, which is a backup to the geomembrane protection against infiltration and the drainage net, will not be replaced beneath the new pile caps (EE Memorandum No. 3)

The complete MMC, with all synthetic layers, will be maintained or replaced outside of the footprint of development structures. Excavation of cover soil below the warning layer will be performed with labor assistance where the synthetic layers are intended to survive construction. The synthetic layers will be protected by cutting without tension stress or tearing. Repairs will be made by extrusion welding new geomembrane sections.

The MMC will be pile supported at Dock Street above the abandoned timber bulkhead and where the underlying clays were not preloaded. This work is illustrated on Drawing DDP-F1.43. A pile-supported concrete platform will extend from the new sheet pile barrier to the inboard extent of the bulkhead frame. The existing MMC synthetic layers will be abandoned in place below the new concrete structure. The new MMC will incorporate the existing capillary break gravel and new synthetic layers (drainage net /geomembrane /GCL) with a protective concrete cover below future Dock Street.

- Construction equipment, including dozers, excavators, trucks, cranes, and other traditional redevelopment equipment, will be traversing the Area 1 cap throughout construction activities. Equipment loads will controlled so that after the load is spread through soil cover, a maximum bearing stress of 2,000 psf will be applied to the drainage net. Computations indicate the existing soil cover will spread loads from an HS-20 truck load (rated truck for Baltimore City Streets) are permitted to operate on areas where the existing 30-inch soil cover remains in place (Drawing DDP-F1.15 and EE Memorandum No. 7). A minimum soil thickness of 24 inches will be in place to protect the geosynthetic materials against mechanical damage by construction equipment. Mats and additional fill will be placed to spread construction loads to meet the 2,000 psf restriction. In some areas, asphalt will be placed to reduce rutting to prevent thinning of the existing soil cover and control dust.

6.2.1 Excavation of Impacted Soil

Excavation of impacted soils from below synthetic layers will follow a protocol for protection of the cover soil against chromium cross-contamination, and dust generation (Material Handling and Management Plan-Appendix B). The temporary storage areas for the excavated material are shown in Drawings EN1.01 and EN1.06.01 and discussed below in Section 7.2.9.1. Soil and obstruction debris removed from below the membrane will be managed for disposal off Site. Obstructions will be broken and sized in the excavation zone to allow loading directly to lined, sealed roll-off container boxes. Suitable, non-hazardous excavated soils may be stockpiled for use to fill areas where obstruction debris are removed, or where coarse stone is placed below new membranes for construction work platforms.

6.2.2 Foundation Penetrations and Repair

A complete MMC, equal to or thicker than the MMC design section, will be provided outside of any area not covered by a development structure. Where possible, the existing MMC will be protected and used for the development cap. Connections at pile penetrations and the perimeter of pile caps will only be made to the geomembrane layer (Drawing DDP-F1.60 for locations of replacement cap).

The geomembrane will be protected against mechanical damage by providing adequate soil cover/thermal insulation (EE Memorandum No. 6). The geomembrane will also be protected by cushion geotextiles for abrasion control, mud mat for structural and puncture control, or additional geomembrane thickness. Where street Right Of Way are located on fill above the MMC, a protective concrete slab will be placed above the drainage layer to protect the MMC synthetic layers against potential damage caused by excavation for installation or maintenance of utilities (Drawing DDP F1.32).

Pile penetrations will be sealed using a geomembrane "skirt", extrusion welded to the MMC geomembrane layer, and sealed using a mechanical boot to the pile. The purpose of the skirt is to allow oversized openings in the geomembrane necessary for geomembrane replacement or resulting from construction disturbance. The boot seal for each pile penetration placed will be tested using the vacuum box method. Materials and Quality Control/Quality Assurance requirements are provided on Drawing DDP-F1.01.

6.3 HEAD MAINTENANCE SYSTEM

6.3.1 Transfer Station Design

Transfer station functional operations shall be uninterrupted during selective demolition and construction. The design provides two levels of operation. Level 1 elements are required prior to the start of construction and are maintained during construction. Level 2 elements are designed to be implemented on an as-need-basis. The sequencing and modifications for each Level are provided on Drawing DDP-EN1.02.

Level 1 describes using the existing water storage tanks located in the Tank Room by making minor modifications to the existing system, e.g. providing positive pressure inside the Tank and Mechanical rooms during potential dust generating activities immediately adjacent to these rooms. Water stored in the exiting tanks will be transferred for off-site disposal using the existing 3-inch "Kamlock" connection located on the western wall of the Tank room. Double-wall flexible hose will be connected from the Kamlock to a portable, temporary loading secondary containment system. The "collapse-a-tainer" containment system provides the portability needed to ensure water transfer operations by vacuum truck are uninterrupted.

Level 2 describes as-needed measures, e.g., during selective demolition of the offices, the water storage tanks will be kept in a "near-empty" (one-foot to tank drain pipe) bypass status. Double wall conveyance pipe will be connected from the existing Vault 1 to one of two 16,000-gallon double wall portable storage ("Frac") tanks (Drawing DDP EN1.04). The design provides 50% greater water storage capacity than the (2) existing 10,000-gallon tanks. The portable containment system described above will be utilized for transferring water from the Frac tanks by vacuum truck.

To minimize interruption and enable maximum integration, selective demolition will be conducted on the existing transfer station (Drawings DDP EN1.02, DDP F1.16 and DDP F1.17). The storage tank and maintenance rooms will remain, including walls, floor and roof. The Trading Floor Garage will be built around the tank and maintenance rooms. The loading dock will be relocated adjacent to the garage entrance for the building. It will be an isolated, dedicated loading dock, complete with walls, trench drain and secondary containment. New conveyance piping will be installed using dual contained pipe (Drawing EN1.04).

Loading dock access to the tank room is designed to allow for the handling of larger equipment through two new 4′ x 8′ doors to the existing bay door to be retained on the Tank room west wall. A set of administrative controls have been designed to segregate employees from this area during those infrequent occasions when equipment replacement is necessary. All decontamination procedures will be performed within the Tank room secondary containment.

The existing air receiver located in the existing loading dock will be relocated to the existing Mechanical Room (see Drawing EN1.07). The HVAC system on the roof will be relocated and rerouted to the exterior of the proposed Exelon Building in order to maintain the exhaust fan and other existing HVAC systems within the preserved portions of the Transfer Station. Electric service will also be relocated.

During construction, the tank and maintenance rooms will remain operational and accessible and HPD will provide temporary office, conference room, and additional support space in a mobile trailer to be located adjacent to the Site (Drawing DDP-EN1.01). A portable, temporary loading containment area will be available on the Site in the event that access to the existing loading dock becomes restricted during construction (Drawing DDP-EN1.04).

Groundwater storage will be limited to 2,500 gallons in either tank located in the Tank room during demolition and pile driving activities. Portable, 16,000-gallon capacity, double-walled water storage containers ("Frac" tanks) will be placed to the west of the existing tank room. Double-wall conveyance piping will be installed from the Vault 1 to these Frac tanks to bypass the Tank room (Drawing DDP EN1.03).

Once potentially disruptive work is completed, the Tank room will be restored to full functionality by re-routing the groundwater from Vault 1 back to the Tank room as the permanent condition.

Offices, conference room, storage rooms, and other transfer station support areas will be relocated and integrated into the first floor of the trading garage Drawings A1.00.01 and A1.31.00.

6.3.2 HMS Design Changes

To avoid disruption to the HMS system during construction, and to maintain continuous operation and access to all HMS components post-construction, modifications have been designed for certain components of the HMS system including vaults, piezometers, junction boxes and conveyance piping and electrical conduits. The specific HMS components

to be affected by the development are shown on Drawing EN1.01, and presented in the table below. Details for modification of these HMS components are shown on Drawings DDP EN1.01, EN1.05, EN1.06, EN1.06.01 and EN1.09.

HMS Components	**Conflict**	***Resolution***
<u>Vaults:</u>		
V1	Elevation	*Extend access riser to new road elevation*
V2	Elevation	*Reduce vault (wall) height to new road elevation*
V11	Timber Piles and Bulkhead/ Elevation	*Support vault on pile supported platform. Extend access riser to new road elevation*
V12	Timber Piles and Bulkhead/ Elevation	*Support vault on pile supported platform./Extend access man-way riser to new sidewalk elevation*
<u>Manhole Junction:</u>		
MJ1	Timber Piles and Bulkhead/ Elevation	*Support MJ1 on pile supported platform. Extend access riser to new road elevation*
<u>Piezometers (PZ):</u>		
IP-1, IP-1S, OP-1, OP-1S	Elevation	*Reduce PZ height, adjust conduits and cables*
IP-2, IP-2S, OP-2, OP-2S	Elevation	*Reduce PZ height, adjust conduits and cables*
IP-11 and OP-11	Elevation	*Extend PZ height, adjust conduits and cables*
IP-12 and OP-12	Elevation	*Reduce IP-12 and extend OP-12*
<u>Junction Boxes:</u>		
JB-1	Elevation	*Replace box, adjust cable and conduits*
JB-2	Elevation	*Replace box, adjust cable and conduits*

HMS Components	Conflict	*Resolution*
JB-11	Elevation/ Curb	*Replace box, adjust cable and conduits/Relocate outside curb*
JB12	Elevation	*Replace box, adjust cable and conduits*

Vault 11 (V11), Vault 12 (V12), and Manhole Junction 1 (MJ1) will be supported by the pile supported platform. The existing conveyance lines between these structures will also be supported from the new pile supported platform (Drawings DDP F1.43 and DDP EN1.09). These HMS modifications are designed to provide long-term stability to the existing systems.

Vault 2 and piezometers IP-1/OP-1, IP-1S/OP-1S, IP-2/OP-2 and IP-2S/OP-2S will be located below the Wills Street platform. Access will be maintained at the Vault 2 man-way, Vault 2 service access ports and both sets of piezometers on street level. DOT rated access ports will be installed in Wills Street ramp immediately above these locations for equipment and piezometer maintenance or replacement in the future (Drawing DDP EN1.05).

The existing SSMP-4 sampling point will be abandoned and relocated to the east of the current location to provide drainage net sampling during construction. A new sampling point, SSMP-4A will be installed west of Vault 11 (Drawings DDP EN1.01 and DDP EN1.06.01)

The existing methane gas vent will be relocated to avoid conflict with new construction (Drawings EN1.01 and EN 1.06.01). The vent is situated outside the Plaza Garage south wall and generally within the highest elevation area. The elevation of the geomembrane at the new vent location is slightly lower than the geomembrane elevation at the current location (Elevation +13 msl). The underlying capillary break will facilitate conveyance of any gas toward the vent. The vent is constructed as a 3-foot high standpipe with perforations at the top of the pipe that will be incorporated into an architectural feature.

6.3.3 Transfer Station and HMS Operations During Construction

The preserved portion of the Transfer Station (TS), will contain all critical operating systems necessary to store impacted groundwater conveyed by the HMS and will remain in operation throughout all phases of construction (Drawing DDP-EN1.02).

The HMS system contains a redundant discharge pipe network. The tank storage and discharge control also have redundant capacity that will allow a high degree of operational flexibility during construction. The temporary loading dock with secondary containment and temporary conveyance pipe, which is described in Section 6.3.1, will be provided prior to construction activities in the vicinity of the Transfer Station to maintain loading operations at all times (Drawing DDP-EN1.03 and EN1.04).

As discussed in Section 6.3.1, the construction presents potential risks from dust and vibration that may impact the conveyance, electrical, monitoring and control systems of the facility. A detailed Contingency Plan (Appendix B) has been developed to address these issues and sets forth an increasing level of action based on potentially increasing levels of system inoperability. The plan takes a practical approach to mitigate operational impacts, maintain system controls, maintain data logging and minimize the risk of system downtime. It also provides a level of flexibility to adapt to changing construction requirements.

Design aspects of the Contingency Plan involving the Transfer Station are shown on Drawings DDP- EN1.02, EN1.03 and EN1.04. Those items involving the HMS are shown on Drawings EN1.05, EN1.06, EN1.06.01 and EN1.09.

6.4 OUTBOARD EMBANKMENT AND WATERSIDE PERIMETER

The Outboard Embankment is intended to provide structural support of the former bulkhead structures, now abandoned in place, and to prevent erosion of the perimeter barrier. The embankment receives discharge from the MMC drainage layer to the perimeter drain.

Shallow cutoff sheeting will be placed at the north edge of the Dock Street pile supported platform. The sheets will be connected to the platform for vertical and lateral restraint. The cutoff sheeting will retain soil surrounding the soil-bentonite barrier and provide embankment stability during utility excavations and pile driving for the new Central Avenue Bridge (see Drawing DDP-F1.43 for plan locations).

Above Elevation 10 the embankment is protected from erosion by a layer of rip rap stone. Rip rap will be removed to facilitate pile driving through the embankment. Rip rap will be replaced and chinked around the new piles to restore the integrity of the rip rap layer. Rip rap in the area of development will be visually inspected and replenished where necessary to maintain its original thickness.

The embankment receives discharge from the MMC drainage layer perimeter pipe. This discharge mechanism shall be protected during construction, and restored, as required. Outfall water sampling point SSMP4 will be modified as discussed in Section 6.3.2 and presented on Drawing EN1.06.01.

7.0 PROJECT-SPECIFIC ENGINEERING, CONSTRUCTION AND ENVIRONMENTAL CONTROLS AND MONITORING

7.1 CONSTRUCTION QUALITY ASSURANCE/ QUALITY CONTROL

The contract drawings and specifications will identify work items that require contractor Quality Control (QC) and items that require developer/owner Quality Assurance (QA). The Contractor will be required to prepare CQC/CQA Work Plans for operations that encounter the Environmental Remediation System (ERS). The Work Plan system will allow the Contractor to determine detailed means and methods for developer approval, and for the developer to control the work that protects the MMC and other ERS elements. QA/QC activities include inspections, testing, monitoring, and reporting. This subsection presents the QA activities related to inspections, testing and monitoring; reporting and documentation are further described in subsection 7.3.

The Developer's CQA team will solely participate in the quality assurance function and will not be involved in any other aspect of the construction effort. This team will, however, possess all of the credentials, capabilities, and experience of an independent design/construction oversight team. The number of interested parties involved in the Area 1 development will require separate HPD and Honeywell CQA organizations. The Contactor's CQC and the Developer's CQA team will be comprised of the positions listed below.

- Project Manager: The Contractor's project manager is responsible for overall implementation and management of QC activities.

- CQC Manager: The Contractor's CQC Manager will report to the project manager. The CQC manager will perform and/or oversee all CQC activities; coordinate CQC activities with the developer; and, maintain copies of all CQC records and test results.

- CQC Laboratory: The laboratory is an entity independent of the owner, developer and contractor located either on or off-site that is responsible for conducting tests on materials, i.e., soil, water, air and geosynthetics, to document conformance with the contract plans and specifications.

- Developer Field CQA Inspectors: Inspectors will report to the Developer's CQA Manager and will inspect major construction activities for conformance with the Contract Plans and Specifications. Inspectors will visually observe imported materials for conformance with the specifications; obtain QC samples; observe CQC sampling; and, observe work performed on ERS components, observe CQC testing, record observations, and prepare daily reports.

HPD will provide resident QA field staff to manage, inspect and monitor construction on a daily basis throughout work that is conducted at or below ground surface, i.e., work that potentially affects the ERS. Specific QA activities are summarized below:

- Inspect the work to confirm that construction complies with the Contract Documents and Specifications. Primary work elements that will be inspected include but are not limited to the following:
    - exposure, removal or repair of any component of the MMC, including geosynthetics and soil materials; including pile penetration boot assembly and geomembrane field welds;
    - installing, modifying or relocating elements of the HMS;
    - selective demolition of the transfer station;
    - installation and operation of the temporary measures for the HMS;
    - gas vent relocation;
    - sheet wall installation through the existing slurry wall;
    - installation of infrastructure that may affect the ERS, i.e., utilities and roadways;
    - excavation within 2 feet of the MMC geosynthetics to remain;
    - installation of new MMC drainage;
    - other construction activities that directly affect the ERS.
- Prepare daily construction reports to document the work, including photographs;

- Attend progress meetings;

- Review construction submittals to confirm compliance with the design;

- Collect and coordinate QA sampling and testing;

- Review QA/QC test results, including soil compaction, geosynthetic materials testing, concrete testing, and testing of other construction materials and completed portions of the project;

- Document materials management activities, including on- and off-site operations. Confirm that hazardous, non-hazardous, and clean materials are managed separately, profiled appropriately, and verify waste manifest procedures. The quantity of waste materials (i.e., water and soil) removed from the site will be documented;

- Verify conformance with the project control plans, such as the Air Monitoring and Material Handling and Management Plans; and

- Confirm that vibration and settlement monitoring is being performed appropriately during construction activities.

Honeywell, or its designee, has the right to review and comment on Contractor's Work Plans, inspect the work, conduct inspections with EPA and MDE, submit required reports to the Agencies, and participate in progress meetings with the Agencies during construction. Honeywell, or its designee, will also have the right to issue a Stop Work notification for work that may significantly impact the ERS in a manner that is not consistent with this DDP. A Stop Work notification may be issued immediately upon learning of the potential for any significant impact to the ERS. The Stop Work procedures will include the following:

- *Stop Work Notification*: written notification to stop work with a description of the issue and requirements (requirements may include time frames and/or actions associated with mitigating further impacts on the ERS);

- *Stop Work Compliance Response*: written response that describes the planned corrective measures to address the issues described in the Stop Work Notification and a schedule for implementation; and,

- *Stop Work Completion*: written notification that the corrective measures have been completed, including a description of any deviations from the Compliance Response.

Specifically, Honeywell will independently inspect the work, coordinate with the resident QA staff regarding construction activities and QA/QC results, and document the activities, accordingly. Honeywell will communicate with the developer and QA staff and document any deficiencies, potential changes, and corrective actions required to meet the performance function of the ERS and the intent of this DDP. As noted above, Honeywell may review any submittals, test results, changes, or other engineering or QA/QC documentation issued for the project.

7.2 CONSTRUCTION AND ENVIRONMENTAL CONTROLS

7.2.1 Air Monitoring and Dust Control

A project-specific Air Monitoring Plan has been prepared for the Area 1 development (Appendix B). The results of the Agency approved Pre-construction Air Monitoring study (April - June 2013) have been incorporated into this Air Monitoring Plan. The Plan establishes the monitoring effort, Site-specific action levels, and responses to be implemented during the current Area 1 development project.

The Air Monitoring Plan provides a description of the methods to be utilized for real-time particulate and weather data collection, air sample collection, laboratory analytical methods, and reporting demonstrating the effectiveness of the dust control measures implemented during intrusive activities. For the purpose of the Air Monitoring Plan, "intrusive activities" occur any time there is disturbance of the surface immediately below the MMC synthetic layers in Area 1.

Air monitoring will be implemented at the initiation of intrusive activities and will continue through the completion of all intrusive activities, restoration of the caps and removal of all controlled soil and debris from the Site.

Best management practices for soil/debris handling that reduce dust generation and prevent excavation spoil deposition onto the adjacent surfaces will be implemented. The potential for dust emissions will be further controlled by misting with potable water during excavation and obstruction removal activities as needed to keep exposed soil surfaces moist. The potable water misting operation is also an effective means to control and/or intercept the migration of airborne particulates. The erection of particulate-capturing barrier fences, curtailing activities, or use of temporary coverings (tarps, fabrics, or plastic) over exposed soils, debris, and other potential particulate-generating sources may also be

implemented. Installation of dust control components will not penetrate the MMC synthetic layers in areas not designed for repair or replacement.

Dust control measures will be implemented during intrusive activities. Should real-time aerosol monitoring detect the unlikely occurrence of particulate concentrations above Site-specific action level at the work zone limits, additional dust control measures as appropriate will be triggered. The Field Engineer will have stop-work authority should the work conditions observed at the time require immediate mitigation.

A sufficient quantity of potable water will be maintained on the Site for dust control use. Watering equipment shall be used to minimize the potential for elevated airborne particulate concentrations and consist of wet, vacuum-sweeper trucks, water tank trucks, or other devices that are capable of applying a uniform spray of water over the asphalt paved temporary construction road surface.

The use of spray-applied foam to seal the exposed soil surface may be utilized in difficult locations to cover with construction plastic or geotextile fabric. These temporary measures will be replaced during construction by installing mudmat across the bottom and up the slopes of the excavation as shown in drawing DDP-F1.30. This more permanent condition will provide protection from potential direct contact with soil or inhalation of dust by pile driving and concrete work crews.

7.2.2 Erosion and Sediment Control and Storm Water Management

Erosion and sediment control at the Site and during construction will be addressed with conventional best management practices, which include silt fence/super silt fence, perimeter berms/swales, stabilized construction entrances, and inlet protection (Drawings C8.00, C8.10 and C8.20). Super silt fence will not be installed within Area 1 to avoid potentially penetrating the MMC synthetic layers with the required depth of the fence posts. Prior to the initiation of any intrusive activities, the erosion and sediment controls and storm water management features will be installed in accordance with the permit drawings to be prepared and submitted to the City of Baltimore under separate cover, and in accordance with the General Permit to Discharge Storm Water associated with Construction Activities, to be submitted to MDE Water Management Division under separate cover.

The Site is considered redevelopment per Baltimore City Code Division 2 Section 23-7 (a) and, therefore, recharge volume, channel protection storage volume, and overbank flood protection volume requirements are anticipated to be waived. Per the latest storm water management

regulations, a combination of impervious area reduction and storm water management implementation must be utilized to provide qualitative control for at least 50% of the Site's impervious area. Preliminary analysis of the post-construction surface conditions suggests that the storm water management requirements will be met via a combination of impervious area reduction, green roof, and rainwater harvesting.

The above storm water management (SWM) summary was prepared while MDE's 2000 Maryland Storm Water Design Manual and the Baltimore City's February 2003 supplement to the MD SWM manual were in effect. In 2009 the MDE manual and the SWM requirements were updated. However, as of May 2012, the City's SWM supplement has yet to be updated and it is unclear if the new MDE regulations will be fully adopted. If they are, the SWM approach will be re-evaluated.

Additionally, erosion and sediment controls as detailed on Drawing DDP-C8.10 will be applied to individual excavations made for sheet pile, pile cap, shear wall foundation installation. Erosion and sediment controls will include the construction of temporary decontamination pads for loading excavated soil from below the MMC. The erosion and sediment controls will also include the construction of a temporary storage area that will include the ability to collect rainwater that could potentially leak from a lined, sealed roll-off container. An asphalt pad and perimeter asphalt berm will be constructed with a shallow perimeter drain to direct run-off to a sealed collection sump installed at the low point in the asphalt surface (Drawings EN1.01 and EN1.06.01).

Run-off water collected in the sealed sump will be pumped to a nearby portable, 16,000-gallon double-wall, closed-top container ("Frac" tank). Further discussion on water handling and disposal is provided in the Materials Handling and Management Plan in Section 5 – Water Management.

7.2.3 Storm Water Pollution Prevention

A Storm Water Pollution Prevention Plan has been prepared outlining the controls for erosion, sediment and storm water during construction (Appendix B).

The storm water management plan was examined for the 25-year storm event and 100-year storm event, however the storage requirements were determined based primarily on the 25-year storm event (EE Memorandum 2). When a storm event occurs, the only water that will come in contact with soil below the membrane will be storm water falling directly into an excavation. All water that falls outside of the

excavations is treated as surface runoff because it will be deflected away from open excavations by diversion berms. Infiltration through the cover soil into the drainage net was assumed to not occur because the drainage net is dammed at the perimeter of each excavation. The bottom of each excavation is open to soil below membrane, so that any storm water collected in the excavation is defined as "impacted".

A sump pump will be installed in each excavation to collect storm water which does not infiltrate into the ground, to prevent it from rising to the capillary break gravel at the down-slope side of the MMC. The entire footprint of the excavation, including the sloped sidewalls, was considered to catch storm water in the excavation. Contact and non-contact water handling and testing and proper disposal procedures are described in the Material Handling and Management Plan project control document.

The sump pumps will convey water to storage tanks sized to contain 24 hours of a 25 year storm (Drawing EN1.01). A second tank will be placed to collect a second 24 hours to enable testing and disposal of the first tank. Double wall pipes will be provided for sump pump discharge.

7.2.4 Spill Prevention and Response Plan

A project-specific Spill Prevention and Response Plan (SPRP) for Area 1 has been prepared to meet the requirements of construction for this development phase (Appendix B).

In general, the handling of liquids shall be done in a manner such that contaminated material will be contained on the construction site and not allowed to flow onto on-site areas where existing environmental protections will not be disturbed, onto completed work, or off the Site as surface water discharge. Liquids include groundwater, seeps, decontamination liquids, liquids generated from subsurface dewatering activities, liquid that may have come in contact with site soils beneath the existing environmental protections exposed by the work, or liquids that may have come in contact with other potentially contaminated material.

Direct discharge of collected liquids to adjacent surface waters, ground surface, or public storm or sanitary sewer will not be allowed until appropriate characterization has been performed, including testing. Proper disposal of captured and stored liquids will be performed in accordance with the Material Handling and Management Plan (Appendix B).

Surface water monitoring will continue during and following construction per the approved EMMP. There are currently 18 monitoring locations and two background locations, which are sampled quarterly by Honeywell at low tide and analyzed for total dissolved chromium. The Consent Decree establishes a surface water performance standard of no more than 50 parts per billion of total chromium.

7.2.5 Optical Survey

Preconstruction Survey

A Preconstruction Survey documenting existing conditions of the Transfer Station tank pad, tanks and connections, mechanical room, and mechanical connections shall be performed prior to demolition and pile installation.

Hydraulic Barrier

Early in the project implementation a new steel sheet pile barrier will be installed along the centerline of the S-B barrier. This construction may cause settlement of the S-B backfill, which is desirable. As a result, the S-B barrier will not be monitored for settlement because installation of the new sheet pile barrier along the entire effected perimeter precludes the need to observe deformation of the S-B barrier.

Vaults

Masonry Survey Nails (PK Nails) shall be placed at each corner of vaults V-1, V-2, V-11, and V-12 once exposed.

Honeywell Transfer Station

The existing Transfer Station tank pad and equipment room will be optically monitored (see Monitoring Notes on DDP-F1.01) for lateral and vertical movement (Northing, Easting and Elevation) as follows:

- Monitor two points on each side of the tank pad, and monitor floor areas at 25 ft. spacing or closer;
- Monitor at two different levels on exterior walls to determine slope of wall;
- Reference readings to a stable horizontal control. Survey accuracy shall be 1/16" accuracy or better. Install crack monitoring gages on any cracks observed on the inside walls or floor of the tank pad.

- Take three baseline readings prior to demolition or pile installation within 50 ft.

7.2.6 Vibration Monitoring

Vibrations caused by pile driving will be monitored using seismographs. Vibration monitoring will be performed at the transfer station maintenance room and tank room, and HMS vaults/manholes within 50 ft. of pile driving (see Monitoring Notes Drawing DDP-F1.01).

Seismographs will record maximum peak particle velocities in three mutually perpendicular planes and its associated zero-crossing frequencies. Seismographs will be equipped with a wireless broadband modem which enables remote communication with the seismograph and allows automatic alerts to designated field personnel when vibrations exceed the pre-established threshold value.

Based on site specific vibration data collected during the test pile program, it was determined that production piles will induce vibrations on structures within 50 feet of pile driving. Pile driving must be performed within close proximity of the HMS vaults and conveyance lines in order to pile support those structures (note that the HMS conveyance lines are flexible pipes within oversized conduits, and at present grades the vault structures are lightly loaded). Pile driving will be performed adjacent to the Transfer Station in order to incorporate that structure within the footprint of the development. A "threshold value" of 1.0 in/sec and a "limiting value" of 2.0 in/sec shall be established for the HMS structures. A "threshold value" of 0.5 in/sec and a "limiting value" of 1.0 in/sec shall be established for the Transfer Station tank pad and mechanical room. Where limiting values are exceeded, performance of the structure will be observed and evaluated, and performance of utilities may be tested. Peak particle velocities above the limiting values will be permitted if structure/ utility performance is deemed acceptable.

7.2.7 Settlement Monitoring

<u>HMS Conveyance Pipe Alignment</u>

Existing settlement plate MP1 will be made obsolete by the new Dock Street platform which will support the MMC and HMS systems in Dock Street on piles. A new settlement plate, MP-1A, will be placed above the HMS conveyance pipes on Wills Street where permanent fill thickness is greater than 8 ft. (Drawing DDP EN1.01).

New settlement plates will be constructed and placed with details similar to the existing settlement monitoring plates, and protected with flush mount covers at the finished grade. Construction settlement observations will be made during construction of the fill and monthly for 12 months after fill placement is completed.

7.2.8 Head Maintenance Pumping Quantity Monitoring

The water pumped from each of the 16 HMS extraction wells is monitored by a magnetic flow meter installed proximal to the well head for each location. A flow meter is connected to a Programmable Logic Controller (PLC) by a 4-20 million pulse per second analog connection and a digital pulse. This volume of groundwater extracted is reported to the EPA and MDE in the Honeywell Baltimore Inner Harbor Quarterly Report.

The volume of water removed from the tanks is logged in the MSS. In addition, the operator of the vacuum truck measures the volume of water in the tank of the truck. The resulting volume is recorded on the Hazardous Waste Manifest and in a spreadsheet maintained by plant personnel. The volume from the truck operator and the volume reported by the MSS are compared to check the accuracy of the tank level monitors and to confirm the volume removed. These procedures will continue during and after construction.

7.2.9 Material Handling & Management Plan

The Material Handling & Management Plan (MHMP) addresses the handling and management of solids (asphalt, stone aggregates, concrete and wood debris and soil) and liquids (storm water and groundwater) that may be encountered during the intrusive activities at the Site. For the purpose of this plan, "intrusive activities" occur any time there is disturbance of the surface immediately below synthetic layers of the MMC in Area 1 or below the LSC in Area 2. There is an orange plastic warning layer 12 inches above the MMC synthetic layers and LSC.

7.2.9.1 Handling and Disposal of Regulated Construction Materials

Direct-loading of excavated soil/debris into lined, sealed roll-off containers is the preferred excavation and transportation method; a controlled, temporary storage area will be constructed for use in the event that excavated material cannot be transported daily off-Site disposal (Drawings EN.01 and EN1.06.01). Conditions that might prompt the use of this temporary storage area, as a contingency, are:

- Volume limit to the daily capacity of the primary and alternate off-site disposal facilities;

- Off-site disposal facility hours of operation; and

- Limited availability of long-haul trucks.

The controlled storage/decontamination area will be located in close proximity to the excavation zone required for construction of the moment slab to reduce the distance for moving containers on the dedicated, temporary construction roads (Drawing DDP-F.15). The controlled area will be an approximately 2,500 square feet asphalt 3-inch pavement section with construction mats to displace the container loading on the MMC synthetic layers. The location of the controlled storage area is not in an area where the compressible clay stratum has been identified.

The controlled area will provide a storage capacity of ten 25-cubic yard lined and sealed roll-off containers, approximately 150 cubic yards of containerized soil/debris storage. Further discussion regarding soil/debris transportation and disposal is provided in Section 4 – Soil/Debris Handling and Management.

7.2.9.2 Imported Soil/Materials Control

In order to minimize the potential of introducing unacceptable materials onto the Site, it will be necessary to verify through documentation that imported materials are being provided from locations with a known history of the material source area. Imported materials will be provided by commercial suppliers only. Commercial suppliers shall provide a certification letter stating the environmentally acceptable historical use(s) of the material source property.

Fill documentation should include detailed information on the previous use of the land from where the fill is taken, whether an environmental site assessment was performed and its findings, and the results of any testing performed as described in the MDE Voluntary Cleanup Program (VCP) *Clean Imported Fill Material* guidance document (MHMP, Appendix B).

If there are no analytical results from testing performed by the commercial supplier, and prior to importing soil from any source, the material will be sampled and tested based on the requirements of the MDE VCP *Clean Imported Fill Material* guidance document Tables 1 and 2 (MHMP, Appendix B).

7.2.9.3 Handling and Re-Use of Site Soil

Clean soil/aggregate removed from above the synthetic layers of the MMC will be segregated from contaminated soil removed from below. Clean soil will be temporarily stockpiled within a designated stockpile area for cover soil (Drawing EN1.01). Aggregates and clean soil removed from above the MMC synthetic layers may be used below the new MMC synthetic layers. However, aggregates and granular soil removed from above the MMC synthetic layers will be sampled and analyzed prior to beneficial re-use above the MMC synthetic layers as provided in the MHMP, Appendix B.

7.2.9.4 Transportation and Off-site Disposal

Based upon the review of the historical analytical soil data and the prior waste profile classification as D007 for materials below the MMC, it is anticipated that contaminated soil/debris generated during excavation will be disposed of at an approved RCRA Landfill. Materials will be transported off-site for disposal following written approval of acceptance from the RCRA landfill facility's representative.

Honeywell maintains a list of their approved Subtitle C landfill facilities and as such the addition of alternative, proposed disposal facilities must be pre-approved.

There are four categories of water anticipated to be managed during intrusive work, including:

- Non-Contact: Storm water diverted from contact with contaminated material below the MMC synthetic layers;
- Contact: Storm water that comes into contact with contaminated material below the MMC synthetic layers;
- Contact: Equipment decontamination water; and
- Groundwater generated by the HMS and construction dewatering.

Should storm water that has not come into contact with contaminated material below the MMC synthetic layers pond on a controlled surface (e.g., mudmat, cover soil aggregate); the standing water will be pumped to a double-walled Frac tank (Drawings EN1.01 and EN1.04). This non-contact water will be held for analytical testing results to determine proper disposal as required by the City of Baltimore.

Storm water that inadvertently comes in contact with contaminated soil below the MMC synthetic layers will be collected in a sealed sump and pumped to a separate, double-walled Frac tank.

Equipment decontamination water will be temporarily stored in the same double-walled Frac tank provided for contact water and while the Tank room is isolated during selective demolition and pile driving activities.

Off-site transportation and disposal of HMS generated groundwater to Environmental Quality, Baltimore, MD will continue uninterrupted by construction.

7.3 PROGRESS SUBMISSIONS AND REPORTING

7.3.1 Documentation

As described in Section 7.1, the Contractors QC staff and Developer's field inspection /QA engineer will prepare field records to document construction, QC, and QA activities. Weekly reports will be prepared to summarize the major work activities, work approvals, construction issues, and corrective actions. A schedule update will be prepared monthly. From a geotechnical perspective, field staff will document the following elements:

1. Vibration monitoring;
2. Ground and instrument settlement monitoring;
3. Pipe pile driving records;
4. Fill compaction testing; and
5. Multimedia Cap reconstruction and QA inspection of contractor's vacuum/spark QC testing for geomembrane field welds and boot penetration seals.

From an environmental perspective, field staff will document the following:

1. Perimeter and work zone real-time air monitoring data and laboratory analytical results;

2. Source(s) of clean fill/aggregates, type of material, and documentation used to certify that the material is suitable and "clean" for on-site use;

3. Waste characterization laboratory analytical results;

4. Waste profile and facility acceptance of all materials to be transported and disposed off-Site;

5. Waste manifests;

6. Approved work plans; and

7. Approved material submittals.

Collectively, the geotechnical, environmental, and QA field staff will prepare the daily and weekly logs. At a minimum, the logs will identify the following:

- work performed;
- changed conditions;
- QA elements and deficiencies;
- monitoring results;
- corrective actions;
- design and construction modifications; and,
- other relevant design or construction activities.

Honeywell's Engineer will review weekly progress reports and monthly schedule updates. The weekly report will summarize the results of daily logs and visual inspections, any deficiencies and corrective actions, design changes, QA/QC activities, and work progress.

7.3.2 Modifications to the DDP or Consent Decree Work Plans

As discussed in Section 3.7.2, the current SSMP does not address the post-development cap foundations and pile penetrations, but allows the Plan to be revised to address development. Minor modifications to the SSMP that will be necessary during the active phase of construction are identified in Section 9. Honeywell will submit a formal request for the minor

modification to address SSMP activities during construction under separate cover. Upon completion of construction, a revised Surface Soil Monitoring Plan will be submitted by Honeywell for agency review and approval.

During the course of construction, if field conditions or construction activities warrant a modification to the elements presented in this DDP or any other minor modification to the Consent Decree Work Plans, HPD and Honeywell will notify USEPA and MDE, accordingly. The modification will be submitted to USEPA and MDE for review and approval.

7.3.3 Construction Completion Report

A Construction Completion Report will be prepared and submitted to USEPA, MDE and Honeywell. The report will be assembled and submitted upon completion of construction, construction-related monitoring, and receipt of all QA/QC test results. The report will document construction activities, compliance with the DDP, and any modifications. Specifically, the report will include the following information:

- construction activities;
- QA/QC documentation;
- documented deviations from the DDP;
- As-Built drawings related to the ERS components;
- Construction photographs;
- monitoring data;
- selected correspondence; and,
- other relevant construction and design information related to the modifications or restoration of the ERS.

8.0 PROJECT-SPECIFIC HEALTH AND SAFETY

ERM has prepared a *Health and Safety Plan, Area1, Phase 1 Development*, dated August 2013 (Appendix B). The purpose of this Health and Safety Plan (HASP) is to establish general personal protection standards and safety practices and procedures to be used as guidelines for the work at the Site. The HASP guidance is not intended to be and shall not be used as a Contractor-Specific Health and Safety Plan (HASP); rather, the contractor will be required to prepare their own HASP that meets or exceeds the requirements specified in the guidance plans.

Also, these documents are not intended to be inclusive of all Health and Safety issues that may be encountered at the Site, such as those associated with general construction activities. Rather, these documents are solely intended to provide guidance to Contractors by identifying environmental issues and constraints that Contractors at a minimum should include in their own HASPs.

Contractors will be required to prepare and implement and comply with their own HASP in accordance with all applicable federal, state and local regulations and standards of care. All Contractor-prepared HASPs will be approved by the General Contractor, or its designee, prior to their personnel mobilizing to the Site.

9.0 REMEDY PERFORMANCE MONITORING DURING AND AFTER CONSTRUCTION

As discussed previously in Section 3.7, the development design provides that all ERS components will remain operable and accessible following construction. This will allow Honeywell to meet the requirements of currently established monitoring programs.

Honeywell will continue to implement all monitoring requirements established in the Environmental Media Monitoring Plan and the Groundwater Gradient Monitoring Plan. As discussed in Section 7.3.2, a minor modification of the Surface Soil Monitoring Plan (SSMP) is required for the construction phase of the redevelopment, and a revised SSMP must be submitted for agency review and approval following construction. A summary of minor modifications for purposes of construction and revisions to the SSMP following construction are indicated below:

- The design proposes to terminate existing settlement monitoring point MP-1 because it is below the planned Dock Street platform which will structurally support the HMS and MMC. A new MP1A will be installed above the Wills Street HMS conveyance alignment below the Wills Street fill (The SSMP requires a minimum of six settlement monitoring points).

- Construction of the planned Dock Street platform will prevent sheet flow in the MMC drainage net from entering the toe drain on Dock Street. The design proposes to construct a new drain at the low point (Valley Drain) of the drainage net created by the Dock Street platform to convey water at the east end of Dock Street to the existing toe drain. This water will be sampled at the relocated SSMP-4 during construction. Water at the west side of Dock Street will be conveyed to a new infiltration point west of the Dock Street platform. A new sampling point SSMP-4A will be installed for sampling of drainage net water from the west portion of the development site and a new sampling point SSMP-4 will be installed (relocated) for sampling of drainage net water from the east portion of the development site.

- A 30″ storm drain in Wills Street crosses Dock Street at the east end of the Dock Street platform. This storm drain interrupts the toe drain at the east end of Dock Street. The Dock Street platform also obstructs flow to the toe drain. The design proposes to capture drainage net water from 90% of the development area for discharge

to a new drain along Dock Street inboard of the Dock Street platform (Valley Drain). This water will be discharged through relocated SSMP-4 (east Valley Drain-65%) and a new SSMP-4A (west Valley Drain-25%) west of the Dock Street platform. The 10% of the development area cap which will not pass through SSMP-4 is at the east edge of the MMC along Wills Street. The design proposes to allow drainage net water to infiltrate into the ground outside of the barrier by subdividing the existing toe drain into 50 ft long segments and creating infiltration points at each segment. Distribution of the infiltration along Wills Street will prevent collection of toe drain water at the intersection of Dock and Wills Streets. Design calculations and summary is presented in EE Memorandum No. 3.

- Construction of the pile supported platform for the HMS and MMC over the abandoned Dock Street bulkhead obstructs flow in the drainage net at the north perimeter. This pile support improvement requires revision of the SSMP requirement for the geomembrane to have a minimum slope of 1% at the perimeter. A collection pipe (new "valley drain") will be added up-slope of Dock Street to convey water off of the MMC. New sampling locations will be added for sampling of drainage net discharge. The substantial reduction in storm water loading provided by the building roof and streets and their storm drainage systems permits flatter slopes to be employed for MMC drainage net discharge.

Honeywell will submit a formal request for the minor modification to address SSMP activities during construction under separate cover. Upon completion of construction, a revised Surface Soil Monitoring Plan will be submitted by Honeywell for agency review and approval.

There are no revisions required in the Groundwater Gradient Monitoring Plan or the Environmental Media Monitoring Plan.

Appendix A
Table

Table A - Multimedia Cap Function Analysis

	Multimedia Cap Layer	Material	Inerim Cap Function	Final Development Cap		
				Areas Outside of Structures	Below Floor Slab	Below or Adjacent to Foundation on Piles
	Cover Soil	2 foot thick clean, imported cover soil, placed in two loose lifts and 6" of crushed stone	Protects multimedia cap against freeze-thaw and mechanical damage. Spreads concentrated loads over synthetic layers.	Leave in place; restore to original design.	May replace with 5" min concrete and management control.	May replace with 5" min concrete and management control.
	Visual Barrier	Bright orange synthetic grid installed 1 foot above geomembrane.	Provids a visual warning of presence of underlying membrane.	Leave in place; restore to original design.	Replace except where concrete is placed within 1 ft of geomembrane.	Not required; membrane penetration prevented by foundation element.
Synthetic Layers	Geotextile Cover	Non-woven getextile bonded to top of the drainage net, 16 oz/sy, overlap joints.	Prevents overlying soil from clogging the geonet flow voids.	Leave in place; replace to original design.	Leave in place; replace to original design.	Not required. Protect geomembrane before concrete is placed.
	Synthetic Drainage Layer	High flow HDPE geonet. Placed with overlap joints.	Provides drainage for cover soil. Conveys water down slope. Designed to perform under high overburden stress.	Leave in place; replace and restore drainage / discharge down slope.	Replacement not needed where infiltration is collected by structure. Seal cut faces against soil clogging.	Not required. Infiltration prevented by foundation element.
	60-Mil LLDPE Geomembrane	60-mil thick linear low-density polyethylene membrane. Overlap seams placed shingle-style, with welded seals. Positive slope from center of site to perimeter.	Protects overlying materials from subsurface contamination, and prevents infiltration to reduce ground water pump & treat quantity.	Leave in place; replace to original design. Extrusion weld seams.	Leave in place; replace to original design. Extrusion weld seams.	Required. Function is to protect overlying concrete from underlying contamination. Extrusion weld seams.
	Geosynthetic Clay Layer (GCL)	Low permeability bentonite clay sanwiched between two synthetic mesh layers; about 1/4" thinckness. Overlap joints, with powdered bentonite seal at joints.	Functions in conjunction with the overlying membrane to seal leaks through imperfections in the membrane. Bentonite should swell on contact with water leaking through the membrane to seal the leak.	Leave in place; replace to original design.	Replacement not needed where infiltration is collected by structure.	Not required; infiltration is prevented by foundation element.
	Geotextile Cushion	Non-woven geotextile, 16 oz/sy, needle punched.	Protects the geomembrane and GCL from mechanical damage due to contact with the crushed stone capillary break.	Leave in place; replace to original design.	Leave in place; replace to original design.	Not required where overburden load is carried by foundation element.
	Capillary Break Gravel	Min 6" thick layer of washed No. 57 crushed stone.	Prevent chromium from rising into the multimedia cap by capillary action.	Leave in place; restore to original design.	Leave in place; restore to original design.	Restore where foundation is above managed water level. Not required below water level.
	Base Geotextile	Non-woven geotextile, 16 oz/sy, needle punched.	Separates Capillary Break Gravel from the subgrade soil to prevent soil fouling of the Capillary Break Gravel.	Leave in place; replace to original design.	Leave in place; replace to original design.	Required where capillary break gravel is placed.
	Cap Subgrade Fill or Existing Subsurface	Compacted miscellaneus fill over abandend foundation.	Compacted fill was placed to establish multimedia cap grades and to support the multimedia cap. Asphalt paving may be directly below the capillary break and base geotextile in some areas.	Leave in place; restore to original design.	Leave in place or restore to provide positive slope.	Not required; geomembrane line and grade controlled by adjacent fill.
	Mechanical Boot	LLDPE extrusion-welded boot field welded to geomembrane. Neoprene gasket (closed cell) with stainless steel pipe clamps to close with steel pipe pile wall.	none	none	At each pile penetration through geomembrane.	At each pile penetration through geomembrane.

Appendix B
Control Documents

Air Monitoring Plan
Area 1, Phase 1 Development

Baltimore Works Site
Baltimore, Maryland

August 2013

By:
Environmental Resources Management Inc.
Harbor Point Development LLC

For:
U.S. Environmental Protection Agency – Region III
Maryland Department of the Environment

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 PURPOSE 1

1.2 SITE DESCRIPTION 2

1.3 SITE USE HISTORY 2

1.4 PRIOR DEVELOPMENT (AREAS 2 AND 3) 2

1.5 FUTURE DEVELOPMENT (AREA 1) 3

2.0 PRE-CONSTRUCTION AIR MONITORING 4

2.1 PCAM STUDY RESULTS 5

3.0 OFF-SITE AIR MONITORING 6

4.0 METEOROLOGICAL COMPARISONS 7

5.0 ADDITIONAL STUDY RESULTS 9

6.0 SITE-SPECIFIC BACKGROUND AND ACTION LEVELS TO BE USED DURING INTRUSIVE ACTIVITIES ASSOCIATED WITH CONSTRUCTION 11

6.1 REAL-TIME TOTAL PARTICULATES 11

6.2 REAL-TIME PARTICLE SIZE FREQUENCY 11

6.3 HEXAVALENT CHROMIUM 11

7.0 ACTION LEVELS AND RESPONSE ACTIONS 12

8.0 REAL-TIME MONITORING 14

8.1 REAL-TIME AEROSOL MONITORS 14

8.2 METEOROLOGICAL STATION 14

9.0 SAMPLE COLLECTION 16

9.1 HIGH VOLUME SAMPLER 16

9.2 FILTER MEDIA 16

9.3 CALIBRATION 17

10.0 LABORATORY ANALYTICAL METHODS 18

10.1 HEXAVALENT CHROMIUM 18

10.2 TOTAL PARTICULATES 18

10.3 QUALITY CONTROL 18

11.0 REPORTING 19

LIST OF APPENDICES

A Pre-Construction Air Monitoring Study

B Figures and Summary Tables

C Suggested Equipment

D Analytical Methods

LIST OF ACRONYMS

BTV – Background Threshold Value

CL – Confidence Limit

COC – Contaminant of Concern

CrVI – Hexavalent Chromium

° C – Degrees Celcius

° F – Degrees Farenheit

DHW – Dry Heavy Wind

DLW – Dry Light Wind

DDP – Detailed Development Plan

EPA – U.S. Environmental Protection Agency

ERS – Environmental Remediation System

HMS – Head Maintenance System

Lpm – Liters Per Minute

LSC – Layered Soil Cap

M^3 – Cubic Meters

MDE – Maryland Department of the Environment

µg - Microgram

mg – Milligram

MMC – Multimedia Cap

NOAA – National Oceanic and Atomospheric Association

ŋg – Nanogram

NIOSH – National Institute for Occupational Safety and Health

NWS – National Weather Service

OSHA – Occupational Safety and Health Administration

PAM - Perimeter Air Monitoring

PCAM – Pre-Construction Air Monitoring

PM – Particulate Matter

PSA – Particle Size Analysis

PVC – Polyvinyl Chloride

RAM – Real-time Aerosol Monitor

RH – Relative Humidity

µg – Microgram

µm - Micron

UPL – Upper Prediction Limit

UTL – Upper Tolerance Limit

WET - Rain

WMW – Wilcoxon-Mann-Whitney

WZ – Work Zone

1.0 INTRODUCTION

This Air Monitoring Plan ('the Plan") has been prepared for inclusion with the Detailed Development Plan (DDP) for the Harbor Point Area 1, Phase 1 Development (the "Site"). A preconstruction air monitoring study has been completed pursuant to the work plan approved by the U.S. Environmental Protection Agency (EPA) on 23 April 2013 and as subsequently modified to incorporate off site monitoring in response to EPA's and MDE's request. The results of the pre-construction air monitoring study have been incorporated into this Plan to establish the monitoring effort, Site-specific hexavalent chromium background concentration and Site-specific particulate action levels and responses to be implemented during Harbor Point development projects.

The principal contaminant of concern (COC) is hexavalent chromium (CrVI). The approved Environmental Remediation System (ERS) is operated and maintained by Honeywell International Inc. (Honeywell) pursuant to the Consent Decree dated April 27, 1989, as amended, among Honeywell, EPA and MDE to contain chromium contaminated groundwater and eliminate exposure to impacted soil. The ERS consists of the Multimedia Cap (MMC), Hydraulic Barrier, Head Maintenance System and Outboard Embankment.

1.1 PURPOSE

This Plan provides a description of the methods to be utilized for real-time particulate and weather data collection, air sample collection, laboratory analytical methods, and reporting to demonstrate the effectiveness of the dust control measures implemented during intrusive activities for the protection of human health and the environment. For the purpose of this Plan, "intrusive activities" occur any time there is disturbance of the surface immediately below the synthetic layers of the existing Multimedia Cap (MMC) in Area 1 or below the capillary break of the Layered Soil Cap (LSC) in Area 2 ("the Caps"). This Plan will be implemented at the initiation of intrusive activities and will continue through the completion of all intrusive activities, restoration of the Caps and the removal from the Site of all soil and debris excavated from below the MMC synthetic layers.

This plan is applicable specifically to redevelopment related activities performed by the Developer and the Developer's contractors and is not applicable to routine operations, monitoring and maintenance work undertaken by Honeywell pursuant to the existing Consent Decree Work Plans.

1.2 SITE DESCRIPTION

The Site is located on a peninsula on the northeast shore of the Patapsco River of the Inner Harbor, in the Fells Point section of Baltimore City, Maryland. The former chromium chemical manufacturing facility consisted of chromium processing production buildings and numerous support buildings on an area that covered approximately 14 acres. The Site is surrounded by water on the north, west and south, the Living Classrooms facility to the north and condominiums on South Caroline Street to the east. The Thames Street Wharf Office Building is located to the east, beyond which is the Douglas Maritime Museum at South Caroline and Thames Streets.

1.3 SITE USE HISTORY

The Site has been divided into Areas 1, 2, and 3. Area 1 is the principal site of Honeywell's (formerly AlliedSignal) Baltimore Works Facility (Figure 1, Appendix B). Chromium ore was processed in Area 1 from 1845 to 1985. The former manufacturing processes resulted in chromium impacts to soil and groundwater. An Environmental Remediation System (ERS) is maintained and operated by Honeywell International Inc. (Honeywell) to contain CrVI-impacted ground water in Area 1 and control the potential for human exposure to affected soil. The ERS consists of a Multimedia cap (MMC), Hydraulic barrier, Head Maintenance System (HMS), a ground water storage and transfer system, and Outboard Embankment. The HMS maintains an inward ground water gradient to mitigate the migration of chromium-impacted ground water from the Site.

1.4 PRIOR DEVELOPMENT (AREAS 2 AND 3)

During the construction of the Thames Street Wharf Office Building, the previously approved Air Monitoring Plan (ERM, 2008) was implemented during intrusive activities for the continuous period November 2007 through August 2008. Continuous total particulate concentration monitoring was performed utilizing DustTrak™ DR4000 real-time aerosol monitors (RAMs) at three (3) perimeter air station locations for those 10 months of intrusive construction work activities. The calculated mean total particulate concentration was 33.0 micrograms per cubic meter ($\mu g/m^3$) for the duration of monitoring.

1.5 FUTURE DEVELOPMENT (AREA 1)

During future development, the exposure pathway of concern is via potential airborne dust from intrusive activities resulting in incidental inhalation, ingestion or dermal contact. The approved Air Monitoring Plan will be implemented during intrusive activities for future Harbor Point development and will be modified, if necessary, as part of the DDP approval process.

2.0 PRE-CONSTRUCTION AIR MONITORING

On-site Pre-Construction Air Monitoring (PCAM) commenced on 23 April 2013 and was completed on 22 June 2013. The PCAM Report is provided in Appendix A. A supplemental Data Report has been prepared for electronic submittal which provides laboratory analytical reports, chains of custody and quality control statements. The supplemental Data Report is included on a CD-ROM in Appendix A.

Real-time aerosol monitors (RAMs) DustTrak™ DR4000 were deployed at seven (7) perimeter air monitoring (PAM) stations to continuously monitor ambient total particulate concentrations. The PAM stations were established daily at seven (7) of the twelve (12) locations surrounding the Harbor Point property boundaries (See Figures, Appendix A). The locations around the Area 1 perimeter correspond to existing HMS vaults where existing electric power is available. The locations adjacent to South Caroline Street correspond to light poles at the adjacent Thames Street Wharf Office Building parking lot for electric power access. The PAM stations continuously recorded total particulate concentrations at 1-minute averages operating at approximately 2 liters per minute (lpm), 24 hours per day for 60 days.

Pre-construction air sampling for laboratory analyses was conducted daily at each of the seven (7) PAM stations. Air samples were collected utilizing an AirCon2 sampling pump, calibrated daily using a primary source at 10 lpm. Air samples were submitted for laboratory analyses for CrVI, per analytical method OSHA ID 215, and Total Particulate concentrations per analytical method NIOSH 500. The air samples submitted were selected to fulfill the sampling matrix as requested by EPA and MDE for each of the meteorologically driven parameters as described in the approved PCAM Plan. All sampling events were 24 hours in duration.

The individual dataset summaries include:

- Hourly average weather observations (specifically wind speed, wind direction and rainfall);
- Hourly real-time particulate average concentrations;
- Airborne CrVI concentrations; and
- Airborne total particulate concentrations.

2.1 PCAM STUDY RESULTS

The datasets described above have been evaluated utilizing EPA's ProUCL4.1 software package to compute parametric and nonparametric upper limits that estimate the background threshold values (BTVs), or not-to-exceed values. These upper limits; including upper prediction limits (UPLs), upper tolerance limits (UTLs), or upper percentiles (%tile), are used to estimate the BTVs that are then utilized for determining if individual observations are consistent with the population of background concentrations.

Statistical analyses were performed on datasets with no non-detects and with non-detects. The ProUCL4.1 dataset is provided in Tables 1a-d, Appendix B. The following summarizes the data analyses for the different objectives described in the approved PCAM Plan:

Background Threshold Values (ProUCL4.1)

Real-time Aerosol Monitor (DustTrak™ DR4000) [µg/M^3]

CL / Coverage	%tile	UPL	UTL	2nd Largest	n
99%-99%	47.6	49.3	56.2	56.2	405
97.5%-97.5%	43.8	44.5	46.5	---	---
95%-95%	35.5	35.7	37.5	---	---

See Tables 2a-d, Appendix B.

Total Particulates (NIOSH 0500) [µg/M^3]

CL / Coverage	%tile	UPL	UTL	Maximum	n
99%-99%	25.5	37.24	36	36	284
97.5%-97.5%	23.4	25.9	28	---	---
95%-95%	21.7	23	24	---	---

See Tables 3a-d, Appendix B.

Hexavalent chromium (OSHA ID215) nanograms per cubic meter [ηg/M^3]

CL / Coverage	%tile	UPL	UTL	Maximum	n
99%-99%	7.9	11.0	23.0	23.0	372*
97.5%-97.5%	7.0	9.3	11.0	---	---
95%-95%	6.1	6.3	7.7	---	---

* Includes Off-site Air Monitoring data (See Section 3.0)

See Tables 4a-d, Appendix B.

The BTVs presented above increase, as expected, from:

> Upper Percentile (%tile) < Upper Prediction Limit (UPL) < Upper Tolerance Limit (UTL) < Maximum Value Observed*

* Depending upon the data distribution and sample size, the BTVs and other not-to-exceed values may be estimated by the maximum detected value, or 2nd or 3rd largest maximum value for larger datasets.

3.0 OFF-SITE AIR MONITORING

Off-site air monitoring (OSAM) commenced on 11 June 2013 and was completed on 9 July 2013 (See Figures and Tables, Appendix A). For the period 11 June through 23 June 2013, three (3) monitoring station locations were established. A fourth air monitoring station location was subsequently established on 24 June 2013.

As with the PCAM study, OSAM air samples were collected utilizing an AirCon2 sampling pump, calibrated daily using a primary source at 10 lpm. Air samples were submitted for laboratory analyses for CrVI, per analytical method OSHA ID 215, and Total Particulate concentrations per analytical method NIOSH 500. All sampling events were 24 hours in duration.

Hexavalent chromium concentration data from the PCAM and OSAM sampling effort have been combined to evaluate the Background Threshold Values presented above in Section 2.1.

4.0 METEOROLOGICAL COMPARISONS

Pursuant to the work plan requested and approved by EPA on 23 April 2013, the potential meteorological variability in the on the on-site PCAM dataset was evaluated through a number of statistical comparisons. Upwind versus downwind CrVI concentrations were compared using the Student's t-test with no non-detects and the Wilcoxon-Mann-Whitney (WMW) test with non-detects. Two sets of upwind versus downwind data were tested by substituting PAM stations that also represented that day's wind direction (Figures 5a and b, Appendix B).

The test comparison results for both datasets indicate there is not a statistically significant difference (99% CL) between upwind and downwind CrVI airborne concentrations. *Downwind CrVI airborne concentrations are less than or equal to upwind CrVI airborne concentrations.*

Additionally, CrVI airborne concentrations were compared using three (3) weather conditions; dry light wind (DLW), dry heavy wind (DHW) and rain (WET) as provided in Tables 6a-c, Appendix B. The same statistical tests were performed as with the upwind versus downwind comparisons.

Test comparison results indicate that there is a statistically significant difference (99% CL) between dry light wind CrVI airborne concentrations and dry heavy wind CrVI airborne concentrations. *Dry heavy wind CrVI airborne concentrations are greater than dry light wind CrVI airborne concentrations.*

The test comparison results indicate that there is not a statistically significant difference (99% CL) between dry light wind CrVI airborne concentrations and rain CrVI airborne. *Dry light wind CrVI airborne concentrations are less than or equal to CrVI airborne concentrations during rainy days.*

The t-test comparison result indicates that there is a statistically significant difference (99% CL) between CrVI airborne concentrations during rainy days and dry heavy wind CrVI airborne concentrations. *Dry heavy wind CrVI airborne concentrations are greater than CrVI airborne concentrations during rainy days.*

Contrary to the t-test result, the WMW test comparison result indicates that there is not a statistically significant difference (99% CL) between CrVI airborne concentrations during rainy days and dry heavy wind CrVI airborne concentrations. *Dry heavy wind CrVI airborne concentrations are less than or equal to CrVI airborne concentrations during rainy days.*

Logic suggests that *dry heavy wind CrVI airborne concentrations are greater than CrVI airborne concentrations during rainy days* as indicated by the Student's t-test result.

5.0 ADDITIONAL STUDY RESULTS

Early in the course of the PCAM study, CrVI airborne concentration results were consistently being reported above the method detection limit by the analytical laboratory (average ~2 ηg/M^3). The concomitant total particulate concentration laboratory results (NIOSH 0500) were low, as was the DustTrak™ DR4000 total particulate concentration data (See BTVs, above). These conditions suggest that the airborne CrVI being reported is not associated with large particles, but rather the emissions-sized particulate matter less than 2.5 microns in diameter (PM2.5).

To further investigate these conditions, four (4) DustTrak™ DRX 8534 real-time aerosol monitors (Appendix B) with particle size analysis (PSA) capability were added to the PCAM sampling stations as shown in Figure 3, Appendix B. Comparisons were made between the DustTrak™ DR4000 that remained in use and operating and the DustTrak™ DRX 8534 which operated continuously, side-by-side, for a two week period from 11 June through 23 June 2013. The ProUCL4.1 dataset used for evaluation and statistical analyses is provided as Table 7 in Appendix A.

A regression analysis performed on ProUCL4.1 comparing the total particulate concentration measured by the DustTrak™ DR4000 to the total particulate concentration measured by the DustTrak™ DRX8534 shows that the DR4000 total particulate concentration is approximately 10 µg/M^3 greater than the DRX8534 total particulate concentration at UTL 99%-99% (Figure 5, Appendix B). The difference between the these two (2) instruments, both manufactured by Thermo Scientific, Inc. is believed to be attributable to the different optic systems that allow the DR4000 to measure higher particulate concentrations (up to 400 µg/M^3), whereas the DRX 8534 upper concentration limit is 150 µg/M^3. The DustTrak™ DRX 8534 PSA total particulate concentration data compare well to the laboratory analyses total particulate concentration data (Figure 6, Appendix B).

As provided for the DustTrak™ DR4000 data above, BTVs calculated for the DustTrak™ DRX 8534 with PSA are provided below:

Real-time Aerosol Monitor (DustTrak™ DRX 8534) [µg/M^3]

CL / Coverage	%tile	UPL	UTL	Maximum	n
99%-99%	45.5	47.45	47.5	47.5	50
97.5%-97.5%	42.9	46.3	47.5	---	---
95%-95%	41.4	42.3	43.38	---	---

See Tables 8a-d, Appendix B.

The DustTrak™ DRX 8534 with PSA capability collects and stores particle size data concentration data in five (5) channels corresponding to PM1, PM2.5, PM4, PM10 and PM total (up to 15 microns). The PSA data demonstrate the high frequency of small diameter particles with 95% of the size frequency and mass concentration below PM2.5 (Figures 7 and 8, Appendix B).

In order to further investigate the higher than expected CrVI airborne concentrations occurring during a period of relatively low airborne particulate concentrations, PM2.5 impactors were used to sample side-by-side with the total particulate and CrVI sampling initiated for the PCAM study. Student's t-test comparison of total particulate concentrations to PM2.5 particulate concentrations indicates that there is not a statistically significant difference (99% CL) as shown in Table 9, Appendix B. *Total particulate airborne concentrations are less than or equal to the less than (<) PM2.5 airborne concentrations.*

Similarly, the t-test comparison of Total CrVI concentrations to PM2.5 CrVI concentrations indicates that there is not a statistically significant difference (99% CL) as shown in Table 10, Appendix A. *Total CrVI concentrations are less than or equal to the < PM2.5 CrVI concentrations.*

6.0 SITE-SPECIFIC BACKGROUND AND ACTION LEVELS TO BE USED DURING INTRUSIVE ACTIVITIES ASSOCIATED WITH CONSTRUCTION

Site-specific background values and action levels have been established based upon the data evaluation presented in Section 2. Specifically, the calculated Upper Tolerance Limit (UTL 99%) background threshold values, as calculated using ProUCL 4.1, will be used for the real-time particulate concentration action level and hexavalent chromium concentration background level.

6.1 REAL-TIME TOTAL PARTICULATES

The Site-specific real-time total airborne particulate concentration action level, as measured utilizing the DustTrak™ DRX 8534 is: **47.5 μg/M³.**

The DustTrak™ DRX 8534 total particulate concentration audible alarm shall be set at **40 μg/M³**.

6.2 REAL-TIME PARTICLE SIZE FREQUENCY

In addition to the Site-specific total airborne particulate concentration action and audible alarm levels above, a qualitative action level has been established based upon the particle size frequency distribution greater or less than PM2.5, as measured utilizing the DustTrak™ DRX 8534.

The qualitative action level for determining the nature of the condition causing a potential action level total airborne particulate concentration is: **Greater than five (5) percent frequency distribution in the greater than PM2.5 particle size fraction.**

The DustTrak™ DRX 8534 shall be operated and viewed in the total particulate concentration and particle size frequency monitor modes during periods of potentially elevated particulate concentrations.

6.3 HEXAVALENT CHROMIUM

The Site-specific hexavalent chromium background threshold value concentration, as measured by OSH ID 215, is: 23.0 ηg/M³

7.0 ACTION LEVELS AND RESPONSE ACTIONS

Best management practices shall be vigilantly employed to eliminate potential dust emissions associated with work activities during construction. In the event that the real-time total airborne particulate concentration utilizing the DustTrak™ DRX 8534 exceeds the **Alarm Level** set at **40 μg/M³**, the following response actions shall be taken:

1. Work activities will be immediately scrutinized by the Developer's field representative to determine if an obvious work activity on the Site exists that requires corrective action to mitigate particulate emissions, and if so, corrective action will be taken;

2. If no potential dust causing work activity on the Site is observed, the DustTrak™ DRX 8534 unit that sounded the alarm will be continuously observed for both total particulate concentrations and particle size frequency for 15 continuous minutes.

    a. If during these 15 minutes the real-time data suggests that the condition has improved or is improving, and the total particulate concentration remains below the alarm level, then no further action is required. The Developer's field representative will complete an "event log" entry describing the condition(s), including off-site activities, if observed, and the appropriate response(s) taken; or

    b. If after 15 minutes the real-time data suggests that the condition has not improved or is not improving, **and** the particle size distribution shows a **greater than five (5) percent frequency in the greater than PM2.5 particle size fraction associated with Site activities** (see Figure 9, Appendix B for example condition), the Developer's field representative will immediately direct implementation of additional dust controls, and initiate air sampling for total particulates and CrVI and PM2.5 particulates and CrVI at the work zone and perimeter monitoring stations.

    c. If after 60 minutes from the initial alarm, the real-time data suggests that the condition has not improved or is not improving, and the total particulate concentration remains at or above the alarm level, and the greater than PM2.5 particle size frequency is greater than five (5) percent, the Developer's field representative will **STOP** all work activities that may be potentially contributing to the elevated total particulate

concentrations. At this juncture the following response actions will occur:

i. Continue work zone and perimeter real-time total particulate monitoring.

ii. Continue to collect total and PM2.5 particulate and CrVI samples over 24-hour sampling periods at the perimeter monitoring locations for five (5) consecutive days.

iii. Submit air samples for laboratory analyses, requesting a 3-day turn-around-time for analytical results to be reported.

iv. Once the real-time total particulate concentration readings are below the alarm level for 15 minutes or it is determined to not be associated with construction, intrusive work and material management activities may resume.

d. Review and compare total particulate and total CrVI concentration data to PM2.5 particulate and PM2.5 CrVI concentration data to determine whether the larger particle size frequency observed shows significantly greater CrVI in the size fraction >PM2.5 and whether Background Threshold Values (BTVs) were exceeded.

e. If the laboratory analytical results show that the BTV for CrVI (23.0 ηg/M^3, n=372) is exceeded and attributable to dust emissions from on-Site activities in the size fraction >PM2.5, additional methods to control potential dust emissions will be implemented. Additional methods may include, but not be limited to, applying spray-foam to exposed surfaces below the MMC synthetic layers as soon as practically possible after excavation activities have ceased for the work day, and/or restricting the size of the excavation area in the contamination zone below the MMC synthetic layers at the location where the >PM2.5 action level conditions were observed.

f. When conditions warrant that no further action is required on-Site, the Developer's field representative will complete an "event log" entry describing the condition(s) and the appropriate response(s) taken. Laboratory analytical results will be maintained in a companion binder to the event log.

8.0 REAL-TIME MONITORING

8.1 REAL-TIME AEROSOL MONITORS

DustTrak™ DRX 8534 aerosol monitors (Appendix C) will be utilized at four (4) perimeter air monitoring (PAM) stations to continuously monitor total particulate concentrations and particle size distributions (Figure 2, Appendix B). The DustTrak™ DRX 8534 will continuously monitor and record total particulate concentrations at 1-minute averages operating at 2 liters per minute (lpm), 24 hours per day, seven days per week.

Work Zone (WZ) monitoring will also be performed utilizing two (2) DustTrak™ DRX 8534 aerosol monitors; one positioned upwind and the other positioned downwind of the intrusive activity area. The WZ stations will continuously monitor and record total particulate concentrations at 1-minute averages operating at 2 lpm during work hours.

The monitoring instruments and sampling equipment will be protected from weather inside a waterproof case ("pelican" or equivalent) with an omni-directional air intake port and will be mounted on a tripod set at a height of 1.5 to 2 Meters above the ground surface (breathing zone). The data loggers will be downloaded to a personal computer.

The DustTrak™ DRX 8534 pertinent manufacturer's specifications are:

- Concentration Range: 0.001 to 150 mg/M^3;
- Particle Size Range: 0.1 to 15 microns;
- Accuracy: 0.1% of reading, or 0.001 mg/M^3 whichever is greater; and
- Sample Flow Rate: 1.0 to 3.0 liters per minute (lpm)

8.2 METEOROLOGICAL STATION

Weather data will be collected continuously and recorded at 15-minute averages, 24 hours per day, seven days per week, utilizing a Davis Instruments Vantage Pro 2, or equivalent, weather station (Appendix C). The weather station console interfaces to a personal computer to create data logs of hourly averages for wind speed, wind direction, temperature, barometric pressure and humidity, as well as daily precipitation levels.

Weather station sensors and the rainfall collection bucket will be pole-mounted at an unobstructed location. The anemometer will be positioned at a height of ten (10) Meters (32.5 feet) above the ground surface at an unobstructed wind flow location as recommended by National Oceanic and Atmospheric Administration (NOAA) - National Weather Service (NWS) and weather instrument manufacturers. As such, the meteorological data collected will be comparable to other weather station data reported in the region.

The Vantage Pro 2 pertinent manufacturer's specifications are:

- Temp accuracy (outside): 1°F (0.5°C)
- RH accuracy (outside): ±3%
- Wind speed accuracy: ±5%
- Wind direction accuracy: ±3°
- Rain fall accuracy: ±4%

9.0 SAMPLE COLLECTION

Sample collection is not required on non-work days and/or rain days if soil/debris below the MMC synthetic layers is not exposed, except as described in described in Section 4. Perimeter monitoring air sampling events will be 24 hours in duration. Work Zone monitoring will be for the duration of the work day.

9.1 HIGH VOLUME SAMPLER

Gilian AirCon 2, or equivalent, high volume air samplers (Appendix C) will be utilized to collect the air samples at each of the PAM and WZ stations for hexavalent chromium and total particulate analyses. Rotometers will be calibrated daily as a secondary calibration source to ensure the nominal flow rate of 10 lpm at the commencement of sampling for new filter cassette and PM2.5 impactor. The flow rate will also be measured at the end of the 24-hour sampling period to determine whether there has been a significant change related to filter clogging.

An instant fault function will be set on the AirCon 2 sampler to shut down the pump when the pressure in the bypass path differs more than ± 5% from the value that was stored initially during flow calibration. Samples will be voided whenever the instant fault function trips with a less than sixteen (16) hour sample duration (<10,000 liters, total sample volume).

9.2 FILTER MEDIA

The pre-loaded, 37 millimeter diameter polystyrene cassette, with a 5.0 micron (µm) pore size polyvinyl chloride filter selected for air sampling meets the OSHA Analytical Method ID 215 requirement for hexavalent chromium analysis (Appendix D). Additionally, the polyvinyl chloride filter will be pre-weighed as required by NIOSH Analytical Method 0500 for total particulates (Appendix D). The PM2.5 impactor utilizes a 47 millimeter diameter, 5.0 µm pore size polyvinyl chloride filter. The low tare weight and moisture pickup of the PVC filter media enhance gravimetric stability, reported to be < 0.5% after 24 hours at 48% RH and 122^{o} F (50^{o} C).

9.3 CALIBRATION

The flow rate for each of the high volume samplers and the PSA pumps described above will be calibrated daily utilizing a Bios International Defender Primary Calibrator, or equivalent (Appendix C). The high volume sampler will be calibrated with the filter cassette media and PM2.5 impactor in place.

10.0 LABORATORY ANALYTICAL METHODS

The following methods will be followed for laboratory analyses of the collected air samples and are provided in Appendix D.

10.1 HEXAVALENT CHROMIUM

OSHA Analytical Method ID 215 will be utilized for the analysis of hexavalent chromium. The same filter cassettes used for the total particulate sampling will also be used for the CrVI sampling and analysis. The sample flow rate will be calibrated 10 liters per minute in order to achieve a method detection limit of approximately 0.7 ηg/M^3. Additionally, the laboratory method reporting limit must not be greater than 0.01 micrograms CrVI.

10.2 TOTAL PARTICULATES

NIOSH Analytical Method 0500 will be utilized for the analysis of total particulates. Laboratory provided, tare weighted, 37-millimeter diameter, 5.0 µm porosity, PVC membrane filters with a cellulose back-up pad will be mounted into 37-millimeter diameter polystyrene cassettes. The sample flow rate will be set to approximately 10 liters per minute instead in order to achieve a low method detection limit of approximately 3.0 µg/M^3. Additionally, the laboratory method reporting limit must not be greater than 100 micrograms.

10.3 QUALITY CONTROL

Two (2) media blanks and two (2) field blanks from each "lot" of 100 pre-loaded filter cassettes received from the filter supplier will be submitted to the laboratory for CrVI and total particulate analysis. All cassettes will be utilized for sampling within the supplier's provided expiration date.

All samples and blanks collected during air monitoring will be transported to the laboratory, with a properly completed chain-of-custody, no more than two (2) weeks from the date of collection. The sample cassette holding time for laboratory analyses is thirty (30) days at ambient (20 to 25 °C) temperature for both analytical methods. The laboratory written analytical results reporting time is seven (7) business days from receipt of the samples.

11.0 REPORTING

The Developer's field representative is responsible for immediately reporting to the Developer, Owner and Developer's Construction Superintendent, that the established Site-specific dust action levels have been exceeded. The Developer's Construction Superintendent is responsible for implementing the Contract Documents specified dust control measures or making modifications to those dust control measures to mitigate the condition.

Daily data summary tables with hourly airborne particulate concentrations for each PAM station, hourly wind speed, wind direction and daily rainfall will be prepared by the Developer's field representative. The daily data summary tables and event logs, if any, will be distributed by the Developer's field representative to the Owner and Developer every two (2) weeks and will incorporate the laboratory analytical results as available. The daily data summary tables and event logs, if any, as well as laboratory analytical results will be distributed to EPA and MDE on a monthly basis.

Appendix A
Pre-Construction Air Monitoring Study

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore City, Maryland

August 2, 2013

Prepared for:

HARBOR POINT DEVELOPMENT LLC
c/o Beatty Development, LLC
1300 Thames Street, Suite 110
Baltimore, Maryland 21231

Attn: Mr. Jonathan Flesher

Prepared by:

GTA USA, LLC
Geotechnical and Environmental Consultants
14280 Park Center Drive, Suite A
Laurel, Maryland 20707
(410) 792-9446 or (301) 470-4470
Facsimile (410) 792-7395
www.mragta.com

Project No: 130467USA

GTA USA, LLC

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

August 2, 2013

Harbor Point Development LLC
c/o Beatty Development, LLC
1300 Thames Street, Suite 110
Baltimore, Maryland 21231

Attn: Mr. Jonathan Flesher

Re: Pre-Construction Air Monitoring Summary
Harbor Point
Baltimore City, Maryland

Dear Mr. Flesher:

In accordance with our agreement dated April 18, 2013, GTA USA, LLC (GTA) has performed a Pre-Construction Air Monitoring (PCAM) study at the Harbor Point site, in Baltimore City, Maryland (the "subject property"). The PCAM consisted of a 60-day period where the ambient air conditions around the Harbor Point site were evaluated for airborne particulates using real-time aerosol monitors, and for total particulates and hexavalent chromium using laboratory analysis.

This report transmits GTA's findings. Should you have any questions regarding this report, or should you require additional information, please contact our office at (410) 792-9446.

Sincerely,
GTA USA, LLC

Samuel J. Stevenson
Associate

SWC/SJS

S:\Project Files\2013\130467USA Harbor Point Parcel 2\Doc\ENV\ENV 130467USA PCAM Summary Report.docx

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Purpose 1
1.2 Limitations 1

2.0 SITE DESCRIPTION 2

3.0 DATA COLLECTION 2
3.1 Meteorological Station 3
3.2 Air Monitoring Stations (AMs) 4
3.2.1 RAMs 4
3.2.2 AirCons 4
3.2.3 Calibration 5
3.2.4 Quality Control 5
3.2.5 Analysis Results 6

4.0 ADD-ON TASKS 6
4.1 PSA-Impactor Add-On 7
4.2 Off-Site Air Monitoring Add-On 7
4.3 Off-Site Air Monitoring Extension 8

LIST OF APPENDICES

Appendix A Figures *(6 pages, 11”x17”, color)*
Appendix B Photographs *(3 pages, color)*
Appendix C Overall Summary Table *(1 page, 11”x17”)*
Appendix D Daily Summary Tables *(61 pages, 11”x17”, color)*
Appendix E Impactor Summary *(1 page)*
Appendix F Off-Site Air Monitoring Station Summary *(1 page)*
Appendix G Chain of Custody Forms/Laboratory Analysis Reports *(299 pages)*

PRE-CONSTRUCTION AIR MONITORING SUMMARY

HARBOR POINT
BALTIMORE CITY, MARYLAND
AUGUST 2, 2013

1.0 INTRODUCTION

1.1 Purpose

At the request of Harbor Point Development LLC, GTA USA, LLC (GTA) has performed a Pre-Construction Air Monitoring (PCAM) study at the Harbor Point site, in Baltimore City, Maryland (the "subject property"). The PCAM consisted of a 60-day period where the ambient air conditions around the Harbor Point site were evaluated for airborne particulates using real-time aerosol monitors, and for total particulates and hexavalent chromium using laboratory analysis.

These services were performed in accordance with the *Pre-Construction Air Monitoring (PCAM) Plan*, dated April 11, 2013, which was prepared by Environmental Resources Management (ERM), and reviewed and accepted by the United States Environmental Protection Agency (USEPA) and the Maryland Department of the Environment (MDE),

1.2 Limitations

This report summarizes sampling activities, real-time field readings, and analysis results, using methodologies and protocols that are described herein, using generally accepted professional environmental practice under similar circumstances. The conclusions reached regarding the conditions of this site do not represent a warranty that all areas within the site are of a similar quality as may be inferred from observable site conditions, field readings, and sampling and analysis results. Site conditions were inferred from the results of field screening and laboratory analysis of samples obtained at specific locations and on specific dates. These conditions may not remain consistent through the passage of time.

GTA prepared this report for Harbor Point Development LLC, under the terms and conditions of GTA's contract(s) with Harbor Point Development LLC. GTA acknowledges that this document is being submitted to the USEPA and the MDE, and will be part of the public record, and that these agencies are expected to use this report as part of their review processes. However, use of this report by any third party is at their sole risk. GTA is not responsible for any claims, damages, or liabilities associated with unauthorized third-party use.

2.0 SITE DESCRIPTION

The subject property comprises the majority of the Harbor Point peninsula, located west of Caroline Street, in downtown Baltimore, Maryland. The site mainly consists of the gravel-covered surface of the multimedia cap, with the Honeywell Transfer Station (1000 Wills Street) on the north-central portion of the site, paved parking lots on the south-central and eastern portions of the site, and minor grassed areas. The Thames Street Wharf office building is immediately southeast of the subject property. The Inner Harbor borders the subject property to the south, west, and northwest. Current site conditions are shown on the aerial photographic bases of the figures included in *Appendix A*.

3.0 DATA COLLECTION

Equipment installations occurred between Friday, April 19 and Monday, April 22, 2013. The equipment included one meteorological station installed at the Honeywell Transfer Station, and 7 perimeter air monitoring units (PAM-1 through PAM-7) installed around the perimeter of the site. Each PAM consisted of a real-time aerosol monitor (RAM) and an air sampling pump, contained in a NEMA enclosure, which was mounted on a tripod. A remote data acquisition telemetry package was also installed in each enclosure. The PAMs were rotated between 12 possible air monitoring locations (AM-1 through AM-12) designated in the *PCAM Plan*. The equipment remained in place for a roughly 60-day monitoring period (April 23 through June 23). All on-site equipment was removed on June 24, 2013.

As discussed in *Section 4.0*, the initial PCAM scope was expanded during the final two weeks of the program to include additional equipment (particle size analyzers [PSAs] and

particulate matter 2.5 micron [PM2.5] Impactors) at four of the AM stations, and three off-site air monitors (OSAMs). The three OSAMs and a fourth OSAM were used to collect additional off-site samples during a two-week extension period, beyond the baseline 60-day period.

3.1 Meteorological Station

GTA installed a Lufft WS600 Weather Station on the roof of the Honeywell Transfer Station, positioned at a height of 10 meters (32.8 feet) above the ground surface. Photographs of the weather station are included in *Appendix B.* The weather station continuously recorded conditions at 5-minute averages (the maximum allowable for this unit), and conveyed the data to a website via a telemetry package. The recorded weather conditions included:

- barometric air pressure,
- dewpoint,
- precipitation,
- relative humidity,
- temperature,
- wind direction, and
- wind speed.

The weather data were regularly downloaded and processed to provide hourly averages for wind speed, temperature, barometric pressure, and humidity; an hourly mode for wind direction; and an hourly sum for precipitation. Weather data are presented in the summary tables in *Appendix C* and *Appendix D.*

As discussed in the *PCAM Plan*, the weather data were used to establish which samples should be submitted for laboratory analysis, in accordance with the desired sampling quotas. By the end of the 60-day period, a total of 210 samples were desired from the 7 PAMs. This would result in 30 samples from each station: 10 collected from dry/light wind days, 10 collected from dry/heavy wind days, and 10 collected from rain days. Ultimately, samples were analyzed for hexavalent chromium from 40 weather days: 16 dry/light wind days, 8 dry/heavy wind days, 14 rain days, and 2 days that fell outside this classification. Two additional days (one dry/light wind and one out of classification) were analyzed for particulates.

Note that the initial definition of a dry/heavy wind day (average wind >10 miles per hour [mph] and humidity <70%) resulted in no days meeting that classification. Therefore, the definition was later adjusted to an average wind speed >7 mph.

3.2 Air Monitoring Stations (AMs)

Each PAM consisted of two main components: an MIE DataRAM 4 (DR4000) and a Gilian AirCon 2 high volume air sampler. The DR4000 and the AirCon were mounted in a NEMA enclosure on a tripod, with electrical power provided from a nearby outlet via extension cords. The RAM and the AirCon were each connected to an omni-directional air intake on the top of the enclosure, such that the intakes were at a height of 1.5 to 2 meters above ground (i.e., in the breathing zone). Photographs of the PAMs are included in *Appendix B.*

Some of the PAMs were periodically rotated between AM stations. The locations of the PAMs during each sampling period are shown on the figures in *Appendix A,* and they are also noted in the summary tables in *Appendix C* and *Appendix D.*

3.2.1 RAMs

The RAMs were set with an intake flow rate of 2.0 liters per minute (Lpm), and GTA used a calibrator on a daily basis to check the flow rate (see *Section 3.2.3*). The RAMs were set to collect real-time particulate readings at a one-minute frequency, and the readings were downloaded remotely via a telemetry package in each enclosure. The RAM data were regularly downloaded and processed to provide hourly averages for particulate concentrations. RAM data are presented in the summary tables in *Appendix C* and *Appendix D.*

3.2.2 AirCons

The AirCons were set with an intake flow rate of 10 Lpm, and GTA used the calibrator on a daily basis to check the flow rate (see *Section 3.2.3*). The sampling train of each AirCon consisted of the omni-directional intake, connected via tubing to the sample media, then via tubing to the AirCon pump intake. The sampling media consisted of a 37-millimeter diameter polystyrene cassette, with a 5.0 µm pore size polyvinyl

chloride (PVC) filter. Cassettes were installed in the sampling train of each AirCon for an approximate 24-hour sampling period. At the end of each 24-hour sampling period, cassettes were removed and capped, logged, and retained for possible laboratory analysis of total particulates (NIOSH Analytical Method 500) and hexavalent chromium (OSHA Analytical Method ID 215). A new cassette was then placed in the sampling train for the next 24-hour sampling period.

3.2.3 Calibration

GTA checked the flow rate of each RAM and each AirCon using a Defender 510H Calibrator, on a daily basis. The flow rates were recorded in a project log. The intended flow rate for each RAM was 2.0 Lpm, and readings were typically within 0.1 to 0.2 Lpm of that intended flow rate.

The intended flow rate for each AirCon was 10 Lpm, in order to achieve the desired low detection limits for the hexavalent chromium analysis. The actual AirCon flow rates were somewhat variable, based on the nature of the equipment, varying approximately 0.5 to 1.0 Lpm from the intended flow rate. During each daily visit, GTA recorded the AirCon flow rate representing the end of the 24-hour sampling cycle for the cassette, then exchanged the used cassette with a new cassette, and checked the flow rate again, adjusting it as needed and recording this value as the initial flow rate for the next 24-hour sampling cycle. The initial and final flow rates were averaged, resulting in the average flow rate for the 24-hour sampling period for the purposes of calculating the particulate and hexavalent chromium concentrations by the laboratory.

3.2.4 Quality Control

From each batch of 100 filter cassettes, GTA collected 2 media blanks and 2 field blanks. The media blanks were unexposed. The field blanks were placed in one of the PAMs during a given 24-hour sampling period, with the caps removed, but were not connected to the sampling train. A total of 14 blanks (7 media and 7 field) were submitted for analysis.

The serial numbers, start/end times, flow rates, and sample locations for the collected samples and blanks were recorded into the project log each day. The "sample date" designation for each sample represents the date the sample was collected, at the end of the 24-hour sampling period. During the first week of the PCAM program, the sampling period began and ended in the middle of the day (roughly 11 am to 1 pm). Thereafter, the sampling period began and ended late in the day (roughly 4 pm to 6 pm).

The samples and blanks were logged onto a Chain of Custody document for transportation back to GTA's office or directly to the analytical laboratory. The majority of the samples were shipped to the laboratory within several days of collection. However, due to the eventual redefining of a dry/heavy wind day, several samples in that classification (May 13, 14, and 25, 2013) were analyzed after the standard 30-day sample holding time.

3.2.5 Analysis Results

Analysis results are presented in the summary tables in *Appendix C* and *Appendix D*. Copies of the Chain of Custody documents and the laboratory reports are included in *Appendix F*.

Analysis of the media and field blanks indicated that one field blank, which was collected on May 25, 2013, contained 0.056 mg total particulates. None of the 13 other blanks contained total particulates or hexavalent chromium above the laboratory's reporting limits.

4.0 ADD-ON TASKS

At the request of the Client and ERM, GTA provided several additional scopes of service that were not in the *PCAM Plan*. These additional services are described in the following sections.

4.1 PSA-Impactor Add-On

At four of the existing PAMs, at the north, south, east, and west ends of the site, additional equipment was installed for the final two weeks of the PCAM program. First, a particle size analyzer (PSA) was installed, providing more clarity in the particle size being detected by the RAMs. The PSAs were also connected to the telemetry package, and the data were downloaded and processed on a regular basis. The acquisition of the PSA data occurred between June 10 and June 23, 2013. Summary tables of the PSA readings were provided to the Client and ERM previously.

Second, the existing AirCon sample train was split into two separate sampling trains using a valve. One side of the sampling train continued to collect a sample using the 37 mm cassettes, per the *PCAM Plan*. The other side of the sampling train collected a sample through a PM2.5 Impactor and associated 47 mm filter, and that filter was analyzed for particulates and hexavalent chromium, which would therefore represent only the PM2.5 fraction of the total respirable dust. The baseline AirCon flow rate was increased, and the flow proportions were adjusted with a ball valve, so that the flow rate through each side of the sampling train had a flow rate of approximately 10 Lpm. The flow rates were measured each day with the calibrator and adjusted as needed. The Impactor sampling occurred over eight days (June 12 through June 15 and June 20 through June 23, 2013). A summary of the analysis results from the Impactor sampling is presented in *Appendix E*. Photographs of the modified PAMs are included in *Appendix B.*

4.2 Off-Site Air Monitoring Add-On

GTA installed three additional PAMs at Client-identified off-site locations. These PAMs were designated Off-Site Air Monitors (OSAM-1 through OSAM-3), and were located at the Maryland Science Center, the National Aquarium in Baltimore, and the City Recreation Pier, as shown on *Figure 5* in *Appendix A.* Each OSAM contained the same equipment used in the on-site PAMs, and operation of the OSAMs was also consistent with the operation of the on-site PAMs. The OSAMs began operation on June 10, 2013, and operated until June 23, 2013. The RAM, particulate, and hexavalent chromium results from the OSAMs are presented in *Appendix F*. Photographs of the OSAMs are included in *Appendix B.*

4.3 Off-Site Air Monitoring Extension

For an additional two-week period after the conclusion of the 60-day PCAM sampling program, the three OSAM referenced above and one additional OSAM (OSAM-4), at Baltimore's Civil War Museum, collected 24-hour air samples using the AirCons and 37 mm cassettes. These samples were analyzed for total particulates and hexavalent chromium, and the results are provided in *Appendix F*.

******* END OF REPORT *******

APPENDIX A

FIGURES

Notes

1. Air Monitoring (AM) Stations depict 12 possible locations for the 7 Perimeter Air Monitoring (PAM) units.
2. PAM-1 through PAM-7 units shown at actual locations between **April 24, 2013 and May 1, 2013.**

GTA USA, LLC
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
14280 PARK CENTER DRIVE, SUITE A
LAUREL, MARYLAND 20707
(410) 792-9446 OR (301) 470-4470
FAX: (410) 792-7395
www.mragta.com
© Geo-Technology Associates, Inc.

HARBOR POINT
1000 WILLS STREET
BALTIMORE, MARYLAND

AIR MONITORING STATION SKETCH
4/24/2013 THROUGH 5/1/2013

PROJECT: 130467USA	DATE: May 2013	Not to Scale	DESIGN BY: SJS	REVIEW BY: SJS	FIGURE: 1

Notes

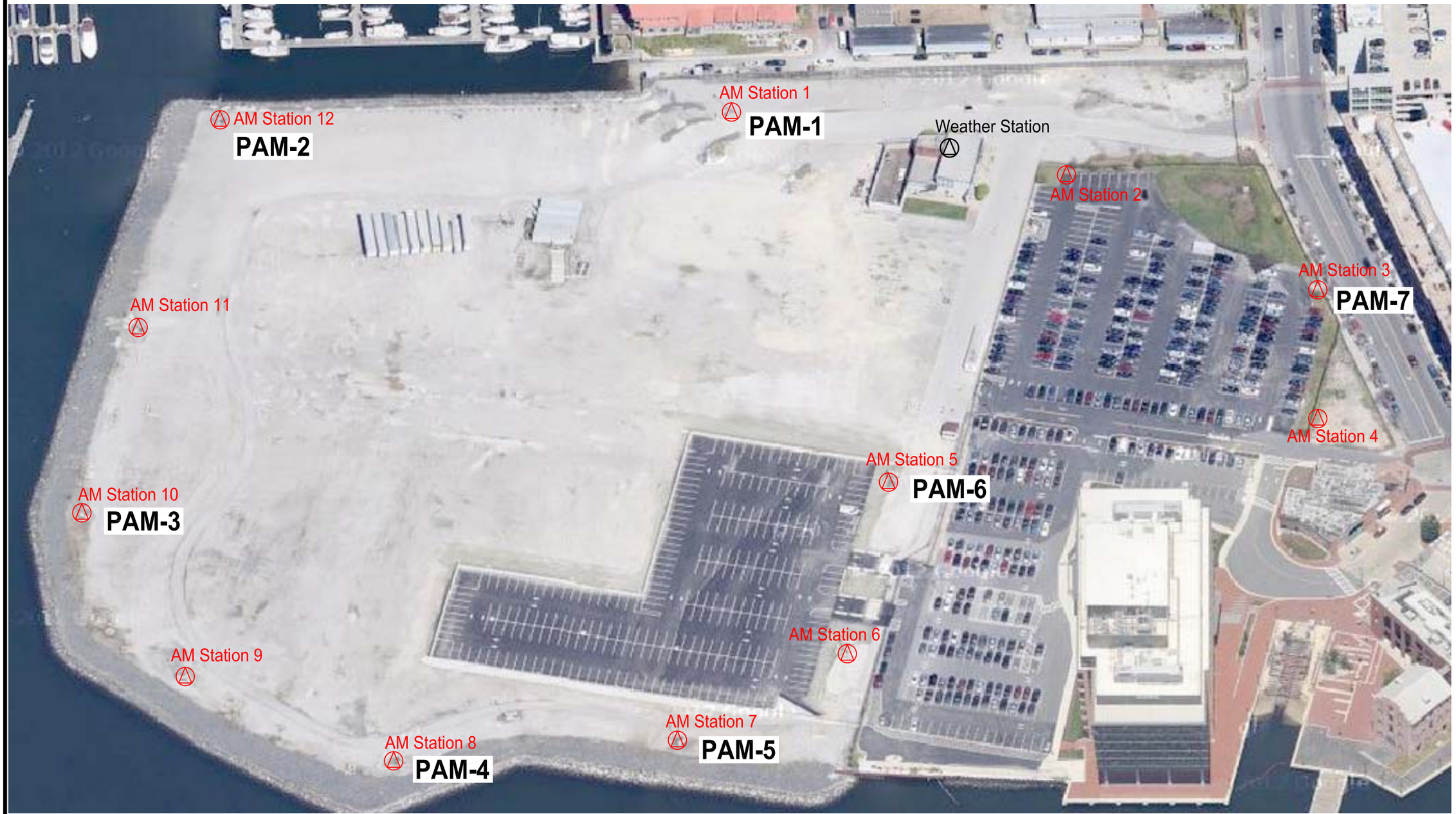
1. Air Monitoring (AM) Stations depict 12 possible locations for the 7 Perimeter Air Monitoring (PAM) units.
2. PAM-1 through PAM-7 units shown at actual locations between **May 2, 2013 and May 8, 2013.**

GTA USA, LLC
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
14280 PARK CENTER DRIVE, SUITE A
LAUREL, MARYLAND 20707
(410) 792-9446 OR (301) 470-4470
FAX: (410) 792-7395
www.mragta.com
© Geo-Technology Associates, Inc.

HARBOR POINT
1000 WILLS STREET
BALTIMORE, MARYLAND

AIR MONITORING STATION SKETCH
5/2/2013 THROUGH 5/8/2013

PROJECT: 130467USA	DATE: May 2013	Not to Scale	DESIGN BY: SJS	REVIEW BY: SJS	FIGURE: 2



Notes

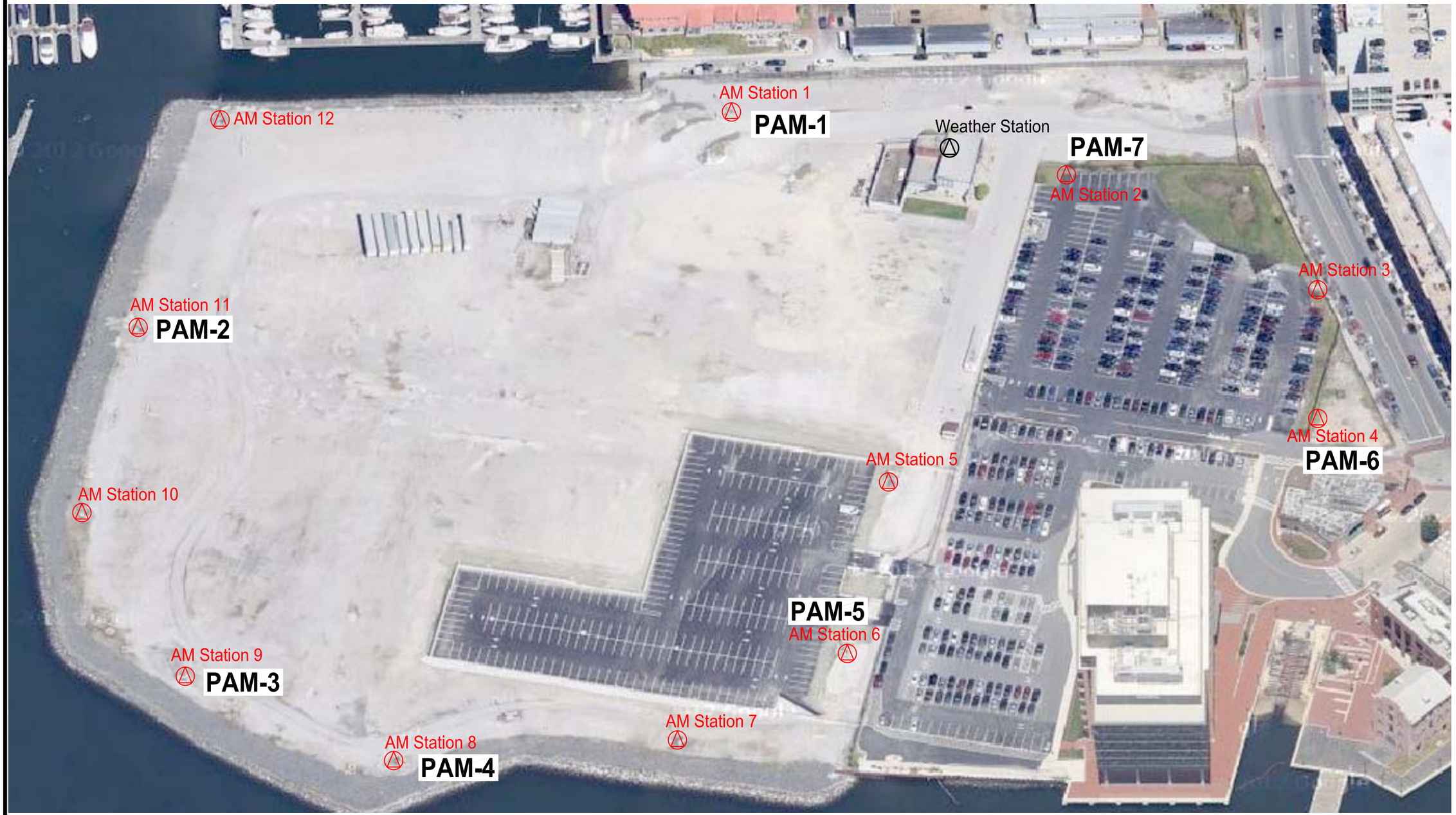
1. Air Monitoring (AM) Stations depict 12 possible locations for the 7 Perimeter Air Monitoring (PAM) units.
2. PAM-1 through PAM-7 units shown at actual locations between **May 9, 2013 and May 22, 2013.**

GTA USA, LLC
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
14280 PARK CENTER DRIVE, SUITE A
LAUREL, MARYLAND 20707
(410) 792-9446 OR (301) 470-4470
FAX: (410) 792-7395
www.mragta.com
© Geo-Technology Associates, Inc.

HARBOR POINT
1000 WILLS STREET
BALTIMORE, MARYLAND

AIR MONITORING STATION SKETCH
5/9/2013 THROUGH 5/22/2013

PROJECT: 130467USA	DATE: May 2013	Not to Scale	DESIGN BY: SJS	REVIEW BY: SJS	FIGURE: 3



Notes

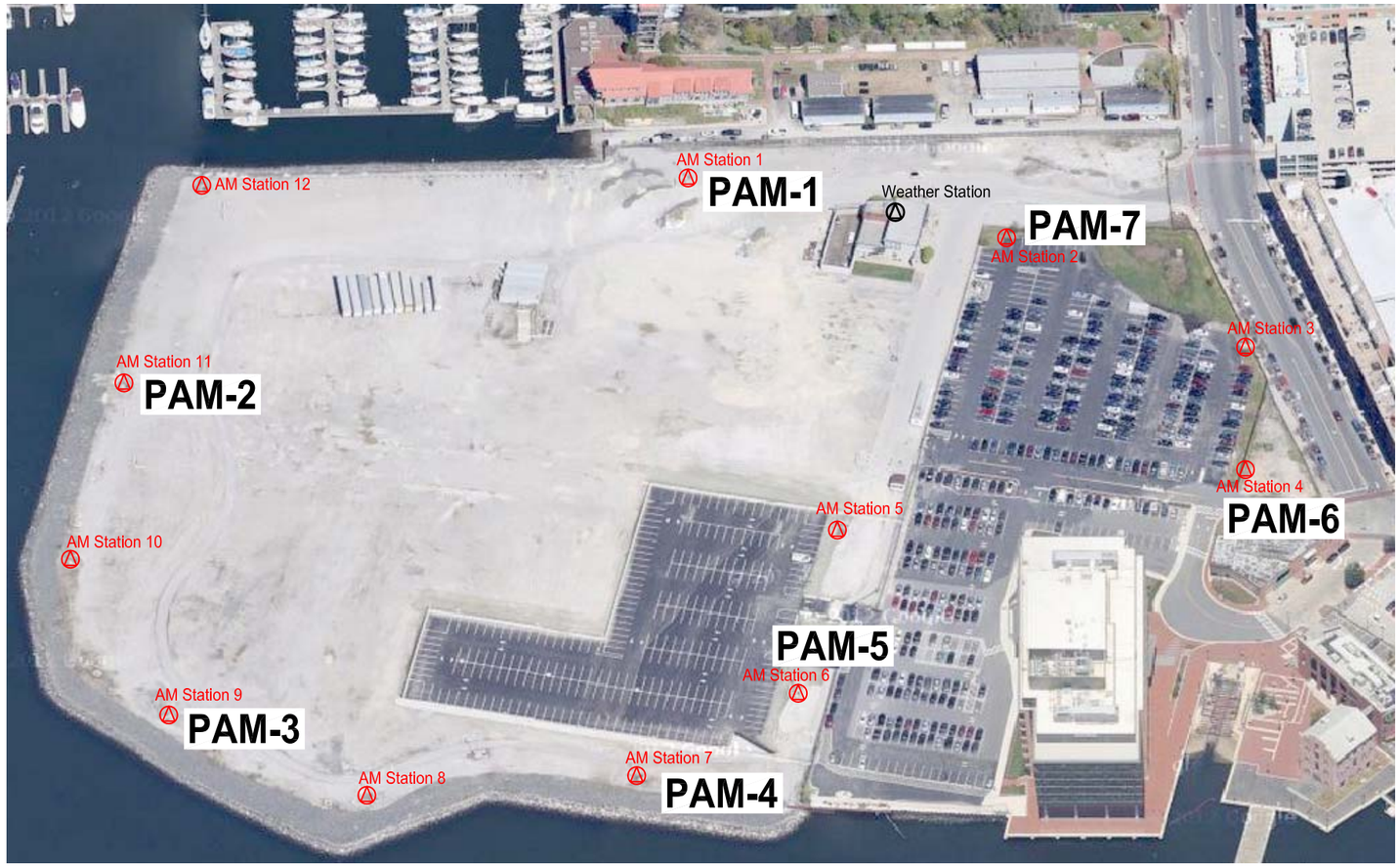
1. Air Monitoring (AM) Stations depict 12 possible locations for the 7 Perimeter Air Monitoring (PAM) units.
2. PAM-1 through PAM-7 units shown at actual locations between **May 23, 2013 and June 10, 2013.**

GTA USA, LLC
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
14280 PARK CENTER DRIVE, SUITE A
LAUREL, MARYLAND 20707
(410) 792-9446 OR (301) 470-4470
FAX: (410) 792-7395
www.mragta.com
© Geo-Technology Associates, Inc.

HARBOR POINT
1000 WILLS STREET
BALTIMORE, MARYLAND

AIR MONITORING STATION SKETCH
5/23/2013 THROUGH 6/10/2013

PROJECT: 130467USA	DATE: May 2013	Not to Scale	DESIGN BY: SJS	REVIEW BY: SJS	FIGURE: 4



Notes

1. Air Monitoring (AM) Stations depict 12 possible on-site locations for the 7 Perimeter Air Monitoring (PAM) units.
2. PAM-1 through PAM-7 units shown at actual locations between **June 11, 2013 and June 23, 2013.**
3. Off-Site Air Monitoring (OSAM-1 through OSAM-3) stations located at the MD Science Center, the Baltimore Aquarium, and the City Recreation Pier.

North

GTA USA, LLC
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
14280 PARK CENTER DRIVE, SUITE A
LAUREL, MARYLAND 20707
(410) 792-9446 OR (301) 470-4470
FAX: (410) 792-7395
www.mragta.com
© Geo-Technology Associates, Inc.

HARBOR POINT
1000 WILLS STREET
BALTIMORE, MARYLAND

AIR MONITORING STATION SKETCH
6/11/2013 THROUGH 6/23/2013

PROJECT: 130467USA	DATE: June 2013	Not to Scale	DESIGN BY: SJS	REVIEW BY: SJS	FIGURE: 5

Notes

1. Off-Site Air Monitoring (OSAM-1 through OSAM-4) stations located at the MD Science Center, the Baltimore Aquarium, City Recreation Pier, and the Civil War Museum.
2. OSAM-1 through OSAM-4 units shown at actual locations between **June 24, 2013 and July 9, 2013.**

GTA USA, LLC
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
14280 PARK CENTER DRIVE, SUITE A
LAUREL, MARYLAND 20707
(410) 792-9446 OR (301) 470-4470
FAX: (410) 792-7395
www.mragta.com
© Geo-Technology Associates, Inc.

HARBOR POINT
1000 WILLS STREET
BALTIMORE, MARYLAND

AIR MONITORING STATION SKETCH
6/24/2013 THROUGH 7/9/2013

PROJECT: 130467USA	DATE: June 2013	Not to Scale	DESIGN BY: SJS	REVIEW BY: SJS	FIGURE: 6

APPENDIX B

PHOTOGRAPHS

Photo 1: View of PAM located at AM-8.

Photo 2: Typical view of PAM interior, at AM-2. AirCon is at left, RAM is at right.

Photo 3: View of the weather station on the Honeywell Transfer Station roof.

Photo 4: View of PAM at AM-3.

Photo 5: View of PAM at AM-1.

Photo 6: View of PAM at AM-5.

Photo 7: View of OSAM-1, at the MD Science Center.

Photo 8: View of OSAM-2, at the National Aquarium.

Photo 9: View of OSAM-3, at the City Recreation Pier.

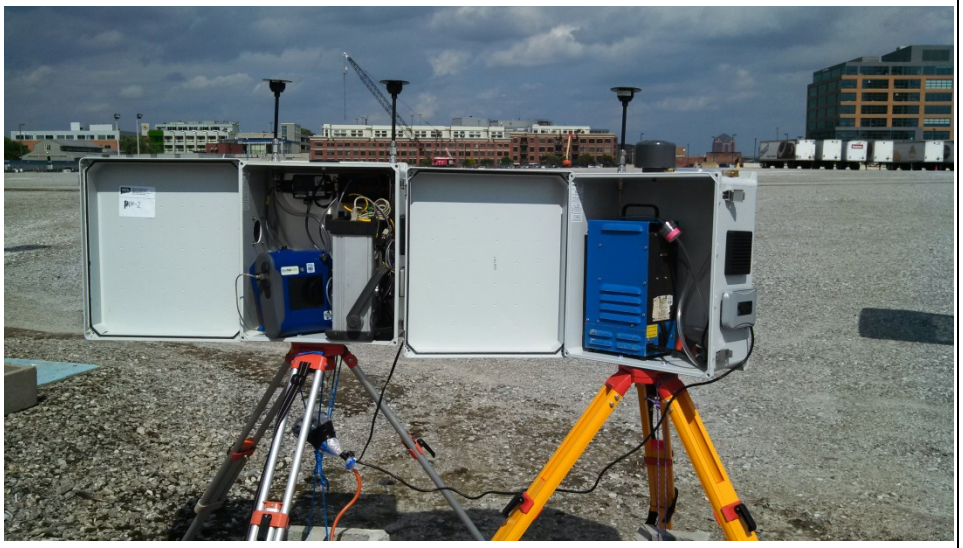


Photo 10: View of an expanded PAM, with the PSA and RAM in the left enclosure, the AirCon in the right enclosure, and the PM2.5 Impactor (with rain cover) on the top of the right enclosure.

Photo 11: View of two calibrators being used to check the air flow rate through the PM2.5 Impactor (brass-colored metal) and the total particulates sample train.

APPENDIX C

OVERALL SUMMARY TABLE

OVERALL AIR MONITORING SUMMARY

Harbor Point
Baltimore, Maryland
Project No. 130467USA

END DATE	AM-1 RAM µg/M³	AM-1 PART µg/M³	AM-1 CrVI ng/M³	AM-2 RAM µg/M³	AM-2 PART µg/M³	AM-2 CrVI ng/M³	AM-3 RAM µg/M³	AM-3 PART µg/M³	AM-3 CrVI ng/M³	AM-4 RAM µg/M³	AM-4 PART µg/M³	AM-4 CrVI ng/M³	AM-5 RAM µg/M³	AM-5 PART µg/M³	AM-5 CrVI ng/M³	AM-6 RAM µg/M³	AM-6 PART µg/M³	AM-6 CrVI ng/M³	Weather: Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Rainfall (in)	Sampling Matrix
24-Apr	30.5	11	<0.7				16.8	11	<0.7				32.3	12	<0.7				4.4	SE	69	0	A1
25-Apr	16.4	17	2.2				9.1	8	0.73				19.6	13	0.71				7.4	N	54	0.004	B1
26-Apr	14.8	14	1.3				8.1	11	3.3				19.2	10	1.8				5.5	W	39	0	A2
27-Apr	14.8	11	3.7				8.2	8	6.0				16.9	11	4.2				4.4	N	35	0	A3
28-Apr	15.9	13	2.4				9.2	12	3.6				18.6	13	5.5				4.1	SSE	44	0	A4
29-Apr	13.4	8	0.83				7.3	135	<0.7				15.8	18	1.7				6.2	SSW	62	0.089	A5
30-Apr	8.5	7	0.72				4.1	5	<0.7				9.7	6	1.1				6.8	ENE	92	0.004	D1
1-May	10.6	5	0.72				5.6	12	<0.7				11.6	14	1.5				5.4	SE	56	0	A6
2-May	9.0	8	0.78				4.3	8	1.1	8.3	12	1.6				6.7	37	0.88	5.6	SE	59	0	A7
3-May	11.6	23	1.2				5.8	<3	<0.6	11.9	8	<0.6				10.6	23	1.5	5.6	SSE	56	0	A8
4-May	12.9	16	1.3				6.2	9	<0.7	12.7	13	<0.7				11.2	11	<0.7	6.0	SE	61	0	A9
5-May	20.3	16	<0.7				10.1	12	<0.7	20.2	16	<0.7				17.2	14	<0.7	6.3	ESE	59	0	A10
6-May	24.7	14	NA				12.6	16	NA	25.2	36	NA				22.3	16	NA	6.0	ENE	71	0.003	D2
7-May	14.4	6	1.2				6.8	8	1.3	13.8	12	<0.65				11.8	8	0.82	9.2	ENE	89	0.667	C1
8-May	19.0	10	2.0				9.6	13	<0.68	18.0	10	<0.68				16.2	14	<0.69	6.2	ENE	85	0.208	C2
9-May	24.6	NS	NS				12.2	NS	NS	25.4	NS	NS				22.7	NS	NS	5.2	W	78	0.160	C (NS)
10-May	21.2	NS	NA				10.5	16	NA				18.5	31	NA				4.1	W	63	0	A11
11-May	12.4	12	1.8				10.6	21	0.8				22.6	39	3.9				5.8	W	76	0.360	C3
12-May	10.7	8	1.2				7.2	10	2.2				13.2	20	3.3				8.3	W	61	0.130	C4
13-May	14.0	8	3.6				3.6	7	2.1				6.9	193	4.8				9.8	W	36	0	B2
14-May	7.8	9	<0.7				5.1	10	1.7				9.8	11	1.6				7.1	N	35	0	B3
15-May	13.1	NA	NA				9.6	NA	NA				16.1	NA	NA				4.7	SSE	56	0.049	A12
16-May	21.1	NA	NA				12.9	NA	NA				22.7	NA	NA				5.7	W	59	0.027	A13
17-May	18.7	NA	NA				11.4	NA	NA				19.7	NA	NA				6.3	W	47	0	A14
18-May	8.2	NA	NA				6.0	NA	NA				10.9	NA	NA				5.2	SSE	55	0.001	A15
19-May	12.5	NA	NA				7.7	NA	NA				13.1	NA	NA				4.3	SSE	90	0	D3
20-May	34.8	NA	NA				19.5	NA	NA				32.5	NA	NA				3.9	ENE	85	0	D4
21-May	28.6	NA	NA				16.6	NA	NA				31.0	NA	NA				4.2	WSW	80	0	D5
22-May	55.7	NA	NA				27.5	NA	NA				56.2	NA	NA				4.9	SSE	78	0	D6
23-May	24.8	7	1.5	9.5	13	3.1				28.0	22	3.5				47.6	13	2.3	5.6	S	75	0.152	C5

END DATE	AM-7 RAM µg/M³	AM-7 PART µg/M³	AM-7 CrVI ng/M³	AM-8 RAM µg/M³	AM-8 PART µg/M³	AM-8 CrVI ng/M³	AM-9 RAM µg/M³	AM-9 PART µg/M³	AM-9 CrVI ng/M³	AM-10 RAM µg/M³	AM-10 PART µg/M³	AM-10 CrVI ng/M³	AM-11 RAM µg/M³	AM-11 PART µg/M³	AM-11 CrVI ng/M³	AM-12 RAM µg/M³	AM-12 PART µg/M³	AM-12 CrVI ng/M³	Weather: Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Rainfall (in)	Sampling Matrix
24-Apr	28.5	11	<0.7	29.7	13	0.95				25.6	14	<0.7				17.1	230	<0.7	4.4	SE	69	0	A1
25-Apr	17.6	13	<0.7	19.3	14	1.4				15.6	14	1.3				19.1	14	2	7.4	N	54	0.004	B1
26-Apr	14.8	13	1.7	15.8	10	1.1				12.7	8	<0.7				19.8	12	1.3	5.5	W	39	0	A2
27-Apr	13.9	12	3.8	15.7	11	4.3				12.9	12	3.8				23.2	9	2.8	4.4	N	35	0	A3
28-Apr	16.4	9	1.1	18.5	11	1.9				14.9	15	5.1				22.9	13	3.8	4.1	SSE	44	0	A4
29-Apr	13.6	28	3.7	14.9	14	1.4				11.4	11	2.0				24.2	<3	1.1	6.2	SSW	62	0.089	A5
30-Apr	8.9	12	2.5	11.0	98	<0.7				8.1	11	3.7				20.2	7	1.0	6.8	ENE	92	0.004	D1
1-May	9.4	14	1.1	11.5	11	1.7				8.6	10	1.7				21.2	11	1.3	5.4	SE	56	0	A6
2-May				9.0	7	1.0	6.5	12	<0.7				21.2	10	<0.7				5.6	SE	59	0	A7
3-May				14.6	24	1.2	10.6	24	2.0				24.7	25	1.4				5.6	SSE	56	0	A8
4-May				15.4	10	1.4	10.6	15	<0.7				25.0	8	<0.7				6	SE	61	0	A9
5-May				21.3	13	0.74	15.7	15	<0.7				31.9	15	<0.7				6.3	ESE	59	0	A10
6-May				24.7	15	NA	19.4	12	NA				35.7	17	NA				6.0	ENE	71	0.003	D2
7-May				14.1	7	<0.67	11.2	8	<0.66				27.1	7	<0.65				9.2	ENE	89	0.667	C1
8-May				19.2	16	<0.68	15.6	<3	<0.68				27.1	10	<0.68				6.2	ENE	85	0.208	C2
9-May				26.5	NS	NS	21.6	NS	NS				37.5	NS	NS				5.2	W	78	0.160	C (NS)
10-May	17.1	22	NA	21.3	19	NA				16.9	21	NA				23.6	17	NA	4.1	W	63	0	A11
11-May	18.9	16	1.8	21.5	<3	2.2				16.3	<3	1.2				29.6	9	1.5	5.8	W	76	0.360	C3
12-May	13.7	9	2.1	15.9	9	<0.7				11.7	8	3.6				31.8	7	4.7	8.3	W	61	0.130	C4
13-May	7.2	10	3.1	9.0	7	4.2				5.9	8	5.1				37.9	8	5.1	9.8	W	36	0	B2
14-May	9.4	8	<0.7	6.2	7	<0.7				7.9	12	1.3				36.6	14	2.2	7.1	N	35	0	B3
15-May	16.7	NA	NA	14.9	NA	NA				15.6	NA	NA				11.3	NA	NA	4.7	SSE	56	0.049	A12
16-May	21.3	NA	NA	17.9	NA	NA				20.4	NA	NA				17.7	NA	NA	5.7	W	59	0.027	A13
17-May	18.2	NA	NA	16.1	NA	NA				18.0	NA	NA				15.2	NA	NA	6.3	W	47	0	A14
18-May	10.8	NA	NA	9.2	NA	NA				10.2	NA	NA				6.1	NA	NA	5.2	SSE	55	0.001	A15
19-May	13.1	NA	NA	10.1	NA	NA				12.4	NA	NA				10.1	NA	NA	4.3	SSE	90	0	D3
20-May	31.6	NA	NA	28.0	NA	NA				30.6	NA	NA				30.4	NA	NA	3.9	ENE	85	0	D4
21-May	26.5	NA	NA	22.9	NA	NA				25.4	NA	NA				24.0	NA	NA	4.2	WSW	80	0	D5
22-May	49.4	NA	NA	46.5	NA	NA				44.6	NA	NA				45.8	NA	NA	4.9	SSE	78	0	D6
23-May				22.0	13	1.6	22.4	10	2.1				20.5	9	1.3				5.6	S	75	0.152	C5

END DATE	AM-1 RAM µg/M³	AM-1 PART µg/M³	AM-1 CrVI ng/M³	AM-2 RAM µg/M³	AM-2 PART µg/M³	AM-2 CrVI ng/M³	AM-3 RAM µg/M³	AM-3 PART µg/M³	AM-3 CrVI ng/M³	AM-4 RAM µg/M³	AM-4 PART µg/M³	AM-4 CrVI ng/M³	AM-5 RAM µg/M³	AM-5 PART µg/M³	AM-5 CrVI ng/M³	AM-6 RAM µg/M³	AM-6 PART µg/M³	AM-6 CrVI ng/M³	Weather: Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Rainfall (in)	Sampling Matrix
24-May	11.0	<3	2.4	2.8	8	5.2				10.8	8	2.8				45.0	6	2.1	5.5	N	71	0.968	C6
25-May	6.6	5	1.2	0.5	10	7.7				7.3	6	4.2				42.9	19	2.2	8.9	N	58	0	B4
26-May	5.8	6	2.2	0.4	9	1.9				5.7	14	2.1				46.0	6	5.4	7.4	NNE	47	0	B5
27-May	7.0	NA	NA	1.0	NA	NA				8.6	NA	NA				88.2	NA	NA	4.1	N	44	0	A16
28-May	16.8	NA	NA	6.9	NA	NA				20.7	NA	NA				0.6	NA	NA	2.8	N	67.4	0.07	A17
29-May	29.2	NS	NS	14.8	29	2.2				35.7	26	3.9				0.7	20	2.4	4.7	W	75	0.141	C7
30-May	30.7	NA	NA	14.3	NA	NA				31.1	NA	NA				0.7	NA	NA	4.1	W	71	0	D7
31-May	33.9	NA	NA	17.8	NA	NA				33.3	NA	NA				1.4	NA	NA	5.0	WSW	61	0	A18
1-Jun	21.4	NA	NA	14.8	NA	NA				22.8	NA	NA				2.3	NA	NA	6.0	WSW	55	0	A19
2-Jun	16.2	16	2.8	12.3	18	2.9				18.3	15	3.6				1.7	13	1.9	7.3	WSW	58	0	B6
3-Jun	17.1	6	0.99	9.9	10	2.8				14.2	11	2.1				1.8	11	<0.66	5.6	W	83	0.65	C8
4-Jun	9.0	NA	NA	5.5	NA	NA				11.7	NA	NA				1.8	NA	NA	5.6	N	48	0.02	A20
5-Jun	8.4	NA	NA	4.6	NA	NA				10.3	NA	NA				1.7	NA	NA	4.6	SE	45	0	A21
6-Jun	12.1	NA	NA	8.5	NA	NA				12.7	NA	NA				6.2	NA	NA	5.3	SSE	58	0	A22
7-Jun	12.0	6	<0.78	8.5	17	3.4				11.5	7	<0.68				7.5	<3	3.3	4.9	ENE	89	1.989	C9
8-Jun	15.7	9	1.0	11.0	9	1.3				14.8	11	<0.67				14.1	9	0.77	6.0	W	80	0.18	C10
9-Jun	24.7	NA	NA	18.9	NA	NA				23.7	NA	NA				22.8	NA	NA	3.6	SSE	61	0.001	A23
10-Jun	29.1	NA	NA	25	NA	NA				28.2	NA	NA				26.3	NA	NA	4.2	SSE	84	0.668	C11
11-Jun	19.1	11	2.6	11.6	<3	7.1				16.5	12	1.2				16.4	18	1.4	8.3	W	82	0.741	C12
12-Jun	35.8	16	1.5	24	20	5.2				32.4	18	4				28.1	17	2.3	7.6	W	65	0	B7
13-Jun	43.9	20	1.6	32.2	21	1.6				40.4	25	1.6				34.3	21	2.2	6.4	W	70	0.682	C13
14-Jun	8.9	10	1.6	3.0	6	4.0				6.9	6	2.5				7.3	8	<0.69	8.1	N	66	0.459	C14
15-Jun	16.2	18	1.5	7.3	21	1.3				15.0	14	2.7				14.5	12	<0.68	6.1	W	49	0	A24
16-Jun	29.5	17	3.3	13.4	20	3.2				25.7	21	2.6				23.9	20	2.9	6.1	W	52	0	A25
17-Jun	17.1	16	1.2	6.4	11	1.8				13.9	18	1.9				15.0	14	1.3	8.1	W	57	0	B8
18-Jun	36.0	4	1.2	16.2	6	1.4				31.2	12	2.4				26.6	10	2.4	4.7	W	73	0.215	C15
19-Jun	18.7	4	1.0	7.4	6	<0.63				13.9	12	2.0				13.6	10	3.0	4.7	ENE	73	0.070	A26
20-Jun	16.1	14	1.8	6.3	14	1.6				13.6	14	0.92				13.8	19	0.89	4.5	SSE	60	0	A27
21-Jun	18.1	6	4.3	8.7	7	2.8				18.7	22	5.2				16.4	15	8.1	4.6	SSE	49	0	A28
22-Jun	20.3	8	4.0	8	21	2.7				16.5	20	4.1				16.2	15	3.2	5	WSW	64	0	A29
23-Jun	19	6	4.5	7.5	17	2.7				16.1	12	1.9				14.9	10	0.95	4.3	SSE	73	0.018	D8

END DATE	AM-7 RAM µg/M³	AM-7 PART µg/M³	AM-7 CrVI ng/M³	AM-8 RAM µg/M³	AM-8 PART µg/M³	AM-8 CrVI ng/M³	AM-9 RAM µg/M³	AM-9 PART µg/M³	AM-9 CrVI ng/M³	AM-10 RAM µg/M³	AM-10 PART µg/M³	AM-10 CrVI ng/M³	AM-11 RAM µg/M³	AM-11 PART µg/M³	AM-11 CrVI ng/M³	AM-12 RAM µg/M³	AM-12 PART µg/M³	AM-12 CrVI ng/M³	Weather: Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Rainfall (in)	Sampling Matrix
24-May				12.6	7	3.9	10.1	5	3				7.5	<3	2.4				5.5	N	71	0.968	C6
25-May				0.0	9	2.5	6.7	7	1.5				4.2	10	4.2				8.9	N	58	0	B4
26-May				0.0	6	2.8	5.8	10	2.4				3.3	8	2.8				7.4	NNE	47	0	B5
27-May				0.0	NA	NA	8.2	NA	NA				5.2	NA	NA				4.1	N	44	0	A16
28-May				0.1	NA	NA	17.1	NA	NA				14.9	NA	NA				2.8	N	67.4	0.07	A17
29-May				1.7	21	3.0	29.8	23	2.2				30.0	20	2.1				4.7	W	75	0.141	C7
30-May				1.4	NA	NA	27.2	NA	NA				27.5	NA	NA				4.1	W	71	0	D7
31-May				3.2	NA	NA	27.5	NA	NA				28.4	NA	NA				5.0	WSW	61	0	A18
1-Jun				7.7	NA	NA	16	NA	NA				18.2	NA	NA				6.0	WSW	55	0	A19
2-Jun				4.6	17	2.0	13.5	13	3.8				15.4	12	1.4				7.3	WSW	58	0	B6
3-Jun				7.3	10	1.2	11.6	21	1.5				14.0	7	2.5				5.6	W	83	0.65	C8
4-Jun				5.7	NA	NA	6.5	NA	NA				9.1	NA	NA				5.6	N	48	0.02	A20
5-Jun				3.5	NA	NA	6.1	NA	NA				7.9	NA	NA				4.6	SE	45	0	A21
6-Jun				9.4	NA	NA	10.4	NA	NA				11.9	NA	NA				5.3	SSE	58	0	A22
7-Jun				8.6	17	1.1	11.1	8	1.0				12.8	26	5.9				4.9	ENE	89	1.989	C9
8-Jun				9.0	10	1.9	12.6	10	2.2				15.0	8	2.2				6.0	W	80	0.18	C10
9-Jun				13.5	NA	NA	20.1	NA	NA				24.1	NA	NA				3.6	SSE	61	0.001	A23
10-Jun				18.2	NA	NA	25.2	NA	NA				29.3	NA	NA				4.2	SSE	84	0.668	C11
11-Jun	NS	11	1.4				13.5	11	1.2				16.5	10	7.6				8.3	W	82	0.741	C12
12-Jun	31.8	18	2.3				26.9	19	5.3				32.7	20	1.9				7.6	W	65	0	B7
13-Jun	23.9	17	0.97				33.2	<3	3.1				37.4	23	3.5				6.4	W	70	0.682	C13
14-Jun	2.8	4	1.6				5.0	9	2.6				7.3	11	3.2				8.1	N	66	0.459	C14
15-Jun	7.0	19	1.4				11.9	28	2.2				14.6	19	1.8				6.1	W	49	0	A24
16-Jun	14.3	20	3.0				21.3	19	3.9				25.8	17	3.7				6.1	W	52	0	A25
17-Jun	6.4	4	<0.68				11.3	14	1.5				12.2	12	5.3				8.1	W	57	0	B8
18-Jun	15.7	12	1.6				24.1	9	1.2				24.8	14	1.9				4.7	W	73	0.215	C15
19-Jun	6.9	12	1.4				11.2	9	2.5				15	14	1.8				4.7	ENE	73	0.070	A26
20-Jun	7	16	<0.65				11	7	0.98				12.7	12	1.6				4.5	SSE	60	0	A27
21-Jun	8.2	17	5.4				11.9	10	5.9				14.6	9	4.3				4.6	SSE	49	0	A28
22-Jun	7.9	12	4.0				12.4	13	4.4				0.5	13	3.6				5	WSW	64	0	A29
23-Jun	6.9	6	1.3				10.9	14	1.3				7.7	7	1.9				4.3	SSE	73	0.018	D8

NS = No Sample
NA = Not Analyzed
Weather Sampling Matrix Codes: A=Dry/Light Wind, B=Dry/Heavy Wind, C=Rain Day, D=Out of Classification

APPENDIX D

DAILY SUMMARY TABLES

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Wednesday, April 24, 2013
(4/23/2013-4/24/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-12)*	PAM-3 *(AM-10)*	PAM-4 *(AM-8)*	PAM-5 *(AM-7)*	PAM-6 *(AM-5)*	PAM-7 *(AM-3)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
4/23/2013	12:00	21.27	ND	16.69	20.06	18.99	24.08	10.55	4.6	NE	53.0	0.000
	13:00	15.07	ND	12.90	14.95	13.42	17.15	7.97	3.1	NW	48.9	0.000
	14:00	16.17	ND	13.33	15.65	13.54	17.33	8.19	3.3	N	46.9	0.000
	15:00	16.13	ND	13.98	16.05	14.00	17.36	8.48	4.2	ESE	43.3	0.000
	16:00	17.40	ND	14.88	16.83	14.37	16.85	9.13	5.4	SSE	42.6	0.000
	17:00	16.69	ND	14.55	17.36	14.66	16.25	9.19	6.5	SE	53.1	0.000
	18:00	17.71	ND	15.13	17.99	16.08	17.23	9.61	6.0	SE	54.9	0.000
	19:00	18.07	ND	14.70	17.38	15.26	17.16	9.46	4.1	SE	56.4	0.000
	20:00	25.89	ND	20.60	23.59	22.83	24.74	13.42	3.6	ESE	60.9	0.000
	21:00	28.44	ND	23.00	26.90	25.81	28.73	14.80	4.2	SE	68.1	0.000
	22:00	22.25	ND	19.38	23.22	21.14	22.92	11.19	4.6	SE	72.3	0.000
	23:00	25.35	ND	21.76	25.21	24.22	26.21	13.04	3.9	SE	75.4	0.000
4/24/2013	0:00	35.18	ND	35.60	40.21	37.55	40.57	18.22	5.7	ESE	78.7	0.000
	1:00	37.46	ND	30.79	35.13	34.40	38.48	19.43	3.3	ESE	80.2	0.000
	2:00	55.38	ND	49.68	57.20	55.34	58.56	28.58	4.3	SSW	82.6	0.000
	3:00	43.21	ND	35.94	40.91	40.71	46.10	27.86	4.1	WSW	86.7	0.000
	4:00	43.84	ND	38.26	43.84	44.31	47.14	26.11	3.0	SW	88.3	0.000
	5:00	63.06	ND	48.45	56.26	59.96	67.70	35.22	2.8	SW	89.4	0.000
	6:00	58.53	ND	46.74	53.29	54.38	63.53	37.23	3.7	WSW	90.6	0.000
	7:00	46.72	ND	39.17	44.55	43.88	49.90	24.54	3.4	WSW	87.9	0.000
	8:00	37.49	ND	31.17	35.91	35.20	41.03	20.55	3.3	SW	81.0	0.000
	9:00	24.22	19.63	19.87	23.53	22.12	26.28	13.63	4.6	SSW	73.9	0.000
	10:00	23.89	15.89	19.65	22.88	21.24	25.61	14.08	4.5	WSW	69.4	0.000
	11:00	25.12	15.63	21.01	24.91	23.23	26.83	14.07	5.4	SE	65.1	0.000
	12:00	28.04	17.40	22.87	28.21	25.06	28.98	15.03	7.0	SE	67.3	0.000
Daily Average/Mode/Sum [C]		**30.50**	**17.14**	**25.60**	**29.68**	**28.47**	**32.27**	**16.78**	**4.4**	**SE**	**68.7**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	11	230	14	13	11	12	11
Hexavalent Chromium	<0.00069	<0.00069	<0.00069	0.00095	<0.00069	<0.00069	<0.00069

Weather Day Classification [E]
Dry/Light Wind

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Thursday, April 25, 2013
(4/24/2013-4/25/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-12)*	PAM-3 *(AM-10)*	PAM-4 *(AM-8)*	PAM-5 *(AM-7)*	PAM-6 *(AM-5)*	PAM-7 *(AM-3)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
4/24/2013	12:00	28.04	17.40	22.87	28.21	25.06	28.98	15.03	7.0	SE	67.3	0.000
	13:00	24.41	16.06	22.16	27.69	23.83	26.20	14.21	10.8	SE	66.4	0.000
	14:00	23.59	15.17	23.14	28.75	23.61	25.23	13.24	9.6	SSE	62.0	0.000
	15:00	27.39	19.10	25.84	31.52	29.82	32.60	14.61	6.0	SSE	58.8	0.000
	16:00	25.44	21.38	27.65	34.22	33.28	31.65	14.14	6.7	S	57.1	0.000
	17:00	29.69	31.88	30.41	38.16	38.77	36.37	15.16	5.2	S	60.2	0.000
	18:00	31.00	32.22	26.46	34.31	37.27	38.57	15.13	4.8	S	59.9	0.000
	19:00	30.44	26.27	22.73	26.76	28.19	41.21	20.40	5.6	SSW	60.3	0.000
	20:00	27.18	32.38	32.60	42.90	35.00	34.15	13.18	3.1	SSE	65.7	0.000
	21:00	27.62	29.81	29.93	34.74	29.67	32.45	15.29	2.8	NW	67.2	0.000
	22:00	15.28	18.67	14.48	16.71	14.75	17.07	9.06	4.0	W	64.4	0.000
	23:00	9.17	14.04	9.41	10.92	9.25	12.87	6.04	10.2	WNW	65.7	0.003
4/25/2013	0:00	2.51	10.00	2.96	3.67	2.94	2.90	2.02	10.2	NNW	57.9	0.000
	1:00	2.77	10.07	3.03	3.59	2.93	3.19	2.01	11.3	N	52.4	0.000
	2:00	2.89	11.39	3.35	3.88	3.54	3.61	1.96	10.6	WNW	51.4	0.000
	3:00	4.94	12.39	5.35	6.53	5.64	6.47	2.90	9.6	NNW	50.9	0.000
	4:00	7.87	15.05	7.86	10.13	8.80	9.81	4.33	11.0	NNW	47.9	0.000
	5:00	8.98	17.30	8.73	11.27	9.74	11.47	4.86	8.5	N	48.0	0.000
	6:00	11.12	17.35	10.40	13.30	11.67	13.90	5.96	7.7	NNW	49.6	0.000
	7:00	12.90	18.55	11.02	14.21	13.03	15.26	6.96	5.2	N	50.8	0.000
	8:00	9.21	15.92	8.17	10.38	9.94	11.28	4.80	9.4	N	47.7	0.000
	9:00	10.01	17.69	8.81	11.26	10.19	12.28	5.46	7.8	N	45.5	0.000
	10:00	11.23	18.28	9.72	12.38	10.93	13.46	6.11	7.1	N	40.9	0.000
	11:00	12.33	18.62	11.41	14.12	12.34	14.30	6.78	6.9	WNW	36.7	0.000
	12:00	14.31	19.23	12.66	15.08	13.33	15.76	7.75	6.6	W	34.3	0.000
	13:00	15.53	20.52	14.37	16.79	14.94	17.78	8.67	4.8	W	31.2	0.000
Daily Average/Mode/Sum [C]		**16.38**	**19.11**	**15.60**	**19.29**	**17.63**	**19.57**	**9.08**	**7.4**	**N**	**53.8**	**0.004**

Lab Analysis (µg/m³) [D]							
Total Particulates	17	14	14	14	13	13	8
Hexavalent Chromium	0.0022	0.0020	0.0013	0.0014	<0.00069	0.00071	0.00073

Weather Day Classification [E]
Dry/Heavy Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Friday, April 26, 2013
(4/25/2013-4/26/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-12)*	PAM-3 *(AM-10)*	PAM-4 *(AM-8)*	PAM-5 *(AM-7)*	PAM-6 *(AM-5)*	PAM-7 *(AM-3)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
4/25/2013	12:00	14.31	19.23	12.66	15.08	13.33	15.76	7.75	6.6	W	34.3	0.000
	13:00	15.53	20.52	14.37	16.79	14.94	17.78	8.67	4.8	W	31.2	0.000
	14:00	17.11	19.99	15.32	17.99	15.81	69.02	9.80	6.4	WNW	27.2	0.000
	15:00	18.11	20.28	17.21	21.62	25.74	20.87	10.30	7.4	W	25.2	0.000
	16:00	14.23	17.03	13.07	15.58	13.08	16.07	8.68	5.1	W	22.2	0.000
	17:00	13.46	16.39	12.41	15.06	12.57	15.31	8.28	5.9	W	22.1	0.000
	18:00	17.23	19.89	15.52	20.59	18.75	20.20	9.40	5.1	WSW	28.1	0.000
	19:00	17.50	21.83	21.35	27.54	24.16	20.78	9.26	3.8	SSE	40.5	0.000
	20:00	27.24	24.39	15.75	21.70	26.33	35.04	10.72	3.0	SSW	41.1	0.000
	21:00	18.51	20.35	12.25	15.89	17.26	24.79	16.11	4.0	S	45.8	0.000
	22:00	18.62	22.43	16.42	19.78	18.38	21.89	10.18	3.7	WSW	45.3	0.000
	23:00	16.02	21.16	14.46	17.36	16.25	19.03	8.64	5.8	W	49.1	0.000
4/26/2013	0:00	14.53	21.67	12.95	15.43	14.54	16.70	7.61	8.2	W	50.3	0.000
	1:00	15.22	21.81	13.22	15.67	14.61	17.58	7.76	3.9	W	52.8	0.000
	2:00	14.70	21.43	12.94	15.23	14.30	16.79	7.68	5.1	W	53.0	0.000
	3:00	15.60	22.66	13.53	16.93	15.83	19.08	8.23	1.6	N	54.8	0.000
	4:00	13.58	22.21	11.61	14.23	13.12	16.19	6.89	4.6	N	49.7	0.000
	5:00	13.20	21.08	11.28	13.78	13.16	15.78	6.94	6.8	N	49.3	0.000
	6:00	13.65	20.89	11.16	14.44	13.64	16.04	6.85	6.2	N	52.5	0.000
	7:00	13.59	20.53	10.81	13.91	13.52	16.58	8.08	6.2	N	48.4	0.000
	8:00	12.57	18.74	9.72	13.03	12.12	15.02	6.91	8.0	N	41.5	0.000
	9:00	10.78	16.21	8.86	11.52	10.25	12.50	5.59	5.3	NNW	39.0	0.000
	10:00	9.22	15.40	8.29	10.18	8.43	10.42	4.99	3.6	N	35.2	0.000
	11:00	8.54	14.42	7.94	9.63	7.84	9.45	5.00	6.6	NNW	31.0	0.000
	12:00	9.38	15.22	7.98	10.08	8.04	10.22	5.57	7.9	W	29.2	0.000
	13:00	11.32	18.39	9.07	10.70	8.51	10.50	5.64	6.8	W	25.9	0.000
Daily Average/Mode/Sum [C]		**14.76**	**19.77**	**12.70**	**15.76**	**14.79**	**19.21**	**8.14**	**5.5**	**W**	**39.4**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	14	12	8	10	13	10	11
Hexavalent Chromium	0.0013	0.0013	<0.00069	0.0011	0.0017	0.0018	0.0033

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Saturday, April 27, 2013
(4/26/2013-4/27/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-12)*	PAM-3 *(AM-10)*	PAM-4 *(AM-8)*	PAM-5 *(AM-7)*	PAM-6 *(AM-5)*	PAM-7 *(AM-3)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
4/26/2013	12:00	9.38	15.22	7.98	10.08	8.04	10.22	5.57	7.9	W	29.2	0.000
	13:00	11.32	18.39	9.07	10.70	8.51	10.50	5.64	6.8	W	25.9	0.000
	14:00	9.62	16.31	8.42	10.35	8.58	10.40	6.07	8.6	WNW	22.0	0.000
	15:00	9.10	16.46	8.36	10.48	8.06	10.00	5.28	7.0	W	21.5	0.000
	16:00	9.23	16.52	8.48	10.43	8.14	9.85	5.78	4.9	W	21.4	0.000
	17:00	9.91	16.91	8.89	10.98	8.73	10.69	6.40	6.2	WNW	22.5	0.000
	18:00	10.63	18.32	9.27	11.11	8.97	11.44	6.28	4.6	W	24.1	0.000
	19:00	12.77	20.35	9.91	12.03	9.74	13.58	6.81	3.4	WNW	25.3	0.000
	20:00	12.96	23.23	11.28	13.52	11.35	15.29	7.19	4.2	N	26.9	0.000
	21:00	13.60	26.08	12.44	14.74	13.21	16.77	8.22	3.0	N	27.5	0.000
	22:00	17.77	24.87	14.59	15.68	14.20	18.24	9.14	2.0	ENE	29.4	0.000
	23:00	19.09	25.22	15.24	18.84	16.68	20.69	10.03	1.4	N	32.9	0.000
4/27/2013	0:00	21.18	29.14	18.22	22.23	20.84	25.28	11.80	2.3	N	32.9	0.000
	1:00	21.19	29.79	18.76	21.99	20.70	24.72	11.44	2.5	N	41.9	0.000
	2:00	20.84	29.28	18.23	22.65	20.98	25.23	10.94	1.5	W	53.0	0.000
	3:00	20.40	30.90	17.73	21.34	20.10	23.75	10.81	3.3	N	54.0	0.000
	4:00	17.20	28.30	15.43	18.36	17.19	20.34	9.04	5.7	N	53.7	0.000
	5:00	17.18	29.04	15.24	18.29	17.01	20.54	9.03	4.4	N	53.1	0.000
	6:00	21.07	32.35	18.18	22.01	20.73	25.27	10.94	4.0	N	55.3	0.000
	7:00	20.98	31.12	17.86	22.27	22.18	26.80	11.43	2.5	NNE	51.2	0.000
	8:00	15.61	24.61	13.61	17.06	15.86	18.51	8.79	5.5	ENE	41.7	0.000
	9:00	12.74	21.87	10.53	13.60	11.77	13.99	6.83	6.4	ENE	41.5	0.000
	10:00	13.48	20.17	11.66	14.41	11.92	14.50	7.10	3.8	SE	34.5	0.000
	11:00	14.04	20.01	13.12	16.09	13.14	16.75	7.82	4.6	SSE	32.9	0.000
	12:00	13.67	20.75	12.93	15.77	13.17	15.12	7.77	4.9	SSE	28.7	0.000
	13:00	10.20	18.47	9.81	11.94	11.33	11.47	6.44	4.3	SE	23.7	0.000
Daily Average/Mode/Sum [C]		**14.81**	**23.22**	**12.89**	**15.65**	**13.89**	**16.92**	**8.18**	**4.4**	**N**	**34.9**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	11	9	12	11	12	11	8
Hexavalent Chromium	0.0037	0.0028	0.0038	0.0043	0.0038	0.0042	0.0060

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Sunday, April 28, 2013
(4/27/2013-4/28/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-12)	PAM-3 (AM-10)	PAM-4 (AM-8)	PAM-5 (AM-7)	PAM-6 (AM-5)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
4/27/2013	12:00	13.67	20.75	12.93	15.77	13.17	15.12	7.77	4.9	SSE	28.7	0.000
	13:00	10.20	18.47	9.81	11.94	11.33	11.47	6.44	4.3	SE	23.7	0.000
	14:00	8.16	16.58	7.87	9.39	7.07	8.92	5.53	6.4	SSE	20.7	0.000
	15:00	10.26	17.93	10.65	13.18	9.75	11.46	6.61	5.5	SSE	23.8	0.000
	16:00	10.53	18.87	10.99	13.44	9.63	11.63	6.79	5.3	SSE	27.3	0.000
	17:00	11.88	17.53	10.62	13.69	9.29	10.91	6.48	5.2	SSE	26.5	0.000
	18:00	8.80	17.21	8.89	11.06	8.46	10.34	6.11	3.9	SE	29.0	0.000
	19:00	9.00	17.78	9.13	11.25	8.31	10.29	5.79	2.4	SSE	30.5	0.000
	20:00	10.26	20.01	13.26	17.16	11.37	11.53	6.12	3.4	S	38.0	0.000
	21:00	12.20	23.02	16.36	21.81	16.67	14.37	6.75	2.6	S	36.4	0.000
	22:00	21.62	23.73	14.66	18.46	18.26	26.49	13.73	3.2	WSW	38.1	0.000
	23:00	16.06	23.87	13.14	16.24	16.02	19.19	10.90	4.4	S	51.6	0.000
4/28/2013	0:00	14.13	24.45	12.67	15.16	13.97	16.03	8.37	3.6	WSW	60.1	0.000
	1:00	26.57	32.34	23.24	28.12	26.56	31.62	15.14	3.7	W	65.2	0.000
	2:00	14.09	21.99	12.54	15.18	14.04	16.25	7.54	2.2	WSW	60.3	0.000
	3:00	14.50	24.75	12.98	16.50	15.62	18.22	8.11	2.7	WSW	62.3	0.000
	4:00	16.19	26.05	13.93	17.54	16.14	18.53	8.77	3.3	WSW	63.4	0.000
	5:00	17.95	27.86	15.34	19.16	18.84	21.26	9.68	1.2	WSW	65.7	0.000
	6:00	27.91	34.63	28.98	34.28	31.55	34.18	14.25	2.1	WSW	70.7	0.000
	7:00	37.07	40.32	36.11	45.23	44.39	45.21	18.76	1.7	WSW	65.1	0.000
	8:00	29.40	32.04	26.15	32.08	30.89	33.58	15.61	2.7	SSE	59.8	0.000
	9:00	22.46	25.26	21.26	27.12	24.43	27.11	12.29	3.8	SSE	57.8	0.000
	10:00	15.74	21.06	15.49	19.53	16.33	18.82	9.35	4.9	SE	49.7	0.000
	11:00	11.91	17.25	11.02	14.27	11.26	13.86	7.31	7.4	SSE	42.4	0.000
	12:00	11.07	15.50	9.93	12.71	11.18	13.25	6.45	7.1	SSW	30.6	0.000
	13:00	11.45	16.81	8.23	10.93	10.65	14.39	7.87	8.1	S	27.1	0.000
Daily Average/Mode/Sum [C]		**15.89**	**22.93**	**14.85**	**18.51**	**16.35**	**18.62**	**9.17**	**4.1**	**SSE**	**44.4**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	13	13	15	11	9	13	12
Hexavalent Chromium	0.0024	0.0038	0.0051	0.0019	0.0011	0.0055	0.0036

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Monday, April 29, 2013
(4/28/2013-4/29/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-12)	PAM-3 (AM-10)	PAM-4 (AM-8)	PAM-5 (AM-7)	PAM-6 (AM-5)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
4/28/2013	12:00	11.1	15.5	9.9	12.7	11.2	13.2	6.5	7.1	SSW	30.6	0.000
	13:00	11.4	16.8	8.2	10.9	10.7	14.4	7.9	8.1	S	27.1	0.000
	14:00	10.2	17.8	8.5	11.9	10.3	13.4	7.3	8.1	SSW	28.3	0.000
	15:00	10.1	17.9	7.7	10.0	9.3	14.3	9.0	9.4	SSW	29.9	0.000
	16:00	10.1	19.9	7.8	11.0	9.1	13.5	8.6	9.0	SSW	33.3	0.002
	17:00	10.7	20.0	7.7	10.6	10.3	13.4	7.1	6.2	SSW	33.3	0.002
	18:00	13.3	21.9	8.1	12.0	11.7	16.8	7.8	7.9	SSW	35.5	0.000
	19:00	14.5	24.1	8.7	13.5	13.7	17.7	6.9	8.3	SSW	39.2	0.000
	20:00	15.3	24.9	8.6	13.1	14.3	18.0	6.8	9.5	S	41.2	0.000
	21:00	12.9	22.8	8.6	11.9	12.1	16.5	8.1	7.7	S	44.7	0.000
	22:00	11.0	24.2	10.3	13.2	12.8	13.3	4.5	6.0	SSW	40.8	0.000
	23:00	9.7	23.6	10.5	14.6	12.2	11.6	4.7	5.0	S	44.2	0.000
4/29/2013	0:00	8.5	23.3	10.6	14.3	10.8	10.1	4.7	3.9	SSE	48.1	0.000
	1:00	11.7	26.6	12.5	16.4	14.9	13.8	5.5	2.7	SSE	55.5	0.002
	2:00	19.2	28.1	13.1	16.8	17.2	22.0	8.6	3.6	SW	72.6	0.005
	3:00	16.7	29.5	17.6	20.4	17.0	17.8	8.9	3.8	SSE	85.5	0.017
	4:00	17.7	29.6	16.1	19.4	17.9	18.7	9.0	6.0	SE	90.9	0.005
	5:00	21.9	33.2	20.1	23.7	22.0	23.8	10.9	5.4	ESE	93.8	0.003
	6:00	20.3	31.4	17.7	20.9	18.8	21.7	10.3	5.9	ESE	94.3	0.001
	7:00	17.8	30.0	15.7	18.8	17.0	19.4	9.2	4.7	SE	93.1	0.001
	8:00	16.6	29.7	15.3	19.0	17.3	19.7	8.8	6.2	ESE	93.9	0.037
	9:00	11.4	24.7	9.3	12.0	10.3	12.3	5.8	4.7	SE	95.1	0.008
	10:00	9.0	22.8	7.6	9.9	8.4	10.0	5.1	4.6	SE	93.6	0.001
	11:00	8.0	21.1	9.1	12.4	9.1	9.6	4.6	3.9	SSE	94.3	0.003
	12:00	15.2	26.1	14.7	19.3	17.9	18.4	6.6	6.1	S	89.3	0.000
	13:00	13.8	24.0	13.4	17.6	16.4	16.7	6.5	7.4	SSW	88.5	0.000
Daily Average/Mode/Sum [C]		**13.4**	**24.2**	**11.4**	**14.9**	**13.6**	**15.8**	**7.3**	**6.2**	**SSW**	**62.2**	**0.089**

Lab Analysis (µg/m³) [D]							
Total Particulates	8	<3	11	14	28	18	135
Hexavalent Chromium	0.00083	0.0011	0.0020	0.0014	0.0037	0.0017	<0.00067

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Tuesday, April 30, 2013
(4/29/2013-4/30/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-12)	PAM-3 (AM-10)	PAM-4 (AM-8)	PAM-5 (AM-7)	PAM-6 (AM-5)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
4/29/2013	12:00	15.2	26.1	14.7	19.3	17.9	18.4	6.6	6.1	S	89.3	0.000
	13:00	13.8	24.0	13.4	17.6	16.4	16.7	6.5	7.4	SSW	88.5	0.000
	14:00	19.2	29.3	14.9	21.3	25.5	26.9	6.0	5.7	S	88.1	0.003
	15:00	11.1	21.7	14.1	22.6	13.8	12.4	4.6	5.4	SE	90.2	0.000
	16:00	6.2	17.0	18.9	27.0	12.3	7.7	3.3	4.2	S	88.4	0.000
	17:00	6.7	17.6	7.6	10.2	7.5	8.0	3.7	5.5	SSE	91.3	0.000
	18:00	7.8	17.5	8.8	11.6	8.6	9.4	4.3	5.4	SSE	92.6	0.000
	19:00	5.4	16.3	7.5	9.9	6.3	6.5	3.0	7.2	SSE	89.4	0.000
	20:00	4.8	17.0	4.3	5.9	4.6	5.6	2.8	4.5	S	94.3	0.000
	21:00	4.7	17.8	3.8	5.5	4.1	5.1	2.6	5.3	ESE	93.7	0.000
	22:00	5.1	18.0	4.3	6.5	4.9	5.9	2.9	4.6	ESE	91.5	0.000
	23:00	6.2	18.4	5.2	7.4	5.8	7.1	3.1	4.6	ENE	92.3	0.000
4/30/2013	0:00	6.5	18.3	5.1	7.3	5.4	7.2	3.2	6.4	E	91.6	0.000
	1:00	9.3	20.6	8.1	10.2	8.9	10.8	4.7	7.9	ENE	91.5	0.000
	2:00	8.4	19.8	6.9	8.8	7.4	9.5	4.1	8.5	ENE	94.7	0.000
	3:00	4.2	17.9	3.3	4.9	3.6	4.6	2.1	8.6	ENE	96.9	0.000
	4:00	3.0	17.0	2.6	3.4	2.7	3.3	1.5	8.3	ENE	95.9	0.000
	5:00	3.0	16.9	2.4	3.5	2.7	3.4	1.3	8.5	ENE	95.8	0.000
	6:00	3.7	17.9	2.8	3.6	2.5	3.4	1.8	9.4	ENE	96.7	0.000
	7:00	3.1	17.4	2.5	3.4	2.4	3.1	1.6	10.1	ENE	95.2	0.000
	8:00	7.2	20.8	5.6	7.3	5.9	7.5	3.5	9.6	ENE	94.9	0.000
	9:00	10.4	22.6	8.2	10.3	9.1	10.9	5.0	8.6	ENE	92.8	0.000
	10:00	13.5	24.7	10.1	13.1	12.1	14.0	6.5	6.6	ENE	93.3	0.000
	11:00	15.1	24.4	11.7	15.2	14.1	15.9	7.4	6.6	ESE	88.9	0.000
	12:00	14.2	24.1	11.0	14.0	12.6	14.7	7.0	6.1	SE	82.8	0.000
	13:00	14.2	22.9	11.6	15.0	13.7	15.1	7.2	5.0	ESE	79.1	0.000
Daily Average/Mode/Sum [C]		**8.5**	**20.2**	**8.1**	**11.0**	**8.9**	**9.7**	**4.1**	**6.8**	**ENE**	**91.5**	**0.004**

Lab Analysis (µg/m³) [D]							
Total Particulates	7	7	11	98	12	6	5
Hexavalent Chromium	0.00072	0.0010	0.0037	<0.00067	0.0025	0.0011	<0.00068

Weather Day Classification [E]
Out of Classification

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Wednesday, May 01, 2013
(4/30/2013-5/1/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-12)*	PAM-3 *(AM-10)*	PAM-4 *(AM-8)*	PAM-5 *(AM-7)*	PAM-6 *(AM-5)*	PAM-7 *(AM-3)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
4/30/2013	12:00	14.2	24.1	11.0	14.0	12.6	14.7	7.0	6.1	SE	82.8	0.000
	13:00	14.2	22.9	11.6	15.0	13.7	15.1	7.2	5.0	ESE	79.1	0.000
	14:00	11.3	19.2	10.2	13.6	10.3	11.8	5.9	6.2	SSE	85.4	0.000
	15:00	10.8	18.3	9.1	12.1	9.1	11.0	5.6	4.5	E	75.8	0.000
	16:00	9.8	17.8	8.4	11.5	8.8	11.0	5.4	6.4	ESE	69.8	0.000
	17:00	11.7	19.8	10.1	13.4	10.5	12.9	6.4	5.6	SE	70.6	0.000
	18:00	11.5	19.5	9.4	12.8	10.3	12.6	6.1	5.0	ESE	65.1	0.000
	19:00	11.5	19.7	9.4	12.4	9.9	12.3	6.1	6.7	SE	61.3	0.000
	20:00	10.6	20.2	9.2	12.3	10.0	12.0	5.8	5.4	ESE	60.2	0.000
	21:00	11.2	20.8	9.3	12.2	9.7	12.3	5.8	3.9	SE	58.6	0.000
	22:00	13.7	23.0	10.3	13.0	11.1	13.8	6.9	3.7	ENE	55.3	0.000
	23:00	10.5	21.7	8.0	9.9	8.1	10.0	5.1	4.7	ENE	45.3	0.000
5/1/2013	0:00	9.2	21.4	7.1	10.3	8.6	10.9	5.0	3.4	NNE	45.1	0.000
	1:00	8.3	21.6	6.8	9.0	7.9	9.8	4.8	3.7	NNE	45.6	0.000
	2:00	8.4	21.7	6.6	9.2	7.8	10.1	4.6	5.1	NNE	48.2	0.000
	3:00	9.2	22.3	7.4	10.1	8.7	10.6	4.7	3.5	NNE	52.5	0.000
	4:00	9.6	23.3	7.6	10.9	9.5	12.3	4.9	3.7	NNE	58.5	0.000
	5:00	10.0	24.7	8.2	10.9	9.7	12.0	5.2	4.3	NE	58.3	0.000
	6:00	11.4	23.8	9.1	11.9	10.7	13.5	5.9	5.7	NNE	55.1	0.000
	7:00	11.6	24.2	9.1	12.5	11.4	13.9	6.1	4.7	NNE	48.5	0.000
	8:00	11.8	23.2	8.8	11.5	10.0	12.5	5.8	6.3	ENE	41.7	0.000
	9:00	10.9	23.0	8.4	11.6	9.5	11.5	5.4	6.0	E	39.3	0.000
	10:00	9.2	18.9	7.0	9.9	7.6	9.7	4.9	7.1	SE	38.4	0.000
	11:00	8.2	18.2	6.4	9.0	6.7	8.1	4.4	7.6	SE	35.0	0.000
	12:00	9.2	18.7	6.6	9.2	6.5	8.4	4.6	7.2	E	33.7	0.000
	13:00	8.6	18.7	7.0	9.5	6.8	8.0	4.8	8.7	SE	34.6	0.000
Daily Average/Mode/Sum [C]		**10.6**	**21.2**	**8.6**	**11.5**	**9.4**	**11.6**	**5.6**	**5.4**	**SE**	**55.5**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	5	11	10	11	14	14	12
Hexavalent Chromium	0.00072	0.0013	0.0017	0.0017	0.0011	0.0015	<0.00067

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Thursday, May 02, 2013
(5/1/2013-5/2/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]						
		PAM-1 *(AM-1)*	PAM-2 *(AM-11)*	PAM-3 *(AM-9)*	PAM-4 *(AM-8)*	PAM-5 *(AM-6)*	PAM-6 *(AM-4)*	PAM-7 *(AM-3)*
5/1/2013	16:00	8.1	19.0	6.4	8.7	6.6	ND	4.6
	17:00	7.8	19.3	6.6	9.3	6.7	ND	4.4
	18:00	9.2	19.1	7.9	10.3	7.0	10.7	5.0
	19:00	10.4	20.4	9.6	12.5	8.4	11.2	5.4
	20:00	7.0	19.4	6.1	8.0	5.5	7.0	3.9
	21:00	8.0	20.0	6.1	8.7	6.2	8.2	3.6
	22:00	8.7	22.5	6.4	8.8	7.0	9.2	4.3
	23:00	9.2	23.7	6.2	8.7	6.9	8.9	3.9
5/2/2013	0:00	8.0	23.3	5.4	7.5	5.9	7.7	3.6
	1:00	8.0	22.9	6.1	8.7	7.3	8.3	3.6
	2:00	7.7	22.9	5.3	7.7	6.3	7.8	3.5
	3:00	9.0	23.8	6.2	9.0	7.3	8.9	4.0
	4:00	7.7	23.8	5.5	7.8	6.3	8.0	3.3
	5:00	9.1	26.7	6.3	9.4	7.7	9.0	3.9
	6:00	12.0	28.2	8.7	11.7	10.3	12.5	5.6
	7:00	13.2	27.1	9.2	12.3	10.8	12.9	5.8
	8:00	11.3	26.8	8.0	11.3	9.6	11.3	6.7
	9:00	10.7	24.0	6.3	8.9	7.1	8.6	4.3
	10:00	6.9	18.5	5.1	7.6	5.4	6.0	3.3
	11:00	5.6	16.6	4.1	6.4	4.3	4.0	3.1
	12:00	9.3	14.7	3.7	5.9	3.4	3.7	2.7
	13:00	15.0	15.8	4.7	7.1	4.2	5.1	3.4
	14:00	8.8	18.2	6.9	9.5	6.2	7.7	4.6
	15:00	10.0	18.0	7.5	9.8	6.4	8.0	4.9
	16:00	7.8	17.4	7.1	9.4	5.6	6.6	4.8
	17:00	6.7	18.1	6.9	9.9	5.6	6.9	4.8
Daily Average/Mode/Sum [C]		**9.0**	**21.2**	**6.5**	**9.0**	**6.7**	**8.3**	**4.3**

Weather [B]			
Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
7.5	SE	30.1	0.000
7.0	SE	29.4	0.000
6.1	SE	32.0	0.000
8.3	SSE	54.2	0.000
9.8	ESE	55.1	0.000
7.5	ESE	58.5	0.000
6.9	SE	62.6	0.000
3.3	ENE	68.2	0.000
2.9	ENE	70.7	0.000
1.7	SSE	73.0	0.000
3.0	SE	71.5	0.000
4.7	ENE	75.3	0.000
6.3	ENE	77.6	0.000
5.2	ENE	80.8	0.000
4.3	ENE	82.9	0.000
4.6	ENE	80.9	0.000
4.5	ENE	75.6	0.000
4.6	E	67.8	0.000
4.1	SSE	57.7	0.000
5.5	SE	52.5	0.000
7.3	SE	48.6	0.000
7.8	SE	48.4	0.000
6.6	SE	47.5	0.000
7.3	ESE	47.6	0.000
5.4	SSE	45.3	0.000
4.5	SSE	43.4	0.000
5.6	**SE**	**59.1**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	8	10	12	7	37	12	8
Hexavalent Chromium	0.00078	<0.00069	<0.00069	0.0010	0.00088	0.0016	0.0011

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Friday, May 03, 2013
(5/2/2013-5/3/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/2/2013	16:00	7.8	17.4	7.1	9.4	5.6	6.6	4.8	5.4	SSE	45.3	0.000
	17:00	6.7	18.1	6.9	9.9	5.6	6.9	4.8	4.5	SSE	43.4	0.000
	18:00	6.9	18.5	8.7	12.2	7.3	7.2	4.6	3.9	S	42.3	0.000
	19:00	6.6	18.3	8.2	12.4	6.3	9.1	5.0	3.5	SSE	43.3	0.000
	20:00	8.7	20.7	7.3	10.0	10.3	13.5	6.8	1.4	SSE	44.7	0.000
	21:00	9.8	23.1	11.4	14.8	12.3	11.4	5.1	2.7	SSE	50.3	0.000
	22:00	10.3	26.7	13.6	19.5	12.9	10.2	4.8	2.9	SSE	55.3	0.000
	23:00	7.6	23.1	10.2	14.3	8.1	8.5	3.9	2.8	SSE	56.0	0.000
5/3/2013	0:00	7.8	22.5	6.8	9.8	7.3	8.8	3.9	4.8	SE	58.6	0.000
	1:00	11.1	25.6	10.2	13.9	11.3	13.0	5.6	2.1	ESE	62.4	0.000
	2:00	14.8	28.1	11.7	15.1	13.2	14.6	6.4	3.1	SE	67.2	0.000
	3:00	14.7	29.3	13.0	16.2	14.2	17.0	7.8	4.9	ENE	73.7	0.000
	4:00	15.3	30.1	13.0	16.3	14.4	17.7	7.8	6.5	ENE	77.7	0.000
	5:00	14.2	30.7	12.2	15.7	14.3	17.1	7.2	5.7	ENE	80.0	0.000
	6:00	16.5	32.8	13.9	17.9	16.5	19.4	8.5	6.3	ENE	81.6	0.000
	7:00	16.5	31.6	13.3	17.0	16.2	19.6	8.7	7.9	NE	73.2	0.000
	8:00	10.4	24.1	7.4	10.3	9.8	11.7	5.3	7.0	E	59.3	0.000
	9:00	9.1	22.3	5.9	9.0	6.9	9.0	4.3	10.0	ESE	49.8	0.000
	10:00	9.7	22.6	6.8	10.0	7.4	8.8	4.6	9.7	ENE	49.4	0.000
	11:00	8.6	21.4	6.7	10.0	7.2	8.9	4.7	9.2	SE	45.9	0.000
	12:00	15.7	20.5	7.0	10.0	7.0	9.2	4.7	7.7	SE	43.0	0.000
	13:00	19.1	22.1	9.0	12.5	8.2	10.3	5.5	8.0	ENE	43.0	0.000
	14:00	13.6	28.6	18.0	23.7	12.8	14.0	7.1	8.1	SSE	51.9	0.000
	15:00	12.3	31.1	18.6	25.5	14.2	13.8	6.8	6.1	S	50.8	0.000
	16:00	15.0	26.8	14.4	21.6	13.0	13.2	6.4	4.9	SW	48.3	0.000
	17:00	12.4	26.3	13.7	21.5	13.0	11.3	5.6	5.6	SSW	50.5	0.000
Daily Average/Mode/Sum [C]		**11.6**	**24.7**	**10.6**	**14.6**	**10.6**	**11.9**	**5.8**	**5.6**	**SSE**	**55.6**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	23	25	24	24	23	8	<3
Hexavalent Chromium	0.0012	0.0014	0.0020	0.0012	0.0015	<0.00064	<0.00063

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Saturday, May 04, 2013
(5/3/2013-5/4/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]						
		PAM-1 *(AM-1)*	PAM-2 *(AM-11)*	PAM-3 *(AM-9)*	PAM-4 *(AM-8)*	PAM-5 *(AM-6)*	PAM-6 *(AM-4)*	PAM-7 *(AM-3)*
5/3/2013	16:00	15.0	26.8	14.4	21.6	13.0	13.2	6.4
	17:00	12.4	26.3	13.7	21.5	13.0	11.3	5.6
	18:00	11.9	25.3	14.5	18.9	12.0	10.6	5.3
	19:00	11.3	25.5	15.3	19.5	10.9	10.2	5.2
	20:00	12.3	25.2	11.3	14.1	10.9	11.6	5.7
	21:00	11.5	26.1	9.6	12.5	10.5	11.9	5.4
	22:00	11.8	27.0	9.4	12.7	11.0	12.7	5.6
	23:00	13.0	28.9	10.2	13.4	11.9	13.7	6.3
5/4/2013	0:00	14.0	30.4	10.9	14.4	12.8	14.4	6.5
	1:00	16.6	31.3	12.3	15.7	14.3	16.7	7.7
	2:00	13.0	28.7	10.3	13.5	11.3	18.9	6.6
	3:00	13.6	28.1	9.8	13.1	11.2	13.2	5.9
	4:00	13.4	29.1	9.8	13.7	11.7	13.8	6.2
	5:00	12.7	27.3	9.4	13.5	11.8	12.9	5.8
	6:00	15.0	28.1	10.8	15.2	13.5	15.2	7.0
	7:00	13.6	26.1	10.1	14.3	12.5	14.1	6.4
	8:00	14.6	26.6	10.9	14.9	13.8	15.4	7.4
	9:00	15.5	26.3	11.1	14.6	13.0	14.1	7.2
	10:00	13.4	23.7	9.3	12.5	10.6	11.6	6.1
	11:00	13.9	21.6	9.4	12.5	10.1	11.4	5.9
	12:00	13.2	21.5	10.3	13.2	10.8	12.5	6.6
	13:00	10.4	18.6	8.7	11.5	8.1	9.5	5.4
	14:00	10.3	18.6	9.0	11.8	8.6	10.0	5.7
	15:00	10.2	17.6	9.3	12.0	8.5	10.0	6.0
	16:00	12.5	17.5	8.6	39.3	7.5	9.4	5.7
	17:00	9.4	17.2	8.4	11.3	7.4	11.0	6.4
Daily Average/Mode/Sum [C]		**12.9**	**25.0**	**10.6**	**15.4**	**11.2**	**12.7**	**6.2**

Date	Time	Weather [B]			
		Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/3/2013	16:00	4.9	SW	48.3	0.000
	17:00	5.6	SSW	50.5	0.000
	18:00	5.2	S	53.6	0.000
	19:00	6.1	S	56.9	0.000
	20:00	7.1	SE	60.8	0.000
	21:00	6.3	SE	61.5	0.000
	22:00	7.3	ESE	65.4	0.000
	23:00	7.6	ESE	70.3	0.000
5/4/2013	0:00	6.6	SE	74.8	0.000
	1:00	3.8	SE	76.6	0.000
	2:00	4.4	ESE	77.1	0.000
	3:00	5.0	ENE	78.5	0.000
	4:00	4.7	ENE	80.0	0.000
	5:00	4.6	NNE	80.2	0.000
	6:00	4.1	NE	80.9	0.000
	7:00	4.9	ENE	76.5	0.000
	8:00	6.1	ENE	72.0	0.000
	9:00	5.9	ENE	65.8	0.000
	10:00	6.3	ESE	53.4	0.000
	11:00	8.3	SE	44.5	0.000
	12:00	7.9	SE	44.2	0.000
	13:00	9.2	SE	43.3	0.000
	14:00	7.8	SSE	43.7	0.000
	15:00	6.8	SE	43.8	0.000
	16:00	4.5	SSE	41.6	0.000
	17:00	3.9	SSE	40.3	0.000
Daily Average/Mode/Sum [C]		**6.0**	**SE**	**60.9**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	16	8	15	10	11	13	9
Hexavalent Chromium	0.0013	<0.00066	<0.00066	0.0014	<0.00065	<0.00066	<0.00066

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Sunday, May 05, 2013
(5/4/2013-5/5/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/4/2013	16:00	12.5	17.5	8.6	39.3	7.5	9.4	5.7	4.5	SSE	41.6	0.000
	17:00	9.4	17.2	8.4	11.3	7.4	11.0	6.4	3.9	SSE	40.3	0.000
	18:00	12.7	17.6	7.8	11.0	6.9	10.7	5.9	5.8	SSE	44.6	0.000
	19:00	10.3	20.1	8.6	11.7	8.8	10.7	5.9	5.5	S	51.0	0.000
	20:00	12.0	23.6	10.7	13.6	10.6	12.6	6.1	3.3	SW	51.3	0.000
	21:00	13.0	24.8	10.2	13.6	10.9	12.8	6.2	4.7	SW	54.0	0.000
	22:00	15.7	27.9	12.3	16.0	13.7	15.6	7.4	6.7	S	61.7	0.000
	23:00	19.1	32.3	15.0	18.4	17.2	19.5	9.2	4.1	SE	62.2	0.000
5/5/2013	0:00	21.7	35.1	16.8	21.3	18.9	22.3	10.3	5.2	ESE	64.5	0.000
	1:00	23.6	35.7	17.4	21.9	19.8	23.9	11.5	7.6	ESE	66.8	0.000
	2:00	23.6	37.7	19.4	24.5	22.1	24.8	11.3	6.1	ESE	70.8	0.000
	3:00	26.0	40.8	20.2	25.0	23.1	26.7	12.9	7.4	ESE	73.2	0.000
	4:00	26.3	41.4	20.8	26.4	23.7	27.2	12.8	6.9	SE	73.7	0.000
	5:00	25.5	40.4	18.5	24.6	21.0	24.9	11.8	8.0	E	71.3	0.000
	6:00	24.9	40.7	17.5	24.1	20.6	23.6	11.6	10.1	ENE	70.0	0.000
	7:00	25.4	41.6	18.5	24.5	22.8	25.5	11.8	5.5	ENE	69.7	0.000
	8:00	25.4	40.0	18.4	24.3	21.2	24.3	11.8	10.8	ENE	65.3	0.000
	9:00	24.0	38.7	17.9	23.1	20.6	23.3	11.1	7.6	E	61.6	0.000
	10:00	22.7	36.6	17.9	23.1	20.2	22.7	11.0	7.2	ESE	61.5	0.000
	11:00	25.6	37.1	18.4	23.6	20.4	23.8	11.8	7.1	ENE	60.0	0.000
	12:00	22.9	35.1	18.4	23.0	20.1	22.8	11.4	7.5	SE	57.0	0.000
	13:00	22.0	33.4	18.0	22.5	19.5	21.8	11.1	7.2	ESE	54.2	0.000
	14:00	21.6	31.5	17.5	21.6	18.2	21.6	10.9	5.7	SE	52.8	0.000
	15:00	21.8	28.4	17.6	22.5	18.2	21.0	10.9	5.4	S	51.5	0.000
	16:00	21.0	27.2	17.0	21.9	17.5	21.6	14.6	5.1	S	49.3	0.000
	17:00	20.3	26.8	16.4	20.9	16.8	19.9	10.5	3.7	S	48.5	0.000
Daily Average/Mode/Sum [C]		**20.3**	**31.9**	**15.7**	**21.3**	**17.2**	**20.2**	**10.1**	**6.3**	**ESE**	**58.8**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	16	15	15	13	14	16	12
Hexavalent Chromium	<0.00065	<0.00067	<0.00066	0.00074	<0.00065	<0.00065	<0.00065

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Monday, May 06, 2013
(5/5/2013-5/6/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/5/2013	16:00	21.0	27.2	17.0	21.9	17.5	21.6	14.6	5.1	S	49.3	0.000
	17:00	20.3	26.8	16.4	20.9	16.8	19.9	10.5	3.7	S	48.5	0.000
	18:00	18.4	25.6	14.8	18.8	15.2	17.7	9.5	6.9	SE	48.7	0.000
	19:00	19.4	28.3	15.1	19.8	15.6	18.5	9.6	3.9	SSE	55.5	0.000
	20:00	19.9	29.4	15.6	21.8	17.0	19.4	9.8	2.5	S	61.0	0.000
	21:00	20.2	31.3	15.6	19.7	17.9	19.6	10.1	9.4	ESE	65.0	0.000
	22:00	22.1	32.4	16.1	20.9	18.4	20.9	10.2	6.1	ESE	64.7	0.000
	23:00	22.6	33.8	17.1	22.1	20.0	23.2	11.0	5.2	E	69.0	0.000
5/6/2013	0:00	22.6	33.4	16.4	21.5	20.0	22.7	10.7	5.0	ENE	69.9	0.000
	1:00	21.2	32.9	15.6	20.7	18.4	21.0	9.8	4.5	ENE	69.2	0.000
	2:00	23.2	33.6	15.8	21.1	18.6	21.1	9.8	5.0	ENE	71.1	0.000
	3:00	21.3	34.1	15.5	20.7	18.7	20.5	9.8	3.5	NNE	74.9	0.000
	4:00	20.3	33.7	14.9	20.0	17.5	20.1	9.3	6.3	NE	74.6	0.000
	5:00	22.7	35.8	16.8	23.0	19.7	22.5	10.6	4.9	NE	78.4	0.000
	6:00	26.4	38.8	19.6	25.1	23.5	26.3	12.5	6.3	NNE	81.6	0.000
	7:00	28.3	39.5	21.0	29.2	26.0	28.3	13.9	4.2	NNE	82.0	0.000
	8:00	32.8	47.0	28.9	35.1	36.4	38.1	17.9	4.4	NE	86.9	0.000
	9:00	34.5	49.7	30.0	36.3	33.9	37.3	18.5	5.1	ENE	85.5	0.000
	10:00	37.7	52.7	31.7	39.0	37.0	41.2	20.3	7.9	ENE	83.2	0.000
	11:00	37.8	51.6	31.1	37.9	36.2	39.8	20.0	7.4	ENE	80.9	0.000
	12:00	31.8	43.5	24.8	30.9	29.0	32.5	16.9	7.8	ENE	79.5	0.000
	13:00	24.5	36.1	20.2	25.0	23.1	25.9	13.5	7.9	ENE	76.4	0.000
	14:00	26.7	36.6	21.4	26.5	24.4	27.2	14.0	8.6	ENE	74.2	0.002
	15:00	26.1	36.8	22.1	26.2	24.4	28.0	14.0	8.0	E	76.6	0.001
	16:00	20.4	29.6	15.8	19.5	17.1	20.4	10.5	7.4	E	74.4	0.000
	17:00	20.0	28.3	16.2	19.5	17.0	20.9	10.2	9.5	ENE	74.4	0.000
Daily Average/Mode/Sum [C]		**24.7**	**35.7**	**19.4**	**24.7**	**22.3**	**25.2**	**12.6**	**6.0**	**ENE**	**71.4**	**0.003**

Lab Analysis (µg/m³) [D]							
Total Particulates	14	17	12	15	16	36	16
Hexavalent Chromium	Not Analyzed						

Weather Day Classification [E]
Out of Classification

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m^3 to $\mu g/m^3$). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Tuesday, May 07, 2013
(5/6/2013-5/7/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/6/2013	16:00	20.4	29.6	15.8	19.5	17.1	20.4	10.5	7.4	E	74.4	0.000
	17:00	20.0	28.3	16.2	19.5	17.0	20.9	10.2	9.5	ENE	74.4	0.000
	18:00	17.6	26.7	13.3	16.6	14.0	17.0	8.4	9.2	SE	76.8	0.000
	19:00	14.1	25.3	11.7	14.9	11.4	14.1	7.1	8.3	ESE	80.3	0.000
	20:00	12.7	24.5	10.9	13.7	10.4	12.3	6.4	11.9	ESE	83.7	0.000
	21:00	12.9	25.8	10.8	13.7	10.7	12.3	5.9	7.6	ESE	85.7	0.000
	22:00	13.0	26.3	10.5	13.4	10.7	12.9	6.1	6.4	ESE	85.7	0.000
	23:00	14.1	27.5	11.2	13.8	11.3	14.0	6.7	6.1	ESE	85.5	0.000
5/7/2013	0:00	15.6	28.9	13.0	15.9	13.4	15.4	7.5	6.4	ENE	86.8	0.000
	1:00	14.6	28.9	11.7	14.3	12.4	13.8	6.7	8.5	E	88.9	0.000
	2:00	14.2	28.4	10.7	13.3	11.5	13.2	6.2	9.8	ENE	90.9	0.000
	3:00	12.5	27.7	8.9	11.3	9.9	11.2	5.5	8.3	NE	93.4	0.000
	4:00	7.7	23.5	5.2	7.2	5.7	6.2	3.1	7.5	ENE	94.8	0.000
	5:00	10.8	25.6	7.6	9.7	7.9	9.0	4.4	8.1	ENE	96.4	0.000
	6:00	15.4	29.9	11.7	15.0	13.0	15.1	6.9	8.0	ENE	96.9	0.000
	7:00	18.5	31.8	13.8	16.7	14.8	16.6	8.1	8.8	ENE	96.3	0.000
	8:00	17.9	32.3	13.9	17.6	15.2	17.0	8.0	11.4	ENE	94.6	0.000
	9:00	14.2	28.0	10.3	13.2	11.4	12.8	6.5	10.4	ENE	91.0	0.012
	10:00	13.5	28.4	9.9	12.1	10.2	11.5	6.1	8.5	ENE	92.7	0.202
	11:00	11.7	25.1	10.2	13.8	10.7	11.9	5.7	9.0	ENE	94.3	0.105
	12:00	12.7	26.4	11.0	13.2	11.0	13.2	6.6	12.0	ENE	93.0	0.002
	13:00	14.6	26.7	12.7	14.9	12.9	14.9	7.7	12.6	ENE	91.2	0.058
	14:00	14.4	26.3	11.0	13.9	11.9	14.1	7.1	13.3	ENE	92.9	0.160
	15:00	14.3	26.4	10.4	13.7	11.8	13.5	6.8	11.4	ENE	93.7	0.128
	16:00	14.0	23.3	10.2	13.2	11.3	13.4	6.5	8.6	ENE	92.7	0.001
	17:00	12.9	22.5	9.5	12.5	10.0	11.6	6.2	10.7	ENE	89.4	0.000
Daily Average/Mode/Sum [C]		**14.4**	**27.1**	**11.2**	**14.1**	**11.8**	**13.8**	**6.8**	**9.2**	**ENE**	**89.1**	**0.667**

Lab Analysis (µg/m³) [D]							
Total Particulates	6	7	8	7	8	12	8
Hexavalent Chromium	0.0012	<0.00065	<0.00066	<0.00067	0.00082	<0.00065	0.0013

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Wednesday, May 08, 2013
(5/7/2013-5/8/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/7/2013	16:00	14.0	23.3	10.2	13.3	11.3	13.4	6.5	8.6	ENE	92.7	0.001
	17:00	12.9	22.5	9.5	12.5	10.0	11.6	6.2	10.7	ENE	89.4	0.000
	18:00	11.5	22.0	8.6	10.8	8.5	10.0	5.7	11.5	ENE	88.1	0.000
	19:00	13.4	24.0	9.1	11.4	9.5	10.8	6.1	8.0	ENE	89.5	0.000
	20:00	14.2	24.7	10.6	13.1	11.4	12.3	6.7	8.7	ENE	89.6	0.004
	21:00	14.4	24.7	10.8	13.7	11.8	12.9	6.7	8.6	ESE	92.0	0.043
	22:00	16.1	25.9	12.3	15.0	13.4	15.1	7.5	9.3	ESE	89.9	0.000
	23:00	13.0	23.9	10.2	12.9	11.2	12.0	6.1	8.0	ESE	88.3	0.000
5/8/2013	0:00	11.5	23.3	9.9	12.9	10.5	11.7	5.4	4.4	ESE	87.3	0.000
	1:00	12.3	23.2	9.9	12.5	10.6	11.7	5.8	5.1	E	89.3	0.000
	2:00	13.3	24.3	10.7	13.3	11.2	12.4	6.3	6.3	ENE	90.8	0.000
	3:00	12.6	24.0	10.0	12.8	10.7	11.8	5.8	4.2	ENE	91.5	0.000
	4:00	13.8	24.7	11.2	13.6	12.0	13.4	6.6	4.5	ENE	91.4	0.000
	5:00	18.3	27.3	14.6	18.2	16.3	18.2	8.9	3.6	SE	91.0	0.000
	6:00	20.2	28.8	15.8	20.0	17.9	20.2	9.9	3.8	SE	90.2	0.000
	7:00	21.7	29.0	17.1	21.2	18.6	21.4	10.7	3.0	SE	89.3	0.000
	8:00	24.7	31.3	20.3	25.2	22.0	25.0	12.2	2.5	SSE	87.2	0.000
	9:00	27.1	30.2	20.5	25.1	24.7	23.8	12.4	3.5	SSE	82.4	0.000
	10:00	43.7	39.8	33.7	40.3	32.8	35.1	18.9	4.0	SSE	80.0	0.000
	11:00	59.0	53.7	48.9	57.5	56.5	61.0	36.4	4.7	ESE	78.6	0.000
	12:00	20.1	25.7	17.0	21.1	17.3	20.4	11.9	6.5	SE	71.5	0.000
	13:00	20.2	25.6	21.0	25.8	17.1	20.1	11.8	6.4	SSE	69.7	0.000
	14:00	18.9	25.1	18.9	23.3	15.9	18.7	11.0	5.5	SSE	69.1	0.000
	15:00	16.2	24.2	17.3	21.8	14.0	16.5	9.9	5.8	S	65.8	0.000
	16:00	18.9	29.6	19.2	20.6	15.3	16.8	9.4	7.5	W	73.3	0.150
	17:00	11.9	23.8	9.6	12.1	10.7	12.3	6.2	7.3	WSW	77.9	0.010
Daily Average/Mode/Sum [C]		**19.0**	**27.1**	**15.6**	**19.2**	**16.2**	**18.0**	**9.6**	**6.2**	**ENE**	**84.5**	**0.208**

Lab Analysis (µg/m³) [D]							
Total Particulates	10	10	<3	16	14	10	13
Hexavalent Chromium	0.0020	<0.00068	<0.00068	<0.00068	<0.00069	<0.00068	<0.00068

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Thursday, May 09, 2013
(5/8/2013-5/9/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/8/2013	16:00	18.9	29.6	19.2	20.6	15.3	16.8	9.4	7.5	W	73.3	0.150
	17:00	11.9	23.8	9.6	12.1	10.7	12.3	6.2	7.3	WSW	77.9	0.010
	18:00	9.4	23.3	8.2	9.9	7.6	9.5	4.6	7.3	W	78.9	0.000
	19:00	12.4	27.4	10.9	12.8	10.3	12.8	5.8	5.6	W	83.2	0.000
	20:00	15.1	30.7	13.1	15.1	12.4	15.1	6.7	4.5	W	83.1	0.000
	21:00	15.4	31.8	13.9	16.4	13.7	16.5	7.2	3.1	WNW	85.3	0.000
	22:00	16.9	30.7	13.8	17.8	16.2	18.3	8.1	1.3	SW	84.0	0.000
	23:00	24.5	37.8	21.4	26.3	22.6	26.6	10.6	1.4	WSW	85.0	0.000
5/9/2013	0:00	23.3	35.8	21.3	25.7	21.7	24.4	11.4	4.0	W	86.3	0.000
	1:00	20.0	31.4	17.7	22.4	18.6	20.8	9.3	2.0	W	86.7	0.000
	2:00	25.7	38.4	23.4	28.8	24.0	27.8	12.4	3.4	W	88.0	0.000
	3:00	33.9	46.4	30.8	40.0	35.0	38.8	17.1	2.9	W	89.7	0.000
	4:00	49.5	61.6	44.1	53.5	49.0	51.3	23.3	3.7	W	91.1	0.000
	5:00	78.2	85.8	69.4	81.7	76.0	81.1	39.1	3.8	N	93.4	0.000
	6:00	70.7	75.8	59.8	71.1	66.7	75.5	35.4	5.4	W	93.7	0.000
	7:00	52.2	59.9	45.6	56.0	51.3	55.8	27.7	5.5	W	91.9	0.000
	8:00	41.6	50.2	34.9	42.9	38.2	42.8	21.1	6.2	W	88.7	0.000
	9:00	27.8	40.9	23.5	30.1	25.4	28.7	14.5	6.9	W	82.6	0.000
	10:00	21.6	34.6	18.5	23.1	18.9	20.9	10.4	6.6	W	78.0	0.000
	11:00	13.2	28.8	11.3	14.8	10.7	12.7	6.0	5.5	WSW	70.1	0.000
	12:00	12.2	25.8	10.5	13.8	9.8	12.4	6.3	5.1	W	64.0	0.000
	13:00	9.7	23.2	9.4	11.9	7.4	9.1	4.9	7.2	W	55.9	0.000
	14:00	8.7	22.1	8.1	10.8	6.2	8.2	4.7	8.4	W	53.0	0.000
	15:00	7.9	21.5	6.9	9.4	5.2	6.6	4.8	9.3	WNW	51.1	0.000
	16:00	9.2	19.5	7.7	10.5	6.1	7.6	4.5	6.0	W	51.4	0.000
	17:00	9.3		8.9	11.7	10.8	8.2	5.2	5.9	W	52.5	0.000
Daily Average/Mode/Sum [C]		**24.6**	**37.5**	**21.6**	**26.5**	**22.7**	**25.4**	**12.2**	**5.2**	**W**	**77.6**	**0.160**

Lab Analysis (µg/m³) [D]	
Total Particulates	No samples collected - PAMs being relocated
Hexavalent Chromium	

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Friday, May 10, 2013
(5/9/2013-5/10/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-12)*	PAM-3 *(AM-10)*	PAM-4 *(AM-8)*	PAM-5 *(AM-7)*	PAM-6 *(AM-5)*	PAM-7 *(AM-3)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/9/2013	16:00	9.2	ND	7.7	10.5	6.1	7.6	4.5	6.0	W	51.4	0.000
	17:00	9.3	ND	8.9	11.7	10.8	8.2	5.2	5.9	W	52.5	0.000
	18:00	8.7	ND	8.7	11.4	13.0	7.4	5.4	8.7	W	52.7	0.000
	19:00	9.5	ND	9.0	11.7	8.2	8.2	5.6	7.2	WNW	53.3	0.000
	20:00	9.5	ND	9.5	12.2	8.7	8.0	5.5	4.9	W	53.6	0.000
	21:00	11.8	ND	11.6	13.8	10.7	11.0	6.7	5.1	W	60.3	0.000
	22:00	18.6	ND	16.6	20.1	16.6	18.5	10.1	3.4	W	67.9	0.000
	23:00	19.0	ND	17.5	22.2	19.1	20.4	10.7	5.0	W	72.6	0.000
5/10/2013	0:00	20.0	ND	17.5	22.1	19.4	21.5	10.6	2.3	W	77.2	0.000
	1:00	18.5	ND	16.4	20.6	18.0	19.9	9.8	3.1	W	79.3	0.000
	2:00	17.2	ND	15.2	18.8	16.2	18.1	8.9	1.5	W	77.4	0.000
	3:00	15.2	ND	13.3	16.4	13.7	15.3	7.9	1.3	N	76.7	0.000
	4:00	20.6	ND	18.2	23.1	19.7	22.7	11.0	1.8	SW	84.1	0.000
	5:00	22.2	ND	19.8	23.0	20.1	22.8	11.3	3.0	W	83.9	0.000
	6:00	23.9	ND	21.1	25.7	22.8	25.9	12.4	1.7	SW	83.6	0.000
	7:00	22.4	ND	19.7	24.0	21.0	23.5	12.0	1.6	N	74.7	0.000
	8:00	22.3	ND	19.4	24.1	20.7	23.2	12.9	1.6	N	64.9	0.000
	9:00	33.5	ND	32.0	37.4	31.3	37.2	20.0	2.9	SE	61.3	0.000
	10:00	50.2	ND	28.9	33.8	28.7	31.7	18.3	3.6	SSE	60.9	0.000
	11:00	51.9	ND	19.9	25.0	20.8	24.7	15.0	4.8	SE	58.5	0.000
	12:00	56.1	ND	20.8	25.8	21.4	25.3	14.1	4.0	SSE	52.1	0.000
	13:00	22.6	ND	18.8	23.2	18.2	18.5	11.7	4.7	SSE	51.5	0.000
	14:00	19.2	ND	16.3	21.0	16.1	18.5	12.5	5.7	SE	50.5	0.000
	15:00	13.4	ND	14.5	27.2	13.6	15.8	11.4	6.1	SSE	48.6	0.000
	16:00	11.1	23.3	18.3	24.5	15.2	13.9	9.6	6.2	SSE	46.6	0.000
	17:00	16.4	23.9	18.8	24.1	14.3	13.9	9.2	5.7	SSE	48.7	0.000
Daily Average/Mode/Sum [C]		**21.2**	**23.6**	**16.9**	**21.3**	**17.1**	**18.5**	**10.5**	**4.1**	**W**	**63.3**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	ND	17	21	19	22	31	16
Hexavalent Chromium	Not Analyzed						

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Saturday, May 11, 2013
(5/10/2013-5/11/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-12)	PAM-3 (AM-10)	PAM-4 (AM-8)	PAM-5 (AM-7)	PAM-6 (AM-5)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/10/2013	16:00	11.1	23.3	18.3	24.5	15.2	13.9	9.6	6.2	SSE	46.6	0.000
	17:00	16.4	23.9	18.8	24.1	14.3	13.9	9.2	5.7	SSE	48.7	0.000
	18:00	12.4	31.6	19.6	27.2	29.0	31.2	10.7	5.8	S	49.8	0.000
	19:00	11.9	34.2	19.4	27.9	32.2	29.9	9.7	5.4	SSW	50.2	0.000
	20:00	13.4	30.5	15.2	22.1	27.3	37.1	13.7	2.6	SSW	53.5	0.000
	21:00	12.7	24.4	12.6	15.9	12.2	15.2	12.7	9.2	SSW	66.5	0.000
	22:00	22.7	27.0	14.6	18.4	15.1	15.6	8.5	5.9	N	88.2	0.240
	23:00	23.1	27.4	14.2	19.7	16.1	15.9	8.2	4.3	W	91.6	0.070
5/11/2013	0:00	9.9	28.6	13.7	19.7	16.9	20.6	8.0	2.7	SW	93.3	0.020
	1:00	10.7	31.9	19.3	24.6	23.0	25.9	9.2	2.4	SSE	93.8	0.000
	2:00	10.4	32.3	24.1	34.4	24.5	20.1	7.8	2.9	SSE	94.4	0.000
	3:00	11.0	33.7	16.8	25.1	34.0	77.4	27.8	7.3	S	92.5	0.000
	4:00	12.2	28.9	13.1	18.0	24.6	39.0	13.9	4.3	WSW	92.2	0.000
	5:00	13.9	28.7	12.2	16.3	13.4	14.0	7.1	2.5	WSW	93.1	0.000
	6:00	15.9	30.4	13.7	17.4	13.8	15.4	8.0	2.3	WSW	92.6	0.000
	7:00	15.2	30.2	13.5	17.7	14.1	15.7	8.0	2.7	WSW	91.2	0.000
	8:00	13.2	31.1	15.4	19.1	15.6	17.5	8.9	3.9	WSW	90.1	0.000
	9:00	11.9	32.9	17.8	22.0	18.5	21.2	10.8	8.6	W	85.6	0.000
	10:00	7.9	36.3	20.9	25.9	22.8	25.3	13.1	7.6	W	85.7	0.010
	11:00	7.0	37.8	23.7	29.0	25.9	29.5	15.0	6.8	WSW	83.5	0.000
	12:00	5.3	35.1	22.6	27.6	23.1	26.5	13.6	6.4	WSW	75.6	0.000
	13:00	8.0	31.7	19.6	24.2	19.8	22.5	12.2	10.8	W	69.1	0.000
	14:00	9.8	29.2	16.8	21.5	17.0	20.2	10.5	11.0	W	64.2	0.000
	15:00	10.1	23.4	11.0	14.5	9.8	10.6	7.1	8.4	W	54.5	0.000
	16:00	11.1	22.1	9.3	12.5	7.4	8.4	7.0	8.1	W	52.7	0.000
	17:00	15.1	22.7	7.8	10.6	6.6	6.1	5.1	7.3	N	73.1	0.020
Daily Average/Mode/Sum [C]		**12.4**	**29.6**	**16.3**	**21.5**	**18.9**	**22.6**	**10.6**	**5.8**	**W**	**75.9**	**0.360**

Lab Analysis (µg/m³) [D]							
Total Particulates	12	9	<3	<3	16	39	21
Hexavalent Chromium	0.0018	0.0015	0.0012	0.0022	0.0018	0.0039	0.0008

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Sunday, May 12, 2013
(5/11/2013-5/12/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-12)*	PAM-3 *(AM-10)*	PAM-4 *(AM-8)*	PAM-5 *(AM-7)*	PAM-6 *(AM-5)*	PAM-7 *(AM-3)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/11/2013	16:00	11.1	22.1	9.3	12.5	7.4	8.4	7.0	8.1	W	52.7	0.000
	17:00	15.1	22.7	7.8	10.6	6.6	6.1	5.1	7.3	N	73.1	0.020
	18:00	14.5	27.2	11.3	15.1	11.7	11.1	6.7	4.1	W	86.4	0.070
	19:00	14.4	29.8	12.0	15.9	12.9	15.3	8.7	2.4	W	88.9	0.010
	20:00	14.0	31.6	14.2	17.4	13.7	14.9	7.5	1.5	SSE	89.2	0.000
	21:00	14.2	34.1	17.7	22.2	20.3	21.0	10.3	3.8	W	91.4	0.030
	22:00	13.3	40.2	21.1	26.4	29.4	26.9	13.2	3.3	W	93.6	0.000
	23:00	11.8	38.8	20.5	25.4	26.6	24.8	12.1	5.1	W	93.2	0.000
5/12/2013	0:00	10.7	38.1	19.7	25.0	23.6	24.4	12.4	6.3	W	89.3	0.000
	1:00	10.4	36.6	18.9	24.4	23.5	23.3	12.2	4.2	NNW	78.9	0.000
	2:00	10.3	37.8	20.0	25.9	25.2	24.5	13.0	5.5	WNW	75.5	0.000
	3:00	9.4	37.1	17.3	22.5	21.0	20.1	10.6	7.1	WNW	69.4	0.000
	4:00	8.3	36.3	13.7	18.8	16.5	15.8	8.2	9.2	WNW	68.2	0.000
	5:00	8.8	35.4	14.6	19.1	16.7	15.7	7.0	3.2	N	67.3	0.000
	6:00	9.0	32.9	11.0	15.2	12.6	12.5	6.3	4.7	W	66.4	0.000
	7:00	7.5	32.3	10.3	15.1	12.5	12.1	6.2	7.0	WNW	65.2	0.000
	8:00	6.7	29.9	9.6	13.6	10.6	10.0	5.9	9.3	W	58.3	0.000
	9:00	6.5	29.0	8.8	12.9	10.1	9.3	5.2	10.3	WNW	44.0	0.000
	10:00	6.4	29.9	9.9	14.7	12.7	10.4	5.8	15.9	WNW	46.0	0.000
	11:00	11.2	29.9	8.3	12.7	10.1	8.9	5.1	12.9	WNW	40.4	0.000
	12:00	8.1	28.2	5.4	8.4	6.4	5.1	3.4	15.6	W	30.0	0.000
	13:00	8.9	28.3	4.2	7.3	4.8	4.3	2.8	13.3	WNW	24.9	0.000
	14:00	9.5	27.5	4.2	7.4	4.6	3.9	2.7	13.3	WNW	26.6	0.000
	15:00	11.3	28.4	4.5	7.7	4.9	4.1	2.9	14.5	W	25.5	0.000
	16:00	12.6	30.8	5.0	9.0	5.3	4.7	2.9	16.2	W	26.2	0.000
	17:00	13.7	31.5	5.3	8.6	6.0	5.8	3.4	12.3	WNW	25.6	0.000
Daily Average/Mode/Sum [C]		**10.7**	**31.8**	**11.7**	**15.9**	**13.7**	**13.2**	**7.2**	**8.3**	**W**	**61.4**	**0.130**

Lab Analysis (µg/m³) [D]							
Total Particulates	8	7	8	9	9	20	10
Hexavalent Chromium	0.0012	0.0047	0.0036	<0.00070	0.0021	0.0033	0.0022

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Monday, May 13, 2013
(5/12/2013-5/13/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]						
		PAM-1 *(AM-1)*	PAM-2 *(AM-12)*	PAM-3 *(AM-10)*	PAM-4 *(AM-8)*	PAM-5 *(AM-7)*	PAM-6 *(AM-5)*	PAM-7 *(AM-3)*
5/12/2013	16:00	12.6	30.8	5.0	9.0	5.3	4.7	2.9
	17:00	13.7	31.5	5.3	8.6	6.0	5.8	3.4
	18:00	14.5	32.3	6.0	9.1	6.5	6.6	3.9
	19:00	15.2	33.7	6.2	9.6	7.1	6.9	3.6
	20:00	16.0	36.0	6.1	9.6	7.2	7.2	3.5
	21:00	17.0	37.7	6.1	9.8	7.6	7.6	3.4
	22:00	18.7	38.7	5.7	9.3	7.2	6.8	3.3
	23:00	20.0	39.9	4.6	8.0	6.0	5.4	2.6
5/13/2013	0:00	20.7	39.9	4.3	7.7	5.8	5.6	2.7
	1:00	21.8	41.3	4.6	7.9	5.8	5.8	2.7
	2:00	20.2	42.8	5.5	9.1	7.1	7.0	3.3
	3:00	16.2	44.9	6.7	10.5	8.5	9.0	3.7
	4:00	13.7	45.9	6.7	10.3	8.1	8.6	3.7
	5:00	11.7	46.0	7.1	11.0	8.9	9.4	4.0
	6:00	10.5	47.6	7.6	11.8	10.0	10.4	4.2
	7:00	10.3	43.6	5.4	9.2	7.7	7.0	3.7
	8:00	10.9	39.7	4.8	8.1	5.9	5.4	2.8
	9:00	11.5	36.8	4.5	7.9	5.9	5.1	3.1
	10:00	11.4	34.5	4.7	8.4	6.0	5.1	3.4
	11:00	ND	33.3	5.1	8.9	6.5	5.6	3.4
	12:00	ND	34.2	5.4	9.1	6.6	5.8	3.8
	13:00	ND	35.3	5.9	9.6	7.3	6.3	3.7
	14:00	ND	35.6	6.8	10.4	7.9	7.4	4.3
	15:00	7.0	34.5	7.7	11.1	8.7	8.4	4.6
	16:00	7.0	34.7	7.1	5.2	8.4	8.1	4.4
	17:00	6.8	34.3	7.6	5.4	8.2	8.4	4.5
Daily Average/Mode/Sum [C]		**14.0**	**37.9**	**5.9**	**9.0**	**7.2**	**6.9**	**3.6**

Date	Time	Weather [B]			
		Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/12/2013	16:00	16.2	W	26.2	0.000
	17:00	12.3	WNW	25.6	0.000
	18:00	12.9	WNW	25.9	0.000
	19:00	14.0	WNW	27.9	0.000
	20:00	11.2	W	30.1	0.000
	21:00	10.3	W	33.2	0.000
	22:00	11.7	WNW	34.3	0.000
	23:00	8.9	W	35.2	0.000
5/13/2013	0:00	6.8	W	37.4	0.000
	1:00	6.8	W	41.3	0.000
	2:00	3.9	WSW	46.9	0.000
	3:00	4.0	W	55.0	0.000
	4:00	3.6	W	58.0	0.000
	5:00	5.9	W	56.5	0.000
	6:00	7.4	W	56.0	0.000
	7:00	9.3	W	46.4	0.000
	8:00	10.5	W	39.0	0.000
	9:00	10.6	W	33.3	0.000
	10:00	9.3	NW	31.9	0.000
	11:00	10.4	W	32.8	0.000
	12:00	14.2	W	29.2	0.000
	13:00	14.3	W	27.9	0.000
	14:00	11.2	WNW	27.3	0.000
	15:00	9.2	WNW	25.6	0.000
	16:00	9.7	N	22.9	0.000
	17:00	10.7	NNW	21.6	0.000
Daily Average/Mode/Sum [C]		**9.8**	**W**	**35.7**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	8	8	8	7	10	193	7
Hexavalent Chromium	3.6	5.1	5.1	4.2	3.1	4.8	2.1

Weather Day Classification [E]
Dry/Heavy Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Tuesday, May 14, 2013
(5/13/2013-5/14/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-12)	PAM-3 (AM-10)	PAM-4 (AM-8)	PAM-5 (AM-7)	PAM-6 (AM-5)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/13/2013	16:00	7.0	34.7	7.1	5.2	8.4	8.1	4.4	9.7	N	22.9	0.000
	17:00	6.8	34.3	7.6	5.4	8.2	8.4	4.5	10.7	NNW	21.6	0.000
	18:00	7.6	33.7	7.3	5.4	8.0	8.5	4.5	9.0	NNW	22.6	0.000
	19:00	9.0	34.9	7.8	5.8	8.9	9.7	4.8	8.5	NNW	25.8	0.000
	20:00	9.3	38.2	9.0	7.2	10.4	11.4	5.1	7.6	N	29.8	0.000
	21:00	9.5	41.5	9.1	7.7	10.7	11.7	5.5	6.9	NNW	32.4	0.000
	22:00	8.8	43.0	9.1	7.4	10.4	11.5	5.1	5.5	N	34.8	0.000
	23:00	7.7	42.5	8.0	6.2	9.5	10.4	4.4	5.6	N	36.5	0.000
5/14/2013	0:00	7.9	43.4	7.9	6.3	9.4	10.6	4.6	4.8	N	39.8	0.000
	1:00	8.0	44.3	7.1	5.7	9.3	10.4	4.3	4.8	N	43.4	0.000
	2:00	7.1	44.7	7.0	5.5	8.9	9.9	4.0	6.0	N	45.6	0.000
	3:00	6.6	44.7	6.9	5.5	8.8	9.4	3.7	5.6	N	47.6	0.000
	4:00	6.5	46.4	6.6	5.8	8.9	9.4	3.7	5.0	N	49.4	0.000
	5:00	7.1	49.7	6.7	5.9	9.3	10.0	3.8	3.7	N	49.9	0.000
	6:00	8.2	49.2	7.5	7.0	10.2	10.9	4.6	3.4	NE	49.0	0.000
	7:00	7.7	46.6	7.7	6.5	10.0	10.2	5.1	4.3	WNW	44.8	0.000
	8:00	5.9	39.7	6.3	4.7	8.6	7.7	3.8	6.9	N	37.9	0.000
	9:00	5.0	33.2	5.6	3.6	6.7	6.7	3.8	6.3	NNW	34.1	0.000
	10:00	4.8	32.5	5.7	3.5	6.4	6.0	3.6	8.3	W	32.3	0.000
	11:00	5.9	33.6	6.7	4.7	7.9	7.1	4.5	10.2	W	31.5	0.000
	12:00	7.5	35.6	8.1	6.6	9.4	9.4	5.5	10.2	W	31.6	0.000
	13:00	8.6	35.5	8.9	7.2	10.2	10.4	5.6	8.2	W	30.1	0.000
	14:00	8.8	34.5	9.5	7.4	10.5	10.6	5.9	8.3	WNW	28.5	0.000
	15:00	9.7	20.9	10.0	7.8	10.7	11.7	6.4	10.1	W	27.6	0.000
	16:00	10.1	7.5	11.4	9.0	12.0	12.3	9.8	8.0	W	27.8	0.000
	17:00	10.4	7.7	11.4	9.3	12.5	12.7	10.4	6.7	W	28.4	0.000
Daily Average/Mode/Sum [C]		**7.8**	**36.6**	**7.9**	**6.2**	**9.4**	**9.8**	**5.1**	**7.1**	**N**	**34.8**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	9	14	12	7	8	11	10
Hexavalent Chromium	<0.00070	0.0022	0.0013	<0.00070	<0.00070	0.0016	0.0017

Weather Day Classification [E]
Dry/Heavy Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Wednesday, May 15, 2013
(5/14/2013-5/15/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-12)	PAM-3 (AM-10)	PAM-4 (AM-8)	PAM-5 (AM-7)	PAM-6 (AM-5)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/14/2013	16:00	10.1	7.5	11.3	9.0	12.0	12.3	9.8	8.0	W	27.8	0.000
	17:00	10.4	7.7	11.4	9.3	12.5	12.6	10.4	6.7	W	28.4	0.000
	18:00	10.2	7.4	11.2	9.1	12.4	12.7	6.8	6.2	W	30.4	0.000
	19:00	10.7	8.2	11.8	9.5	12.9	13.2	6.6	3.3	W	31.8	0.000
	20:00	10.6	7.8	11.6	9.0	12.2	13.1	ND	3.0	SW	32.8	0.000
	21:00	15.6	11.2	14.2	12.7	16.5	19.8	ND	3.2	SW	43.7	0.006
	22:00	13.9	15.0	20.7	25.0	23.5	18.2	ND	2.7	SSE	51.3	0.002
	23:00	8.7	8.3	14.8	17.8	15.2	12.2	ND	3.6	SSE	48.3	0.000
5/15/2013	0:00	7.3	5.6	12.7	12.9	11.7	10.0	ND	4.4	SSE	54.7	0.000
	1:00	7.9	5.5	9.7	8.2	10.6	10.9	ND	5.1	SE	64.0	0.004
	2:00	10.1	7.4	11.2	9.3	12.7	12.7	ND	5.5	ESE	65.7	0.000
	3:00	13.0	11.0	13.6	12.6	15.5	16.2	ND	4.6	ESE	70.6	0.004
	4:00	12.2	11.4	18.7	20.7	17.4	15.3	ND	4.7	SE	77.4	0.002
	5:00	13.1	14.2	24.4	28.7	21.3	17.1	7.8	3.6	S	80.0	0.001
	6:00	14.4	12.9	15.8	15.7	17.4	18.3	9.0	2.6	SSE	81.1	0.000
	7:00	14.9	13.7	18.6	21.1	19.9	19.5	9.4	3.9	SE	80.0	0.000
	8:00	17.1	17.5	21.1	21.7	24.1	22.7	9.9	3.4	SSE	76.4	0.004
	9:00	12.1	10.8	13.6	11.1	15.2	15.2	8.2	4.3	WSW	64.5	0.008
	10:00	14.4	11.6	14.3	12.7	17.3	18.1	11.2	4.1	SSW	64.1	0.007
	11:00	12.2	10.4	13.4	11.0	15.5	15.0	9.2	4.3	W	56.7	0.000
	12:00	12.4	10.5	13.8	10.6	15.0	14.8	8.9	4.7	SSW	53.7	0.001
	13:00	15.9	14.4	16.8	15.7	19.3	18.7	11.4	5.4	WSW	54.8	0.008
	14:00	18.1	16.9	19.6	18.3	21.4	21.0	11.9	6.4	SSE	52.4	0.002
	15:00	15.6	15.0	22.1	22.1	21.7	17.5	10.3	7.2	SE	58.6	0.000
	16:00	18.9	14.6	19.6	18.2	19.4	18.6	10.9	6.2	SSE	57.8	0.000
	17:00	20.6	16.6	20.0	16.0	21.7	23.1	12.0	4.6	SSE	55.0	0.000
Daily Average/Mode/Sum [C]		**13.1**	**11.3**	**15.6**	**14.9**	**16.7**	**16.1**	**9.6**	**4.7**	**SSE**	**56.2**	**0.049**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Thursday, May 16, 2013
(5/15/2013-5/16/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-12)	PAM-3 (AM-10)	PAM-4 (AM-8)	PAM-5 (AM-7)	PAM-6 (AM-5)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/15/2013	16:00	18.9	14.6	19.6	18.2	19.4	18.6	10.9	6.2	SSE	57.8	0.000
	17:00	20.6	16.6	20.0	16.0	21.7	23.1	12.0	4.6	SSE	55.0	0.000
	18:00	18.4	17.8	19.7	16.1	20.3	22.1	13.1	4.7	SE	56.0	0.000
	19:00	18.6	17.3	19.8	16.0	19.7	22.0	13.3	3.1	SE	58.8	0.000
	20:00	23.3	23.3	26.4	24.7	27.4	25.6	14.5	1.4	SE	61.6	0.000
	21:00	29.5	27.7	28.6	26.5	29.7	32.1	18.0	1.4	SSE	66.1	0.000
	22:00	33.7	32.2	32.6	32.8	35.5	38.2	20.7	2.7	WSW	67.0	0.018
	23:00	31.9	27.5	28.9	29.2	33.4	36.4	18.2	3.9	W	72.9	0.000
5/16/2013	0:00	28.4	25.2	26.1	25.7	29.0	30.1	16.0	3.1	W	72.9	0.000
	1:00	27.4	25.7	27.5	26.4	28.9	29.9	16.9	1.0	N	72.3	0.000
	2:00	33.0	31.5	32.9	32.1	36.5	41.0	20.5	1.0	E	76.0	0.000
	3:00	16.5	13.1	17.1	15.8	20.1	20.7	11.6	6.4	W	56.0	0.000
	4:00	17.6	15.1	18.0	15.2	19.1	20.0	11.2	3.1	W	59.2	0.000
	5:00	17.1	14.3	17.2	15.8	19.2	20.4	11.3	4.9	W	57.4	0.000
	6:00	20.3	17.4	20.2	17.6	21.4	24.3	12.3	3.1	WSW	62.0	0.000
	7:00	22.0	19.5	22.1	20.1	23.6	26.1	14.0	3.0	W	58.6	0.000
	8:00	21.6	20.0	21.8	18.7	21.7	24.4	13.5	2.0	W	55.2	0.000
	9:00	17.5	15.6	18.4	15.5	18.8	21.1	12.0	3.7	W	53.2	0.000
	10:00	10.8	8.5	12.1	7.7	10.9	11.6	8.4	6.7	W	51.4	0.000
	11:00	10.4	8.5	12.4	8.5	11.6	12.1	8.4	8.0	W	50.5	0.000
	12:00	11.2	9.3	12.7	9.4	12.0	12.6	8.5	11.7	W	53.4	0.009
	13:00	11.6	9.2	13.0	9.9	13.1	13.1	8.1	11.1	W	56.4	0.000
	14:00	12.3	10.2	13.2	10.0	13.0	13.4	8.6	12.9	WNW	51.4	0.000
	15:00	14.2	12.4	15.0	11.6	14.7	15.3	10.4	14.1	W	50.1	0.000
	16:00	46.5	13.7	16.9	12.7	15.5	16.6	10.9	11.6	W	50.9	0.000
	17:00	16.3	14.4	17.2	13.8	16.9	18.6	11.5	12.2	W	51.1	0.000
Daily Average/Mode/Sum [C]		**21.1**	**17.7**	**20.4**	**17.9**	**21.3**	**22.7**	**12.9**	**5.7**	**W**	**59.0**	**0.027**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Friday, May 17, 2013
(5/16/2013-5/17/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-12)*	PAM-3 *(AM-10)*	PAM-4 *(AM-8)*	PAM-5 *(AM-7)*	PAM-6 *(AM-5)*	PAM-7 *(AM-3)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/16/2013	16:00	46.5	13.7	16.9	12.7	15.5	16.6	10.9	11.6	W	50.9	0.000
	17:00	16.3	14.4	17.2	13.8	16.9	18.6	11.5	12.2	W	51.1	0.000
	18:00	17.9	16.0	18.4	15.7	18.7	20.2	12.2	10.1	W	51.9	0.000
	19:00	21.9	20.2	21.8	18.6	22.2	24.4	14.1	10.2	W	50.8	0.000
	20:00	26.5	24.5	25.8	23.6	27.2	29.9	16.5	10.1	W	52.4	0.000
	21:00	28.0	25.3	26.3	24.6	28.4	31.1	16.9	7.8	W	55.8	0.000
	22:00	22.9	20.0	21.8	20.4	23.4	25.7	13.7	11.6	W	53.8	0.000
	23:00	20.7	18.3	20.1	18.7	21.8	23.2	12.4	11.2	WNW	54.9	0.000
5/17/2013	0:00	21.1	18.3	19.6	19.2	22.0	23.7	12.6	8.5	W	59.3	0.000
	1:00	22.0	19.1	20.3	19.9	22.6	24.6	12.6	6.2	WNW	60.8	0.000
	2:00	23.2	20.6	22.1	21.1	23.9	26.9	13.2	2.1	NNW	64.0	0.000
	3:00	24.9	22.2	23.7	21.8	25.0	29.0	14.2	1.3	ENE	67.6	0.000
	4:00	26.1	23.7	24.2	23.1	26.6	30.0	15.7	1.8	N	69.7	0.000
	5:00	27.9	25.5	26.6	25.8	28.6	31.1	15.6	2.1	W	72.3	0.000
	6:00	30.8	26.7	25.8	25.0	28.7	32.9	17.7	1.2	N	68.1	0.000
	7:00	21.6	15.1	14.9	12.8	19.0	22.8	13.4	5.1	N	51.8	0.000
	8:00	10.2	7.3	10.0	6.5	10.2	11.7	6.9	5.2	N	35.8	0.000
	9:00	7.2	4.6	8.2	3.5	6.9	7.1	5.2	5.0	N	26.0	0.000
	10:00	6.0	4.4	8.8	2.8	5.8	6.8	5.3	5.7	N	23.7	0.000
	11:00	6.0	4.2	7.1	2.5	5.4	5.8	5.0	3.4	N	23.9	0.000
	12:00	7.8	5.4	9.2	4.7	7.3	7.9	6.7	5.2	SSE	27.5	0.000
	13:00	13.4	9.8	12.1	10.7	13.1	13.0	7.8	5.1	SSE	29.5	0.000
	14:00	9.3	8.2	15.4	14.0	11.8	11.4	9.0	5.4	SSE	31.0	0.000
	15:00	9.9	9.6	18.3	20.1	13.9	13.4	9.3	5.0	SSE	32.0	0.000
	16:00	9.2	10.9	19.4	25.9	16.7	13.7	9.1	5.6	SSE	32.7	0.000
	17:00	7.8	6.3	14.1	11.0	11.2	10.3	8.0	4.8	S	34.5	0.000
Daily Average/Mode/Sum [C]		**18.7**	**15.2**	**18.0**	**16.1**	**18.2**	**19.7**	**11.4**	**6.3**	**W**	**47.4**	**0.000**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Saturday, May 18, 2013
(5/17/2013-5/18/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-12)*	PAM-3 *(AM-10)*	PAM-4 *(AM-8)*	PAM-5 *(AM-7)*	PAM-6 *(AM-5)*	PAM-7 *(AM-3)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/17/2013	16:00	9.2	10.9	19.4	25.9	16.7	13.7	9.1	5.6	SSE	32.7	0.000
	17:00	7.8	6.3	14.1	11.0	11.2	10.3	8.0	4.8	S	34.5	0.000
	18:00	8.2	8.0	15.1	15.3	12.8	10.7	7.3	4.9	SSE	37.3	0.000
	19:00	7.8	4.6	7.4	3.8	7.1	8.4	6.2	6.5	SE	33.7	0.000
	20:00	9.1	6.9	8.7	4.6	8.7	8.5	6.5	4.2	SE	32.8	0.000
	21:00	11.4	9.0	9.9	5.5	8.8	10.3	7.7	5.0	ENE	34.4	0.000
	22:00	8.3	5.5	8.2	5.6	8.4	9.5	6.5	7.4	SE	44.9	0.000
	23:00	9.5	9.5	13.9	15.7	15.6	13.7	6.4	5.4	S	53.1	0.000
5/18/2013	0:00	19.3	9.8	10.9	10.0	17.5	28.8	13.1	5.4	SSW	58.4	0.000
	1:00	14.6	12.9	15.8	18.3	22.0	19.1	6.5	3.9	S	51.3	0.000
	2:00	8.0	7.4	9.7	9.8	12.3	10.7	5.7	5.4	SSE	56.7	0.000
	3:00	7.1	4.4	7.3	5.1	8.0	9.3	4.9	6.0	SE	61.1	0.000
	4:00	5.3	3.0	6.7	5.1	7.2	6.8	3.8	5.6	ESE	57.8	0.000
	5:00	5.6	3.4	7.0	5.8	7.6	7.5	4.1	4.6	SE	67.5	0.000
	6:00	6.1	3.9	10.0	8.8	8.4	8.3	4.1	3.7	SE	68.3	0.000
	7:00	6.7	5.3	11.7	12.3	11.5	10.8	4.1	4.1	SSE	67.1	0.000
	8:00	6.0	3.7	9.3	9.2	8.0	7.9	4.1	4.8	SSE	62.8	0.000
	9:00	7.4	5.7	9.2	8.4	11.1	10.5	4.7	4.0	SSE	58.9	0.000
	10:00	5.7	3.9	10.1	9.1	8.5	7.4	4.4	4.6	SSE	57.3	0.000
	11:00	7.0	5.5	8.0	6.5	11.1	10.3	6.0	4.9	SSE	54.3	0.000
	12:00	6.0	3.7	8.3	8.0	8.2	8.3	5.1	5.4	S	55.6	0.000
	13:00	6.9	4.6	9.9	8.9	10.5	10.7	5.6	7.2	SSE	59.6	0.000
	14:00	11.6	7.9	9.1	8.7	15.3	16.9	6.8	4.4	SSW	60.4	0.000
	15:00	6.9	4.4	7.5	5.5	8.3	8.8	5.1	6.0	WSW	81.6	0.001
	16:00	6.5	4.2	10.7	7.0	8.8	8.3	4.5	4.6	SSE	74.9	0.000
	17:00	6.5	3.9	6.8	4.4	7.5	7.8	4.7	7.1	SE	71.6	0.000
Daily Average/Mode/Sum [C]		**8.2**	**6.1**	**10.2**	**9.2**	**10.8**	**10.9**	**6.0**	**5.2**	**SSE**	**54.9**	**0.001**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Sunday, May 19, 2013
(5/18/2013-5/19/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-12)*	PAM-3 *(AM-10)*	PAM-4 *(AM-8)*	PAM-5 *(AM-7)*	PAM-6 *(AM-5)*	PAM-7 *(AM-3)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/18/2013	16:00	6.5	4.2	10.7	7.0	8.8	8.3	4.5	4.6	SSE	74.9	0.000
	17:00	6.5	3.9	6.8	4.4	7.5	7.8	4.7	7.1	SE	71.6	0.000
	18:00	6.3	3.7	6.8	4.3	7.7	7.7	4.4	9.9	ESE	72.1	0.000
	19:00	6.8	4.4	7.7	5.7	8.3	8.2	4.8	5.0	SSE	74.7	0.000
	20:00	7.7	4.7	8.3	6.5	9.2	8.3	5.0	5.8	SSE	80.4	0.000
	21:00	8.4	5.6	8.1	5.5	9.2	9.6	5.3	6.3	SE	91.8	0.000
	22:00	9.9	6.5	8.8	6.4	10.1	10.1	5.7	4.1	ESE	92.4	0.000
	23:00	7.8	5.0	7.7	4.6	8.3	7.9	4.9	3.4	SE	93.0	0.000
5/19/2013	0:00	6.3	4.0	6.3	3.4	6.9	6.9	4.3	4.1	ENE	93.4	0.000
	1:00	6.2	3.7	6.4	3.1	6.6	6.7	3.9	4.0	ENE	95.4	0.000
	2:00	7.5	4.3	6.6	3.1	6.5	6.9	4.2	3.7	ENE	95.5	0.000
	3:00	5.8	3.3	6.0	2.6	6.3	6.1	3.7	2.7	NE	96.3	0.000
	4:00	4.4	2.1	4.9	1.5	5.0	4.7	3.1	2.9	SE	97.0	0.000
	5:00	5.0	2.9	6.0	2.3	6.0	6.0	3.5	3.2	ESE	96.6	0.000
	6:00	5.2	2.9	5.9	2.5	6.4	6.0	3.8	6.5	ESE	96.7	0.000
	7:00	9.6	7.0	10.2	8.3	11.1	11.5	6.3	5.2	SE	96.9	0.000
	8:00	13.1	10.5	13.4	11.9	15.2	14.8	8.3	3.9	SE	96.5	0.000
	9:00	15.4	13.0	15.5	13.8	17.1	17.1	9.6	4.1	ESE	96.3	0.000
	10:00	16.4	14.2	16.8	15.1	18.3	17.7	10.4	3.9	ENE	95.8	0.000
	11:00	18.2	15.0	17.3	14.8	17.8	18.3	10.5	3.6	ESE	94.3	0.000
	12:00	19.5	16.4	18.8	16.5	19.5	19.4	11.5	3.2	E	91.1	0.000
	13:00	24.0	21.4	23.4	21.4	24.6	24.6	14.5	2.4	SSE	89.0	0.000
	14:00	27.0	24.5	26.2	24.6	27.6	27.8	16.8	2.5	SSE	88.6	0.000
	15:00	25.3	30.2	23.6	22.1	25.0	25.3	15.6	2.4	SSE	86.6	0.000
	16:00	26.9	22.9	24.3	29.1	24.6	24.5	15.3	3.3	SSE	85.3	0.000
	17:00	29.9	24.9	25.8	22.8	27.1	27.3	16.5	3.5	SE	84.5	0.000
Daily Average/Mode/Sum [C]		**12.5**	**10.1**	**12.4**	**10.1**	**13.1**	**13.1**	**7.7**	**4.3**	**SSE**	**89.5**	**0.000**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Out of Classification

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Monday, May 20, 2013
(5/19/2013-5/20/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-12)	PAM-3 (AM-10)	PAM-4 (AM-8)	PAM-5 (AM-7)	PAM-6 (AM-5)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/19/2013	16:00	26.9	22.9	24.3	29.1	24.6	24.5	15.3	3.3	SSE	85.3	0.000
	17:00	29.9	24.9	25.8	22.8	27.1	27.3	16.5	3.5	SE	84.5	0.000
	18:00	36.0	30.9	30.1	26.5	30.4	32.2	20.0	4.6	ENE	82.6	0.000
	19:00	36.5	32.6	31.1	27.5	31.2	33.2	20.3	5.4	ENE	84.7	0.000
	20:00	41.1	35.8	34.1	30.0	34.5	36.7	21.6	6.3	NE	87.1	0.000
	21:00	43.7	38.9	36.4	33.1	37.4	39.5	22.8	5.9	ENE	87.9	0.000
	22:00	45.4	39.4	36.7	35.5	40.0	41.5	23.5	4.1	NE	88.2	0.000
	23:00	39.9	35.0	33.8	33.3	36.6	37.7	21.0	4.1	ENE	88.7	0.000
5/20/2013	0:00	40.2	35.0	34.7	33.4	36.5	38.1	21.1	5.2	ENE	90.2	0.000
	1:00	42.2	37.4	36.5	33.9	37.9	39.4	21.8	4.7	ENE	91.6	0.000
	2:00	44.8	39.2	38.5	36.4	40.8	41.8	23.1	2.6	NE	92.0	0.000
	3:00	48.9	42.9	42.1	39.5	43.9	45.4	25.4	2.3	ENE	92.5	0.000
	4:00	57.7	52.7	52.9	51.4	53.5	53.3	30.3	1.6	SE	94.7	0.000
	5:00	53.8	46.9	45.4	43.0	47.7	49.3	27.6	2.1	ENE	94.3	0.000
	6:00	41.4	37.1	37.3	33.9	38.5	41.3	21.6	1.3	SSE	94.2	0.000
	7:00	29.1	25.3	25.8	22.5	26.8	26.9	20.0	2.5	SW	92.6	0.000
	8:00	27.3	23.3	24.3	21.5	26.1	25.6	15.8	3.2	W	89.2	0.000
	9:00	27.4	23.5	24.8	20.8	25.4	25.5	16.8	4.7	SSW	86.8	0.000
	10:00	30.0	25.8	26.9	24.1	28.3	28.1	18.2	5.1	SSW	82.8	0.000
	11:00	25.4	21.8	23.6	20.2	24.5	23.8	17.7	3.8	SW	79.8	0.000
	12:00	19.9	16.6	18.8	14.9	18.8	17.9	12.3	4.0	WSW	76.7	0.000
	13:00	20.8	17.7	19.9	17.0	21.3	21.4	13.9	5.4	SW	73.9	0.000
	14:00	21.2	19.0	21.1	16.6	20.8	20.8	13.7	4.7	WSW	72.7	0.000
	15:00	23.6	20.8	22.3	17.7	22.0	21.8	14.5	1.8	N	67.9	0.000
	16:00	24.1	21.4	23.3	20.9	23.2	24.7	16.0	3.7	SSE	67.5	0.000
	17:00	27.6	22.4	25.3	23.1	24.5	27.6	16.8	4.5	SSE	70.1	0.000
Daily Average/Mode/Sum [C]		**34.8**	**30.4**	**30.6**	**28.0**	**31.6**	**32.5**	**19.5**	**3.9**	**ENE**	**84.6**	**0.000**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Out of Classification

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Tuesday, May 21, 2013
(5/20/2013-5/21/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-12)	PAM-3 (AM-10)	PAM-4 (AM-8)	PAM-5 (AM-7)	PAM-6 (AM-5)	PAM-7 (AM-3)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/20/2013	16:00	24.1	21.4	23.3	20.9	23.2	24.7	16.0	3.7	SSE	67.5	0.000
	17:00	27.6	22.4	25.3	23.1	24.5	27.6	16.8	4.5	SSE	70.1	0.000
	18:00	19.7	17.2	19.6	17.4	19.2	21.4	13.6	5.2	SSE	70.5	0.000
	19:00	25.0	19.0	21.0	19.1	23.9	28.6	14.3	3.5	SSE	72.9	0.000
	20:00	20.8	17.1	19.4	16.0	20.4	24.4	12.6	2.3	SSE	76.8	0.000
	21:00	21.5	17.6	20.7	18.0	21.1	23.9	12.8	2.2	SSE	80.1	0.000
	22:00	31.7	22.5	22.0	20.3	26.8	36.1	14.4	3.3	S	83.5	0.000
	23:00	24.9	21.1	23.6	21.8	24.9	27.6	13.7	1.8	SSE	88.2	0.000
5/21/2013	0:00	23.8	20.1	22.3	20.1	23.4	26.9	13.4	1.7	WSW	89.2	0.000
	1:00	25.5	20.7	22.4	19.6	23.6	30.2	18.4	2.6	SSW	90.8	0.000
	2:00	22.5	18.2	19.8	16.9	21.6	26.0	15.8	3.3	S	92.8	0.000
	3:00	20.3	16.9	18.6	15.6	19.0	22.1	11.7	3.9	W	93.3	0.000
	4:00	18.7	15.7	17.7	14.0	17.7	20.5	10.1	2.7	WSW	93.9	0.000
	5:00	28.8	25.2	25.9	22.7	25.6	30.1	14.8	4.4	WSW	94.0	0.000
	6:00	37.2	33.3	32.6	31.8	34.9	40.8	19.4	5.2	WSW	93.4	0.000
	7:00	41.1	36.9	35.6	34.4	38.1	44.7	21.3	4.0	WSW	92.3	0.000
	8:00	40.2	35.3	34.8	28.4	37.2	43.9	21.2	3.1	WSW	89.3	0.000
	9:00	28.7	24.7	25.7	21.6	27.2	31.6	15.7	4.6	SW	84.6	0.000
	10:00	24.2	21.3	22.9	21.2	24.0	27.4	13.9	5.2	W	79.5	0.000
	11:00	27.8	24.0	25.8	23.8	26.5	31.5	16.4	4.0	WSW	75.2	0.000
	12:00	33.1	28.9	29.8	28.2	30.5	36.2	19.5	4.6	WSW	69.4	0.000
	13:00	33.5	27.8	29.4	24.5	30.7	36.9	20.8	5.4	S	65.5	0.000
	14:00	43.0	30.5	31.4	29.9	32.5	37.1	22.1	7.9	S	64.9	0.000
	15:00	36.9	31.9	33.3	31.8	34.2	40.2	22.8	4.4	SSW	62.0	0.000
	16:00	36.0	31.6	31.8	31.5	32.4	38.0	22.0	7.2	SE	66.1	0.000
	17:00	26.7	23.2	25.5	24.0	24.8	27.8	17.0	7.3	SE	68.6	0.000
Daily Average/Mode/Sum [C]		**28.6**	**24.0**	**25.4**	**22.9**	**26.5**	**31.0**	**16.6**	**4.2**	**WSW**	**79.8**	**0.000**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Out of Classification

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m^3 to $\mu g/m^3$). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Wednesday, May 22, 2013
(5/21/2013-5/22/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-12)*	PAM-3 *(AM-10)*	PAM-4 *(AM-8)*	PAM-5 *(AM-7)*	PAM-6 *(AM-5)*	PAM-7 *(AM-3)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/21/2013	16:00	36.0	31.6	31.8	31.5	32.4	38.0	22.0	7.2	SE	66.1	0.000
	17:00	26.7	23.2	25.5	24.0	24.8	27.8	17.0	7.3	SE	68.6	0.000
	18:00	28.1	25.3	29.3	28.5	26.7	30.2	17.0	3.6	SSE	70.3	0.000
	19:00	31.3	28.9	28.8	29.1	31.2	34.1	17.3	4.5	S	71.6	0.000
	20:00	37.0	31.9	32.5	33.4	34.3	41.0	18.7	3.4	SSE	75.3	0.000
	21:00	37.6	28.1	28.8	27.4	30.5	43.2	24.2	6.0	S	77.0	0.000
	22:00	36.7	30.0	30.7	29.8	32.3	41.0	21.2	3.9	SSW	80.2	0.000
	23:00	39.9	34.8	34.9	35.1	38.3	43.5	21.5	2.9	WSW	81.4	0.000
5/22/2013	0:00	63.7	41.7	39.8	40.9	50.5	77.9	24.9	3.8	S	83.7	0.000
	1:00	59.6	56.6	49.0	56.3	70.9	74.8	25.1	3.5	SSE	88.2	0.000
	2:00	54.3	49.5	51.5	54.9	48.7	58.5	26.1	2.9	SSE	90.8	0.000
	3:00	67.8	53.3	47.2	52.7	58.7	72.5	31.9	3.4	S	91.0	0.000
	4:00	59.5	46.9	45.2	46.5	48.3	56.4	29.8	2.7	SW	92.2	0.000
	5:00	64.8	49.8	48.2	50.2	51.4	59.8	28.7	2.3	W	92.6	0.000
	6:00	73.7	54.7	51.2	53.6	56.4	67.5	32.2	2.3	SW	92.8	0.000
	7:00	78.8	60.2	56.5	59.0	59.7	69.4	34.1	6.0	WSW	91.6	0.000
	8:00	78.1	61.6	57.0	60.1	60.6	69.8	54.1	7.0	W	86.9	0.000
	9:00	69.5	57.5	52.8	55.0	55.9	64.3	41.4	6.1	W	80.9	0.000
	10:00	66.2	53.3	51.3	53.0	54.2	62.1	27.2	4.7	WSW	75.0	0.000
	11:00	62.3	51.7	51.0	52.5	54.4	62.5	29.0	5.4	SSW	71.5	0.000
	12:00	62.7	52.4	52.0	54.8	56.2	62.5	29.5	5.1	SSW	66.5	0.000
	13:00	68.1	59.3	58.1	62.0	63.1	68.9	32.9	5.9	SE	66.0	0.000
	14:00	77.2	55.0	52.9	53.2	55.3	63.9	31.6	6.7	SSE	69.0	0.000
	15:00	58.4	50.1	49.4	51.3	51.7	57.7	27.4	8.3	SE	69.4	0.000
	16:00	56.6	52.0	52.6	58.5	56.6	59.1	26.5	7.6	SSE	69.3	0.000
	17:00	53.5	50.2	51.4	55.7	81.4	56.0	24.3	5.0	SE	68.7	0.000
Daily Average/Mode/Sum [C]		**55.7**	**45.8**	**44.6**	**46.5**	**49.4**	**56.2**	**27.5**	**4.9**	**SSE**	**78.3**	**0.000**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Out of Classification

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Thursday, May 23, 2013
(5/22/2013-5/23/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/22/2013	16:00	56.6	52.0	52.6	58.5	56.6	59.1	26.5	7.6	SSE	69.3	0.000
	17:00	53.5	50.2	51.4	55.7	81.4	56.0	24.3	5.0	SE	68.7	0.000
	18:00	52.8	45.4	44.2	50.0	79.5	52.8	23.6	6.7	S	65.5	0.000
	19:00	49.0	43.2	41.6	46.9	77.1	48.1	21.3	4.2	S	69.7	0.000
	20:00	44.7	37.7	37.4	39.5	72.1	56.6	21.6	5.9	S	73.1	0.000
	21:00	34.9	30.4	30.3	31.0	60.7	45.3	15.0	4.5	SSW	70.5	0.000
	22:00	14.1	10.7	13.5	10.6	35.3	14.0	4.3	6.2	WNW	59.8	0.000
	23:00	11.2	8.1	11.8	8.7	31.7	11.3	3.2	6.4	W	71.4	0.000
5/23/2013	0:00	10.5	7.6	11.4	8.4	31.9	11.4	2.9	4.3	W	76.7	0.000
	1:00	12.7	9.8	12.5	10.0	34.4	13.3	3.3	4.5	WSW	77.7	0.000
	2:00	14.7	11.1	14.1	11.6	37.4	25.7	5.2	3.5	SSW	79.0	0.000
	3:00	18.4	14.2	16.6	15.2	42.3	25.7	6.2	3.2	SW	80.6	0.000
	4:00	17.8	15.0	17.2	15.9	41.8	18.4	5.4	3.3	WSW	83.0	0.000
	5:00	18.6	16.2	17.9	16.2	43.0	20.0	5.7	3.9	WSW	86.7	0.000
	6:00	18.9	15.8	17.9	16.3	43.0	22.0	5.5	4.1	SSW	87.0	0.000
	7:00	19.4	16.3	18.2	17.0	43.4	24.8	6.1	5.0	SW	86.8	0.000
	8:00	24.6	17.1	19.8	18.9	45.3	26.9	6.7	7.0	SSW	85.2	0.000
	9:00	19.7	16.3	18.8	17.6	42.3	24.8	6.4	6.2	SSW	82.9	0.110
	10:00	21.6	16.0	18.3	17.1	43.6	34.1	7.9	7.8	S	79.7	0.002
	11:00	16.5	13.4	16.7	14.4	39.6	21.8	5.2	5.7	S	71.7	0.000
	12:00	16.0	13.2	15.6	13.5	39.6	17.6	5.1	6.1	WSW	68.6	0.000
	13:00	20.3	16.5	19.7	17.5	42.9	21.1	7.0	5.4	W	78.6	0.040
	14:00	15.8	13.2	15.5	13.0	39.9	16.6	5.0	7.5	WSW	74.0	0.000
	15:00	13.9	10.6	13.6	10.1	35.9	15.3	4.5	7.5	WSW	64.7	0.000
	16:00	26.5	16.3	17.9	18.0	50.2	26.0	11.1	7.3	SSW	68.6	0.000
	17:00	22.4	16.9	19.1	19.4	46.0	20.1	8.3	6.9	S	70.9	0.000
Daily Average/Mode/Sum [C]		**24.8**	**20.5**	**22.4**	**22.0**	**47.6**	**28.0**	**9.5**	**5.6**	**S**	**75.0**	**0.152**

Lab Analysis (µg/m³) [D]							
Total Particulates	7	9	10	13	13	22	13
Hexavalent Chromium	0.0015	0.0013	0.0021	0.0016	0.0023	0.0035	0.0031

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Friday, May 24, 2013
(5/23/2013-5/24/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/23/2013	16:00	26.5	16.3	17.9	18.0	50.2	26.0	11.1	7.3	SSW	68.6	0.000
	17:00	22.4	16.9	19.1	19.4	46.0	20.1	8.3	6.9	S	70.9	0.000
	18:00	15.3	7.6	11.1	9.5	36.4	11.1	4.6	6.2	S	78.8	0.008
	19:00	8.2	5.0	8.1	4.5	27.6	12.2	2.0	6.1	S	76.1	0.000
	20:00	13.1	8.9	12.6	10.2	32.3	10.9	3.4	4.0	N	100 [F]	0.420
	21:00	16.7	12.3	14.7	14.1	36.8	15.5	3.4	2.6	N	100 [F]	0.350
	22:00	10.5	7.4	9.9	ND	31.7	9.7	1.9	1.4	NW	100 [F]	0.040
	23:00	14.3	10.2	12.8	ND	66.6	14.5	3.7	0.8	N	100 [F]	0.100
5/24/2013	0:00	13.9	10.5	13.0	ND	71.3	14.2	3.4	3.4	NNW	100 [F]	0.010
	1:00	10.0	7.2	10.3	ND	50.3	10.4	2.3	2.9	NNW	100 [F]	0.000
	2:00	10.6	7.7	10.9	ND	48.6	10.9	2.5	3.2	N	100 [F]	0.010
	3:00	11.6	8.1	11.3	ND	48.7	13.9	3.1	1.2	N	100 [F]	0.000
	4:00	12.3	9.5	12.0	ND	48.2	11.8	3.1	1.1	N	100 [F]	0.000
	5:00	13.8	10.8	13.7	ND	51.2	13.9	3.6	2.9	N	100 [F]	0.000
	6:00	13.6	11.0	13.4	ND	51.5	13.0	3.7	5.5	NNW	100 [F]	0.000
	7:00	17.0	13.8	15.5	ND	56.4	15.7	4.7	5.7	NNW	100 [F]	0.010
	8:00	13.2	10.7	12.8	ND	56.9	13.3	3.4	7.3	N	100 [F]	0.000
	9:00	4.6	2.8	5.4	ND	41.3	5.0	0.5	5.7	N	100 [F]	0.010
	10:00	3.7	1.6	4.3	ND	39.1	4.0	0.3	8.3	N	100 [F]	0.000
	11:00	4.6	2.6	5.2	ND	41.3	5.1	0.3	8.4	N	100 [F]	0.000
	12:00	7.6	3.9	6.9	ND	44.3	7.1	1.0	9.9	NNE	100 [F]	0.010
	13:00	4.3	1.8	4.2	ND	38.4	4.7	0.3	10.4	NNE	100 [F]	0.000
	14:00	4.4	1.8	4.3	ND	39.8	4.3	0.2	6.6	N	100 [F]	0.000
	15:00	4.0	2.1	4.4	ND	38.5	4.5	0.3	7.3	N	71.9	0.000
	16:00	4.2	2.2	4.5	ND	37.8	4.7	0.3	10.0	N	64.6	0.000
	17:00	4.7	3.0	5.6	ND	39.3	5.6	0.3	7.0	NNW	64.7	0.000
Daily Average/Mode/Sum [C]		**11.0**	**7.5**	**10.1**	**12.6**	**45.0**	**10.8**	**2.8**	**5.5**	**N**	**70.8**	**0.968**

Lab Analysis (µg/m³) [D]							
Total Particulates	<3	<3	5	7	6	8	8
Hexavalent Chromium	0.0024	0.0025	0.0030	0.0039	0.0021	0.0028	0.0052

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

[F] Weather Data aquired from Honeywell weather station. Humidity levels above 100% are shown as 100%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Saturday, May 25, 2013
(5/24/2013-5/25/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/24/2013	16:00	4.2	2.2	4.5	ND	37.8	4.7	0.3	10.0	N	64.6	0.000
	17:00	4.7	3.0	5.6	ND	39.3	5.6	0.3	7.0	NNW	64.7	0.000
	18:00	7.2	4.3	6.9	ND	43.0	7.4	0.4	9.8	NNW	65.8	0.000
	19:00	6.7	3.9	6.7	ND	43.6	6.9	0.4	10.3	N	64.8	0.000
	20:00	7.2	4.2	6.8	0.0	42.3	7.6	0.4	9.0	N	66.8	0.000
	21:00	7.8	5.0	7.6	0.0	44.8	8.6	0.5	7.3	N	67.6	0.000
	22:00	6.9	4.4	7.3	0.0	44.6	8.4	0.4	10.6	N	64.6	0.000
	23:00	5.7	3.6	6.3	0.0	42.0	7.0	0.3	7.6	N	63.4	0.000
5/25/2013	0:00	5.3	3.3	5.7	0.0	41.6	6.5	0.2	6.7	N	62.8	0.000
	1:00	4.9	3.2	5.3	0.0	40.6	6.7	0.2	7.3	NNW	64.7	0.000
	2:00	4.7	2.6	4.9	0.0	40.2	5.9	0.2	6.3	N	65.6	0.000
	3:00	4.9	2.9	5.0	0.0	40.4	6.0	0.2	8.6	NNW	70.1	0.000
	4:00	5.3	3.2	5.4	0.0	41.3	6.7	0.3	7.8	NW	74.3	0.000
	5:00	7.2	4.9	7.1	0.0	44.0	8.8	0.4	8.4	NNW	76.2	0.000
	6:00	10.9	8.1	10.3	0.3	50.1	12.0	1.3	10.3	NW	69.9	0.000
	7:00	12.7	10.0	12.1	0.2	54.0	13.9	1.8	11.3	NW	55.4	0.000
	8:00	10.7	7.9	10.0	0.0	50.9	11.4	1.5	8.1	NNW	52.8	0.000
	9:00	8.0	5.2	8.0	0.0	45.3	8.6	0.6	6.7	N	47.4	0.000
	10:00	5.8	3.5	6.4	0.0	41.9	6.5	0.3	11.1	N	48.9	0.000
	11:00	5.6	3.4	5.8	0.0	41.0	5.9	0.3	9.8	N	48.7	0.000
	12:00	5.7	3.4	5.9	0.3	41.0	5.6	0.3	9.3	N	48.2	0.000
	13:00	6.1	3.7	6.1	0.0	41.8	6.0	0.4	9.3	NNW	46.3	0.000
	14:00	6.2	3.9	6.4	0.0	42.2	5.8	0.4	8.8	N	45.0	0.000
	15:00	5.9	3.6	6.4	0.0	41.3	6.5	0.4	10.7	NNW	42.0	0.000
	16:00	6.2	3.9	6.6	0.0	41.3	5.7	0.5	8.8	NNW	40.3	0.000
	17:00	5.8	3.1	5.6	0.0	40.3	5.4	0.5	10.1	NNW	38.7	0.000
Daily Average/Mode/Sum [C]		**6.6**	**4.2**	**6.7**	**0.0**	**42.9**	**7.3**	**0.5**	**8.9**	**N**	**58.4**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	5	10	7	9	19	6	10
Hexavalent Chromium	0.0012	0.0042	0.0015	0.0025	0.0022	0.0042	0.0077

Weather Day Classification [E]
Dry/Heavy Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Sunday, May 26, 2013
(5/25/2013-5/26/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/25/2013	16:00	6.2	3.9	6.6	0.0	41.3	5.7	0.5	8.8	NNW	40.3	0.000
	17:00	5.8	3.1	5.6	0.0	40.3	5.4	0.5	10.1	NNW	38.7	0.000
	18:00	6.2	3.1	5.4	0.0	44.2	5.5	1.8	7.7	N	37.1	0.000
	19:00	5.8	2.9	5.3	0.0	42.2	5.1	0.5	8.4	NNW	39.9	0.000
	20:00	5.4	2.7	4.9	0.0	38.9	5.1	0.3	8.7	NW	45.3	0.000
	21:00	6.2	2.9	5.1	0.0	37.8	5.9	0.5	5.9	NNW	47.4	0.000
	22:00	6.0	3.2	5.1	0.0	38.6	6.2	0.5	4.4	NNW	50.5	0.000
	23:00	5.8	3.2	5.3	0.0	39.1	6.7	0.3	4.7	NNW	53.4	0.000
5/26/2013	0:00	5.2	2.9	5.2	0.0	40.1	5.8	0.3	4.8	NNW	55.2	0.000
	1:00	5.2	3.0	5.5	0.0	40.9	5.9	0.3	3.8	NNW	58.9	0.000
	2:00	9.2	7.7	14.0	0.0	53.6	11.5	1.0	4.7	NW	64.6	0.000
	3:00	6.6	3.8	6.4	0.0	42.8	7.1	0.5	8.1	NW	66.3	0.000
	4:00	5.7	3.1	5.2	0.0	40.1	6.3	0.2	11.0	NW	67.2	0.000
	5:00	7.1	4.0	6.1	0.0	42.2	7.5	0.3	5.5	NNW	68.6	0.000
	6:00	7.4	3.9	6.3	0.0	42.6	7.6	0.3	5.8	NNW	61.7	0.000
	7:00	6.7	3.5	5.9	0.0	41.8	7.1	0.3	6.2	NNW	45.0	0.000
	8:00	6.2	3.3	5.7	0.0	40.1	6.0	0.3	5.2	NNW	43.6	0.000
	9:00	5.0	2.7	5.0	0.0	38.3	4.7	0.3	6.8	NNW	37.6	0.000
	10:00	4.5	2.1	4.7	0.0	37.7	3.6	0.3	8.1	N	40.3	0.000
	11:00	4.3	2.2	4.6	0.0	37.3	3.8	0.3	7.3	N	40.3	0.000
	12:00	4.5	2.5	5.0	0.0	38.7	3.9	0.3	9.8	NNW	41.2	0.000
	13:00	5.5	2.7	5.0	0.0	42.4	4.0	0.3	10.3	NNW	40.0	0.000
	14:00	5.4	3.0	5.7	0.0	49.6	4.4	0.5	10.8	NW	39.2	0.000
	15:00	5.4	3.2	5.8	0.0	72.5	4.5	0.5	8.0	NW	37.6	0.000
	16:00	4.7	2.7	5.4	0.0	81.8	4.0	0.5	10.0	NW	36.8	0.000
	17:00	5.4	3.2	6.5	0.0	91.3	4.1	0.5	6.7	N	33.8	0.000
Daily Average/Mode/Sum [C]		**5.8**	**3.3**	**5.8**	**0.0**	**46.0**	**5.7**	**0.4**	**7.4**	**NNW**	**47.3**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	6	8	10	6	6	14	9
Hexavalent Chromium	0.0022	0.0028	0.0024	0.0028	0.0054	0.0021	0.0019

Weather Day Classification [E]
Dry/Heavy Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Monday, May 27, 2013
(5/26/2013-5/27/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/26/2013	16:00	4.7	2.7	5.4	0.0	81.8	4.0	0.5	10.0	NW	36.8	0.000
	17:00	5.4	3.2	6.5	0.0	91.3	4.1	0.5	6.7	N	33.8	0.000
	18:00	5.6	3.4	6.3	0.0	104.6	5.3	0.7	7.8	N	32.3	0.000
	19:00	6.3	4.3	6.9	0.0	117.1	6.3	0.7	5.8	N	35.3	0.000
	20:00	7.9	12.6	8.7	0.0	128.7	9.1	1.1	3.5	N	41.5	0.000
	21:00	7.9	5.4	9.5	0.0	138.5	10.0	1.1	3.4	NNW	49.9	0.000
	22:00	11.9	9.7	12.5	0.1	153.4	13.9	2.3	2.8	NNW	57.4	0.000
	23:00	9.9	7.9	12.8	0.0	150.1	13.9	2.2	4.5	NNW	59.7	0.000
5/27/2013	0:00	7.2	5.0	8.1	0.0	120.7	9.5	0.6	5.8	NNW	56.1	0.000
	1:00	8.1	5.4	8.3	0.0	129.4	10.8	1.0	4.3	N	57.4	0.000
	2:00	7.2	4.5	7.8	0.0	127.2	9.7	0.6	4.1	N	59.8	0.000
	3:00	7.9	5.1	8.1	0.0	122.0	10.2	0.6	4.3	N	62.4	0.000
	4:00	7.5	5.0	8.1	0.0	114.3	10.0	0.5	2.9	N	62.3	0.000
	5:00	8.4	5.7	8.4	0.0	112.7	11.0	0.7	3.6	N	66.0	0.000
	6:00	9.4	6.3	10.0	0.0	104.7	12.2	1.1	3.2	N	61.3	0.000
	7:00	8.6	6.0	9.3	0.0	98.1	11.2	0.9	1.3	NNE	41.8	0.000
	8:00	7.2	5.3	9.0	0.0	91.6	9.6	0.7	1.6	NNE	36.9	0.000
	9:00	6.1	4.6	7.5	0.0	81.3	8.2	0.8	1.8	NNE	29.5	0.000
	10:00	5.1	3.3	6.2	0.0	71.8	5.4	0.6	2.9	SE	30.8	0.000
	11:00	5.4	3.9	7.4	0.0	66.4	6.6	0.8	2.8	SE	32.8	0.000
	12:00	5.8	4.4	7.8	0.0	56.2	7.0	1.1	2.9	SE	33.6	0.000
	13:00	6.1	5.1	8.8	0.0	28.0	7.9	1.7	1.6	WSW	30.7	0.000
	14:00	6.1	3.9	8.3	0.0	0.6	7.7	1.4	3.8	SE	33.5	0.000
	15:00	5.5	4.1	7.5	0.1	0.6	6.6	1.0	3.6	NW	33.7	0.000
	16:00	5.8	3.9	7.6	0.1	0.6	6.6	1.3	5.9	WNW	35.9	0.000
	17:00	6.1	4.0	7.8	0.0	0.6	6.9	0.9	5.0	NW	40.1	0.000
Daily Average/Mode/Sum [C]		**7.0**	**5.2**	**8.2**	**0.0**	**88.2**	**8.6**	**1.0**	**4.1**	**N**	**44.3**	**0.000**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Tuesday, May 28, 2013
(5/27/2013-5/28/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/27/2013	16:00	5.8	3.9	7.6	0.1	0.6	6.6	1.3	5.9	WNW	35.9	0.000
	17:00	6.1	4.0	7.8	0.0	0.6	6.9	0.9	5.0	NW	40.1	0.000
	18:00	7.3	4.9	8.2	0.0	0.6	8.1	1.1	5.1	NNW	43.5	0.000
	19:00	7.3	4.8	8.6	0.0	0.6	9.0	1.1	4.6	NNW	48.0	0.000
	20:00	7.2	4.8	8.0	0.0	0.6	8.8	1.0	3.9	N	51.6	0.000
	21:00	7.3	5.4	8.9	0.0	0.6	9.3	1.0	3.1	NNW	55.0	0.000
	22:00	8.5	6.3	9.5	0.0	0.6	10.5	1.4	0.7	N	59.6	0.000
	23:00	13.2	10.5	14.0	0.0	0.6	16.8	3.6	0.8	N	65.2	0.000
5/28/2013	0:00	12.6	10.3	13.2	0.0	0.6	15.1	3.5	1.0	N	66.5	0.000
	1:00	11.8	9.8	12.9	0.0	0.6	15.0	3.4	0.5	N	67.9	0.000
	2:00	14.4	12.3	15.3	0.0	0.7	19.0	4.3	0.8	N	69.6	0.000
	3:00	18.9	17.0	18.8	0.0	0.7	23.5	6.2	1.9	N	71.5	0.000
	4:00	18.7	16.7	18.9	0.0	0.6	22.6	6.1	1.4	NNE	75.0	0.000
	5:00	17.9	16.0	17.9	0.0	0.6	21.9	5.7	1.2	NNE	80.0	0.000
	6:00	18.7	16.5	18.5	0.0	0.7	22.3	5.8	0.9	N	93.8	0.030
	7:00	18.1	16.9	17.9	0.0	0.6	22.6	6.4	1.8	NE	100 [F]	0.020
	8:00	19.7	18.1	19.6	0.0	0.6	24.0	6.7	1.3	NE	94.8	0.000
	9:00	28.3	19.5	19.7	1.4	0.8	30.9	12.3	3.6	SSE	84.3	0.013
	10:00	18.3	17.3	18.7	0.1	0.7	31.7	7.7	3.1	SW	83.4	0.007
	11:00	23.2	21.7	22.3	0.2	0.6	27.7	18.3	3.1	S	79.7	0.000
	12:00	25.2	23.8	24.8	0.0	0.6	29.3	23.7	4.4	SE	74.4	0.000
	13:00	26.4	25.8	27.1	0.1	0.6	31.9	11.5	4.3	ESE	70.2	0.000
	14:00	27.3	26.4	28.2	0.2	0.6	33.4	11.9	4.0	SE	69.5	0.000
	15:00	26.3	25.6	27.7	0.1	0.7	31.7	13.1	4.6	SSE	69.9	0.000
	16:00	24.0	23.1	25.0	0.0	0.6	28.1	9.9	4.2	SE	68.7	0.000
	17:00	25.2	26.3	26.7	0.0	0.8	30.9	11.3	2.1	SE	66.3	0.000
Daily Average/Mode/Sum [C]		**16.8**	**14.9**	**17.1**	**0.1**	**0.6**	**20.7**	**6.9**	**2.8**	**N**	**67.4**	**0.070**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Wednesday, May 29, 2013
(5/28/2013-5/29/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/28/2013	16:00	24.0	23.1	25.0	0.0	0.6	28.1	9.9	4.2	SE	68.7	0.000
	17:00	25.2	26.3	26.7	0.0	0.8	30.9	11.3	2.1	SE	66.3	0.000
	18:00	20.2	20.4	22.4	0.0	0.6	26.5	9.3	4.9	SE	67.4	0.000
	19:00	46.0	46.9	42.8	11.8	0.7	58.3	25.5	4.4	E	75.0	0.141
	20:00	34.7	35.0	32.8	2.4	0.7	42.8	17.0	2.6	ENE	89.6	0.000
	21:00	42.7	47.5	44.4	12.5	0.8	54.3	21.6	3.0	ENE	92.2	0.000
	22:00	26.3	28.0	29.4	0.3	0.6	33.9	11.8	3.7	SSE	91.2	0.000
	23:00	27.2	30.7	30.4	1.7	0.6	38.8	12.8	1.6	ESE	92.1	0.000
5/29/2013	0:00	29.9	35.3	36.5	4.7	0.6	42.9	14.9	1.3	ENE	92.3	0.000
	1:00	27.6	29.9	30.6	1.3	0.6	36.5	13.4	1.5	WSW	92.5	0.000
	2:00	22.3	25.2	26.4	0.3	0.7	31.2	9.9	1.8	SSW	92.4	0.000
	3:00	23.7	26.7	26.7	0.0	0.6	33.4	10.9	1.8	S	92.4	0.000
	4:00	24.7	27.6	27.4	0.0	0.8	33.1	11.1	2.3	W	93.4	0.000
	5:00	27.1	29.5	28.8	0.1	0.7	34.8	12.2	5.0	W	91.7	0.000
	6:00	29.3	31.8	30.6	0.6	0.6	38.3	13.1	4.1	W	91.4	0.000
	7:00	33.2	35.2	33.2	1.2	0.7	41.9	15.3	7.3	W	89.1	0.000
	8:00	39.0	38.9	38.5	3.2	0.6	45.5	22.1	7.0	W	83.2	0.000
	9:00	31.1	30.7	30.6	0.3	0.6	36.8	18.0	7.1	W	74.0	0.000
	10:00	33.5	34.3	32.1	0.1	0.7	36.2	19.3	4.5	WSW	68.3	0.000
	11:00	34.6	28.1	28.1	0.0	0.6	32.3	16.5	5.9	WSW	61.4	0.000
	12:00	29.4	25.1	25.6	0.0	0.7	28.9	15.4	8.3	W	52.1	0.000
	13:00	22.5	21.7	22.7	0.0	0.6	25.6	12.6	9.2	W	44.6	0.000
	14:00	21.6	20.6	21.9	0.0	0.6	24.0	12.5	8.9	W	42.4	0.000
	15:00	23.4	22.0	23.1	0.0	0.7	25.2	13.6	7.6	W	43.1	0.000
	16:00	24.5	23.4	24.8	0.0	0.6	30.1	14.7	7.6	W	42.1	0.000
	17:00	35.5	35.0	32.0	2.8	0.7	39.0	18.9	4.6	SSW	55.8	0.000
Daily Average/Mode/Sum [C]		**29.2**	**30.0**	**29.8**	**1.7**	**0.7**	**35.7**	**14.8**	**4.7**	**W**	**74.8**	**0.141**

Lab Analysis (µg/m³) [D]							
Total Particulates	ND	20	23	21	20	26	29
Hexavalent Chromium	ND	0.0021	0.0022	0.0030	0.0024	0.0039	0.0022

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Thursday, May 30, 2013
(5/29/2013-5/30/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/29/2013	16:00	24.5	23.4	24.8	0.0	0.6	30.1	14.7	1.3	ENE	92.3	0.000
	17:00	35.5	35.0	32.0	2.8	0.7	39.0	18.9	1.5	WSW	92.5	0.000
	18:00	48.3	37.8	35.4	3.1	1.0	37.7	22.2	1.8	SSW	92.4	0.000
	19:00	51.1	33.1	29.2	0.5	0.8	52.4	30.0	1.8	S	92.4	0.000
	20:00	29.4	27.0	25.6	0.0	0.6	57.0	18.2	2.3	W	93.4	0.000
	21:00	31.6	27.2	26.6	0.0	0.7	31.5	12.7	5.0	W	91.7	0.000
	22:00	30.2	25.3	25.4	0.0	0.6	28.0	12.3	4.1	W	91.4	0.000
	23:00	26.4	22.3	22.5	0.0	0.6	25.2	10.2	7.3	W	89.1	0.000
5/30/2013	0:00	27.8	23.1	23.1	0.0	0.6	24.2	10.7	3.9	WSW	64.6	0.000
	1:00	27.1	23.3	23.0	0.0	0.6	25.1	10.7	3.7	WSW	66.8	0.000
	2:00	26.5	22.4	22.1	0.0	0.6	24.6	9.9	4.8	W	69.1	0.000
	3:00	27.7	23.9	24.5	0.0	0.6	26.2	10.2	5.3	W	71.3	0.000
	4:00	28.0	25.1	24.0	0.0	0.7	27.4	10.9	5.1	W	73.2	0.000
	5:00	21.4	18.3	20.0	0.0	0.8	22.2	7.7	3.6	W	71.4	0.000
	6:00	24.3	20.1	21.4	0.0	0.6	23.1	8.8	2.6	SW	72.5	0.000
	7:00	23.7	20.5	21.6	0.0	0.6	23.4	9.0	4.5	W	72.8	0.000
	8:00	23.7	22.0	22.6	0.0	0.7	24.1	9.6	4.3	W	67.1	0.000
	9:00	32.3	27.2	25.9	0.2	0.7	38.8	16.0	3.1	SW	63.5	0.000
	10:00	35.2	28.2	26.7	0.3	0.6	34.7	16.8	4.3	S	59.7	0.000
	11:00	29.7	27.8	27.4	0.3	0.7	36.3	17.1	4.7	S	52.3	0.000
	12:00	46.9	43.0	40.6	10.1	0.8	33.1	22.0	4.4	S	50.7	0.000
	13:00	32.0	51.6	51.5	17.0	0.6	30.6	16.6	5.0	SSE	51.7	0.000
	14:00	25.9	27.5	30.6	0.8	0.6	26.3	13.4	5.2	SSE	50.5	0.000
	15:00	27.0	25.2	26.3	0.0	0.6	28.5	13.6	5.9	SE	50.6	0.000
	16:00	26.7	25.2	26.1	0.0	0.8	28.0	13.2	6.1	SE	53.3	0.000
	17:00	34.1	29.0	28.2	0.4	0.6	32.4	16.2	4.6	S	49.6	0.000
Daily Average/Mode/Sum [C]		**30.7**	**27.5**	**27.2**	**1.4**	**0.7**	**31.1**	**14.3**	**4.1**	**W**	**71.0**	**0.000**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Out of Classification

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m^3 to $\mu g/m^3$). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Friday, May 31, 2013
(5/30/2013-5/31/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/30/2013	16:00	26.7	25.2	26.1	0.0	0.8	28.0	13.2	6.1	SE	53.3	0.000
	17:00	34.1	29.0	28.2	0.4	0.6	32.4	16.2	4.6	S	49.6	0.000
	18:00	44.6	28.1	27.1	0.3	0.7	45.5	21.4	7.0	SSW	50.8	0.000
	19:00	36.2	26.5	26.8	0.0	0.6	62.1	20.8	6.1	SSW	56.1	0.000
	20:00	29.3	25.2	26.0	0.0	0.6	31.1	11.9	4.8	WSW	57.4	0.000
	21:00	29.2	25.2	25.6	0.0	0.6	26.1	11.2	4.4	SW	58.2	0.000
	22:00	39.3	34.6	33.4	1.7	0.7	36.3	15.9	3.5	SSE	66.2	0.000
	23:00	44.8	43.1	38.9	3.0	0.8	42.9	18.0	2.8	SSE	72.4	0.000
5/31/2013	0:00	43.2	39.0	36.0	2.9	0.7	39.6	16.5	2.4	SW	73.0	0.000
	1:00	37.2	31.4	29.7	0.1	0.7	31.1	14.2	2.9	WSW	70.9	0.000
	2:00	38.9	31.6	30.7	0.1	0.6	33.8	14.2	2.3	SW	73.0	0.000
	3:00	42.6	35.1	33.0	0.5	0.7	37.7	16.0	2.0	SSW	78.1	0.000
	4:00	41.9	35.0	33.6	2.0	0.7	37.7	16.5	2.5	SW	80.5	0.000
	5:00	38.2	30.8	30.2	0.1	0.6	32.6	13.9	2.6	WSW	79.1	0.000
	6:00	39.1	31.6	29.8	1.1	0.7	35.5	13.8	2.6	SSW	78.5	0.000
	7:00	37.1	31.4	29.7	0.1	0.6	46.8	15.7	2.2	WSW	76.1	0.000
	8:00	36.8	31.7	31.2	0.0	0.6	37.0	42.8	2.8	SSW	70.9	0.000
	9:00	39.5	32.5	31.9	0.1	0.7	38.8	28.0	3.4	SSW	66.4	0.000
	10:00	39.3	33.8	33.6	1.1	2.0	37.0	34.0	4.4	SE	63.0	0.000
	11:00	34.5	31.2	32.5	18.6	5.1	31.5	26.4	5.6	SE	58.9	0.000
	12:00	32.2	28.6	30.7	16.0	4.5	28.5	21.9	5.9	SSE	53.3	0.000
	13:00	29.5	20.3	18.1	10.8	4.3	26.8	20.7	5.9	SW	41.7	0.000
	14:00	17.9	15.4	14.2	7.0	2.1	19.5	11.3	8.8	WSW	37.2	0.000
	15:00	17.5	15.7	13.8	6.8	2.2	16.6	10.3	9.3	WSW	37.5	0.000
	16:00	16.3	14.1	12.7	5.5	1.8	15.8	9.5	12.1	W	37.0	0.000
	17:00	15.3	12.7	11.2	5.6	1.5	14.4	8.5	13.5	WSW	35.3	0.000
Daily Average/Mode/Sum [C]		**33.9**	**28.4**	**27.5**	**3.2**	**1.4**	**33.3**	**17.8**	**5.0**	**WSW**	**60.5**	**0.000**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m^3 to $\mu g/m^3$). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Saturday, June 01, 2013
(5/31/2013-6/1/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5/31/2013	16:00	16.3	14.1	12.7	5.5	1.8	15.8	9.5	12.1	W	37.0	0.000
	17:00	15.3	12.7	11.2	5.6	1.5	14.4	8.5	13.5	WSW	35.3	0.000
	18:00	15.7	12.9	11.1	5.9	1.9	14.6	9.1	12.8	WSW	36.7	0.000
	19:00	16.5	13.2	11.7	4.8	1.7	16.0	9.6	9.7	WSW	39.6	0.000
	20:00	18.1	14.2	12.5	5.0	2.0	19.0	11.1	6.4	WSW	44.8	0.000
	21:00	18.4	14.9	13.0	5.7	2.0	17.6	12.3	5.9	WSW	48.7	0.000
	22:00	23.2	17.1	15.3	7.4	2.3	33.5	17.4	4.1	SW	54.8	0.000
	23:00	19.9	15.4	13.2	6.1	1.9	19.1	12.9	2.3	WSW	56.9	0.000
6/1/2013	0:00	34.7	25.9	20.3	15.7	3.8	34.2	26.8	4.1	S	64.5	0.000
	1:00	21.9	17.2	14.5	7.0	2.5	31.7	18.1	2.7	S	62.6	0.000
	2:00	26.8	22.5	18.2	11.4	3.1	30.7	20.9	2.6	SSE	66.4	0.000
	3:00	19.1	16.4	13.9	6.5	2.1	24.4	14.5	2.9	SW	68.7	0.000
	4:00	19.5	17.2	15.0	7.5	1.9	19.0	12.9	2.4	SW	70.1	0.000
	5:00	20.7	18.2	15.6	8.5	2.5	31.7	16.7	3.7	SW	71.8	0.000
	6:00	22.1	19.6	16.3	9.5	2.3	20.2	15.3	5.3	WSW	72.1	0.000
	7:00	22.5	20.1	16.9	8.2	2.3	21.6	15.4	7.1	W	71.1	0.000
	8:00	23.7	21.0	18.0	7.8	2.7	22.2	15.8	6.1	WSW	68.4	0.000
	9:00	23.4	21.5	20.2	7.9	2.5	23.0	15.4	5.3	WSW	63.0	0.000
	10:00	23.7	22.0	20.0	7.9	2.3	24.5	15.9	5.3	SSW	59.8	0.000
	11:00	24.0	22.3	20.3	8.6	2.8	24.5	16.7	5.4	S	55.0	0.000
	12:00	24.6	22.8	20.6	9.5	2.5	25.3	17.2	5.7	S	51.9	0.000
	13:00	25.1	21.2	20.0	10.2	2.5	23.0	16.2	5.6	SSE	52.2	0.000
	14:00	22.5	19.1	17.9	8.5	2.3	21.9	15.2	6.3	SSE	54.4	0.000
	15:00	20.7	18.4	17.6	7.8	2.2	21.9	14.5	5.7	SSE	49.5	0.000
	16:00	20.1	17.7	16.2	6.1	2.4	21.9	14.1	6.0	WSW	43.4	0.000
	17:00	17.0	16.0	14.3	5.0	1.9	20.2	12.0	6.3	SW	42.1	0.000
Daily Average/Mode/Sum [C]		**21.4**	**18.2**	**16.0**	**7.7**	**2.3**	**22.8**	**14.8**	**6.0**	**WSW**	**55.4**	**0.000**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Sunday, June 02, 2013
(6/1/2013-6/2/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]						
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)
6/1/2013	16:00	20.1	17.7	16.2	6.1	2.4	21.9	14.1
	17:00	17.0	16.0	14.3	5.0	1.9	20.2	12.0
	18:00	14.8	14.4	13.0	4.3	1.6	17.0	10.1
	19:00	14.4	14.2	13.0	4.2	1.6	15.6	9.7
	20:00	15.5	16.0	13.9	4.6	1.7	17.2	11.1
	21:00	19.6	15.3	14.2	5.0	2.1	29.8	18.1
	22:00	29.7	19.2	17.4	8.9	3.3	32.7	27.2
	23:00	27.2	18.4	16.1	8.1	3.1	38.4	26.0
6/2/2013	0:00	15.0	13.8	12.3	4.5	1.7	18.9	11.4
	1:00	13.0	13.4	11.1	3.5	1.5	13.2	9.3
	2:00	12.1	12.5	9.8	2.9	1.3	12.4	8.6
	3:00	11.9	12.0	11.1	2.8	1.3	12.2	8.2
	4:00	12.3	12.2	13.9	3.4	1.4	11.9	8.2
	5:00	12.8	12.3	10.4	3.5	1.4	15.2	9.5
	6:00	13.2	13.4	11.0	4.3	1.4	13.2	9.5
	7:00	19.0	18.1	15.6	7.8	2.0	21.2	15.8
	8:00	15.0	15.2	12.7	4.2	1.6	15.6	11.2
	9:00	15.2	15.6	13.3	3.8	1.7	15.4	10.9
	10:00	15.4	16.3	13.9	3.7	1.6	15.4	10.7
	11:00	15.2	16.7	14.0	4.1	1.8	16.0	10.8
	12:00	15.9	17.3	14.6	4.3	1.8	17.0	11.1
	13:00	16.3	17.0	14.9	4.6	2.0	18.3	12.2
	14:00	16.5	17.5	15.1	4.5	1.9	18.0	12.6
	15:00	15.5	16.4	13.9	4.1	1.7	17.6	11.5
	16:00	15.2	15.9	13.5	3.9	1.0	16.7	11.3
	17:00	12.9	13.8	11.7	2.8	0.6	15.2	9.2
Daily Average/Mode/Sum [C]		**16.2**	**15.4**	**13.5**	**4.6**	**1.7**	**18.3**	**12.3**

Weather [B]			
Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6.0	WSW	43.4	0.000
6.3	SW	42.1	0.000
6.5	WSW	43.5	0.000
7.1	WSW	44.5	0.000
5.8	WSW	47.1	0.000
6.1	SW	52.5	0.000
8.0	SSW	59.5	0.000
6.4	S	65.6	0.000
4.9	SW	63.0	0.000
5.1	WSW	61.0	0.000
4.9	WSW	59.5	0.000
6.1	WSW	60.4	0.000
3.6	WSW	62.7	0.000
4.5	WSW	64.0	0.000
6.0	SW	65.1	0.000
7.5	W	67.0	0.000
10.5	W	67.2	0.000
10.9	WSW	64.2	0.000
7.9	WSW	60.8	0.000
9.5	W	57.6	0.000
8.6	WSW	59.6	0.000
10.9	W	60.1	0.000
6.8	WSW	60.2	0.000
9.8	WSW	57.7	0.000
10.8	WSW	57.5	0.000
8.8	WSW	57.2	0.000
7.3	**WSW**	**57.8**	**0.000**

Lab Analysis (µg/m³) [D]							
Total Particulates	16	12	13	17	13	15	18
Hexavalent Chromium	0.0028	0.0014	0.0038	0.0020	0.0019	0.0036	0.0029

Weather Day Classification [E]
Dry/Heavy Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Monday, June 03, 2013
(6/2/2013-6/3/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/2/2013	16:00	15.2	15.9	13.5	3.9	1.0	16.7	11.3	10.8	WSW	57.5	0.000
	17:00	12.9	13.8	11.7	2.8	0.6	15.2	9.2	8.8	WSW	57.2	0.000
	18:00	15.4	11.4	10.4	4.8	0.5	14.0	7.8	14.5	W	74.4	0.130
	19:00	ND	7.8	6.5	ND	0.7	9.0	3.9	9.4	W	86.9	0.090
	20:00	ND	7.7	6.1	ND	0.4	11.6	4.8	5.3	W	91.1	0.050
	21:00	ND	6.3	4.6	ND	0.2	7.7	2.9	6.9	W	89.3	0.000
	22:00	ND	7.2	5.3	ND	0.0	8.8	4.0	6.7	W	90.7	0.000
	23:00	ND	9.8	7.8	ND	0.2	11.7	6.8	5.4	W	91.2	0.010
6/3/2013	0:00	ND	12.2	9.7	ND	1.0	12.6	8.6	2.3	WSW	91.9	0.010
	1:00	ND	11.4	8.3	ND	0.0	10.9	7.5	4.4	WSW	91.3	0.010
	2:00	ND	10.5	8.0	ND	0.0	10.9	6.7	5.2	WSW	92.4	0.000
	3:00	ND	11.9	8.9	ND	0.0	11.5	7.6	3.9	W	93.1	0.010
	4:00	ND	11.6	9.0	ND	0.0	11.5	8.0	5.3	WSW	94.3	0.000
	5:00	ND	12.4	10.4	ND	1.6	10.4	7.0	7.3	WSW	94.2	0.060
	6:00	ND	13.2	12.1	ND	3.2	10.4	6.5	4.7	W	95.1	0.140
	7:00	ND	9.6	7.0	ND	3.5	10.4	6.6	4.7	W	93.7	0.000
	8:00	10.5	11.4	8.7	4.2	1.4	11.6	8.8	2.9	W	92.3	0.010
	9:00	11.2	12.2	9.5	4.1	1.0	15.7	13.8	2.8	W	92.1	0.000
	10:00	12.6	13.7	10.7	4.0	1.1	12.8	9.8	4.1	W	89.0	0.000
	11:00	18.6	20.1	16.2	7.1	1.3	18.1	14.5	2.7	WSW	79.4	0.000
	12:00	20.7	22.8	18.1	8.9	1.2	20.4	16.4	3.1	ESE	71.8	0.000
	13:00	22.2	23.7	19.7	10.0	1.2	22.6	18.4	4.0	SSE	67.7	0.000
	14:00	26.8	28.8	24.6	15.5	ND	26.8	22.3	3.7	SSE	65.9	0.000
	15:00	25.2	29.3	29.3	17.6	19.1	24.2	19.6	5.5	SSE	74.7	0.110
	16:00	17.2	17.2	15.0	7.8	3.0	18.1	14.5	7.1	N	79.6	0.020
	17:00	13.6	12.6	10.9	4.5	2.7	14.5	9.9	3.5	NNW	61.1	0.000
Daily Average/Mode/Sum [C]		**17.1**	**14.0**	**11.6**	**7.3**	**1.8**	**14.2**	**9.9**	**5.6**	**W**	**83.0**	**0.650**

Lab Analysis (µg/m³) [D]							
Total Particulates	6	7	21	10	11	11	10
Hexavalent Chromium	0.00099	0.0025	0.0015	0.0012	<0.00066	0.0021	0.0028

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Tuesday, June 04, 2013
(6/3/2013-6/4/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/3/2013	16:00	17.2	17.2	15.0	7.8	3.0	18.1	14.5	7.1	N	79.6	0.020
	17:00	13.6	12.6	10.9	4.5	2.7	14.5	9.9	3.5	NNW	61.1	0.000
	18:00	15.5	14.9	ND	4.8	3.2	18.1	11.7	2.3	N	56.7	0.000
	19:00	12.8	11.4	ND	1.8	2.1	11.8	8.1	5.3	N	49.0	0.000
	20:00	13.4	11.4	ND	2.8	2.2	13.6	8.5	5.1	N	50.6	0.000
	21:00	14.3	12.8	ND	4.2	2.4	15.1	10.4	3.9	NNW	52.8	0.000
	22:00	14.9	13.4	11.6	5.0	2.9	15.4	10.6	4.4	N	55.1	0.000
	23:00	13.9	14.2	12.2	7.3	2.5	14.4	9.8	6.4	WNW	55.5	0.000
6/4/2013	0:00	17.4	18.5	16.2	13.8	3.2	18.1	12.6	5.7	WNW	55.3	0.000
	1:00	13.8	15.2	12.2	11.9	2.6	14.2	9.7	5.6	WNW	55.2	0.000
	2:00	10.7	12.0	9.0	11.2	2.9	12.0	7.6	5.0	NNW	55.6	0.000
	3:00	9.5	10.6	7.3	10.8	2.0	10.6	6.6	5.3	N	57.0	0.000
	4:00	8.2	8.4	5.9	9.8	2.2	9.3	5.3	5.0	N	56.9	0.000
	5:00	6.8	7.3	5.0	11.2	1.9	8.0	3.8	5.4	NNW	54.7	0.000
	6:00	6.4	7.0	5.1	11.2	1.8	7.6	4.0	5.3	N	53.5	0.000
	7:00	5.2	5.5	3.8	8.1	1.5	6.7	2.0	7.6	N	47.4	0.000
	8:00	4.3	4.8	2.6	6.8	1.4	5.8	1.5	6.5	N	43.8	0.000
	9:00	4.2	4.4	2.6	5.5	1.2	4.4	0.8	8.0	N	41.7	0.000
	10:00	4.5	5.0	2.9	4.2	1.4	5.1	1.5	4.7	NNW	38.8	0.000
	11:00	4.7	5.5	3.2	3.7	1.3	4.9	1.5	6.5	WNW	36.3	0.000
	12:00	3.8	4.7	3.2	1.8	0.8	4.4	1.3	6.2	W	35.2	0.000
	13:00	4.0	3.8	2.7	0.2	1.0	7.6	0.6	6.4	W	31.7	0.000
	14:00	4.1	3.9	3.1	0.2	0.6	6.8	0.5	6.7	N	30.4	0.000
	15:00	3.7	3.7	3.0	0.0	0.2	3.6	0.4	5.3	W	30.4	0.000
	16:00	3.8	4.0	3.2	0.0	0.0	3.3	0.3	5.8	WSW	29.9	0.000
	17:00	3.8	3.9	2.6	0.0	0.4	50.0	0.3	5.6	W	30.5	0.000
Daily Average/Mode/Sum [C]		**9.0**	**9.1**	**6.5**	**5.7**	**1.8**	**11.7**	**5.5**	**5.6**	**N**	**47.9**	**0.020**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Wednesday, June 05, 2013
(6/4/2013-6/5/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]						
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)
6/4/2013	16:00	3.8	4.0	3.2	0.0	0.0	3.3	0.3
	17:00	3.8	3.9	2.6	0.0	0.4	50.0	0.3
	18:00	4.4	4.3	2.6	0.3	0.2	4.0	0.4
	19:00	5.1	4.6	3.1	0.0	0.3	5.2	3.3
	20:00	6.0	5.1	3.1	0.1	0.5	6.0	2.3
	21:00	9.3	7.7	5.3	2.2	0.9	9.9	4.6
	22:00	6.9	6.1	4.9	2.8	1.0	9.8	3.5
	23:00	9.7	8.9	6.5	3.9	1.5	11.4	6.9
6/5/2013	0:00	11.2	10.7	8.5	5.3	1.8	11.6	8.1
	1:00	14.3	14.5	11.2	8.5	3.7	15.1	10.9
	2:00	10.2	10.5	9.6	7.9	2.6	11.0	7.2
	3:00	13.0	13.0	10.1	9.5	3.2	13.5	9.6
	4:00	11.3	11.0	8.3	9.0	2.5	12.3	8.3
	5:00	9.8	9.6	7.2	9.2	1.8	10.7	6.2
	6:00	9.4	9.3	6.8	9.5	2.3	11.2	7.5
	7:00	10.3	9.3	7.3	7.0	1.9	10.9	6.3
	8:00	11.2	10.1	7.6	4.8	2.3	10.6	6.2
	9:00	10.0	9.1	6.6	2.6	1.7	8.9	5.2
	10:00	7.7	7.2	5.3	0.9	1.4	6.6	3.3
	11:00	7.5	6.8	4.9	0.2	1.7	5.9	2.6
	12:00	7.1	6.7	5.5	1.0	1.7	6.0	7.2
	13:00	7.9	8.1	7.3	2.4	2.3	6.6	2.4
	14:00	6.6	5.7	4.8	0.3	1.4	6.8	1.7
	15:00	7.0	5.8	5.8	0.6	1.3	6.2	2.0
	16:00	7.1	6.0	5.9	0.4	1.4	6.7	1.7
	17:00	7.2	6.3	5.5	2.2	3.4	6.8	2.4
Daily Average/Mode/Sum [C]		**8.4**	**7.9**	**6.1**	**3.5**	**1.7**	**10.3**	**4.6**

Weather [B]			
Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
5.8	WSW	29.9	0.000
5.6	W	30.5	0.000
3.3	W	31.3	0.000
3.6	NNW	33.1	0.000
3.8	N	34.9	0.000
3.6	ENE	36.9	0.000
2.5	ENE	38.1	0.000
2.2	N	43.1	0.000
2.3	N	52.3	0.000
2.4	W	59.8	0.000
2.1	W	61.6	0.000
2.7	N	65.6	0.000
3.8	NNE	65.4	0.000
3.3	NE	59.0	0.000
2.4	NE	55.5	0.000
4.8	ENE	52.4	0.000
7.1	ENE	49.2	0.000
6.3	ENE	46.6	0.000
5.4	SE	41.6	0.000
6.6	SE	38.4	0.000
7.5	SE	38.8	0.000
6.3	SE	40.2	0.000
5.7	SE	37.9	0.000
7.2	SE	39.3	0.000
5.7	SSE	39.0	0.000
6.6	SE	40.8	0.000
4.6	**SE**	**44.7**	**0.000**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Thursday, June 06, 2013
(6/5/2013-6/6/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-11)*	PAM-3 *(AM-9)*	PAM-4 *(AM-8)*	PAM-5 *(AM-6)*	PAM-6 *(AM-4)*	PAM-7 *(AM-2)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/5/2013	16:00	7.1	6.0	5.9	0.4	1.4	6.7	1.7	5.7	SSE	39.0	0.000
	17:00	7.2	6.3	5.5	2.2	3.4	6.8	2.4	6.6	SE	40.8	0.000
	18:00	8.8	8.7	7.5	3.5	3.9	7.9	3.5	5.2	SSE	40.6	0.000
	19:00	8.4	8.2	10.8	4.4	3.4	8.1	3.4	5.1	SSE	43.7	0.000
	20:00	11.7	18.1	15.7	13.5	7.3	10.1	6.9	4.0	SSE	48.8	0.000
	21:00	19.5	14.6	10.6	10.4	11.5	13.9	15.2	4.2	S	55.8	0.000
	22:00	23.0	13.7	10.4	11.7	14.1	15.7	18.4	5.4	S	56.8	0.000
	23:00	12.6	7.6	5.5	6.2	5.7	20.0	14.0	6.4	S	56.4	0.000
6/6/2013	0:00	7.0	5.9	4.0	5.0	2.6	19.4	6.9	5.7	SSW	56.3	0.000
	1:00	8.7	7.8	4.8	5.8	3.1	13.7	6.7	3.5	SSW	58.1	0.000
	2:00	12.8	8.1	4.8	5.6	5.9	23.3	13.3	4.7	SW	59.8	0.000
	3:00	10.1	9.8	6.2	7.0	4.1	14.5	7.1	2.8	SW	63.7	0.000
	4:00	12.8	15.0	12.2	11.6	6.6	12.5	8.4	2.2	S	69.8	0.000
	5:00	22.2	19.5	13.6	16.4	12.6	14.4	13.7	3.9	SSE	72.2	0.000
	6:00	14.5	20.9	14.7	19.1	8.2	12.9	9.8	4.0	SSE	66.7	0.000
	7:00	10.0	15.5	17.1	18.8	6.3	9.6	6.8	4.8	S	56.1	0.000
	8:00	10.8	16.6	17.6	18.3	7.3	8.7	5.7	6.0	SE	61.4	0.000
	9:00	7.4	8.9	11.9	10.9	3.0	7.1	3.3	8.0	SE	59.8	0.000
	10:00	9.3	12.5	13.0	11.4	4.7	9.0	5.1	6.3	SSE	61.3	0.000
	11:00	9.0	11.4	11.4	8.8	4.3	8.7	5.0	6.4	SSE	60.3	0.000
	12:00	9.0	9.7	8.3	4.9	3.9	9.3	5.0	6.9	SSE	62.5	0.000
	13:00	8.6	8.8	9.1	5.7	3.8	8.7	4.4	5.3	SE	60.8	0.000
	14:00	12.5	15.6	15.6	12.9	7.7	11.2	7.5	4.1	SSW	60.7	0.000
	15:00	17.6	11.3	9.4	6.7	9.8	22.9	17.6	7.3	SSW	65.5	0.000
	16:00	19.1	12.4	9.8	7.7	10.1	24.7	19.7	7.8	SSW	68.6	0.000
	17:00	14.5	17.8	15.8	14.9	7.4	10.9	9.5	5.0	SW	66.0	0.000
Daily Average/Mode/Sum [C]		**12.1**	**11.9**	**10.4**	**9.4**	**6.2**	**12.7**	**8.5**	**5.3**	**SSE**	**58.1**	**0.000**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m^3 to $\mu g/m^3$). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Friday, June 07, 2013
(6/6/2013-6/7/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/6/2013	16:00	19.1	12.4	9.8	7.7	10.1	24.7	19.7	7.8	SSW	68.6	0.000
	17:00	14.5	17.8	15.8	14.9	7.4	10.9	9.5	5.0	SW	66.0	0.000
	18:00	10.2	18.9	20.4	18.2	4.7	10.2	7.2	4.3	SSE	70.2	0.020
	19:00	21.7	18.8	14.1	14.2	11.9	13.4	17.1	4.1	SSW	72.4	0.017
	20:00	11.6	23.8	20.4	24.1	5.5	11.8	9.1	4.9	SSW	77.0	0.093
	21:00	10.4	12.0	13.8	13.4	3.8	11.2	7.6	6.3	ESE	76.6	0.046
	22:00	12.1	11.1	9.1	8.9	4.2	12.0	9.0	6.9	ESE	82.7	0.000
	23:00	12.2	11.3	9.5	8.0	4.6	12.0	9.1	4.7	ENE	83.8	0.000
6/7/2013	0:00	12.7	11.8	9.8	7.6	23.3	12.6	9.6	4.9	ENE	88.5	0.023
	1:00	13.5	13.5	11.7	10.5	443.0	13.9	10.9	6.4	E	94.4	0.273
	2:00	11.0	10.9	10.1	9.3	565.0	12.3	8.2	6.1	ESE	96.4	0.552
	3:00	11.0	11.8	10.0	9.0	696.1	11.8	8.2	5.9	ESE	96.8	0.257
	4:00	17.1	17.9	15.9	14.1	774.3	18.3	14.6	4.2	SE	96.5	0.014
	5:00	27.4	33.2	28.7	26.4	963.0	25.9	22.5	2.5	SE	97.4	0.008
	6:00	22.4	22.9	22.1	17.7	772.9	18.8	16.0	0.8	N	98.4	0.004
	7:00	9.5	14.1	12.4	5.5	538.3	7.7	4.6	1.3	WSW	98.3	0.010
	8:00	11.3	10.8	9.1	3.0	372.8	9.2	7.0	4.1	WSW	97.1	0.014
	9:00	6.4	6.1	4.6	0.5	303.0	5.4	1.9	3.2	WSW	96.1	0.020
	10:00	6.7	6.4	5.4	0.8	317.0	6.2	2.9	2.1	WSW	95.2	0.049
	11:00	8.8	7.7	5.4	0.8	321.9	6.8	4.2	2.7	ENE	94.9	0.015
	12:00	13.1	12.9	10.8	4.4	378.6	14.3	9.9	5.5	ENE	95.2	0.066
	13:00	11.3	11.0	8.4	2.9	461.1	12.0	7.1	5.9	ENE	96.6	0.196
	14:00	5.4	5.3	3.8	0.4	328.4	6.1	1.8	7.5	ENE	95.9	0.100
	15:00	4.5	3.8	2.5	0.3	299.1	5.3	0.7	8.3	ENE	94.6	0.048
	16:00	4.0	3.4	2.1	0.4	6699.5	3.9	1.1	6.5	NE	94.2	0.077
	17:00	4.9	3.8	1.9	0.2	0.0	3.9	0.9	5.6	ENE	93.8	0.086
Daily Average/Mode/Sum [C]		**12.0**	**12.8**	**11.1**	**8.6**	**7.5**	**11.5**	**8.5**	**4.9**	**ENE**	**89.1**	**1.989**

Lab Analysis (µg/m³) [D]							
Total Particulates	6	26	8	17	<3	7	17
Hexavalent Chromium	<0.00078	0.0059	0.0010	0.0011	0.0033	<0.00068	0.0034

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Saturday, June 08, 2013
(6/7/2013-6/8/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/7/2013	16:00	4.0	3.4	2.1	0.4	6699.5	3.9	1.1	6.5	NE	94.2	0.077
	17:00	4.9	3.8	1.9	0.2	0.0	3.9	0.9	5.6	ENE	93.8	0.086
	18:00	3.4	3.4	1.5	0.2	0.1	3.3	1.9	4.8	N	92.3	0.007
	19:00	3.0	3.5	1.7	0.2	1.5	2.3	0.7	7.5	N	88.8	0.000
	20:00	4.6	4.0	2.3	0.2	3.2	4.0	2.4	7.0	N	90.0	0.000
	21:00	8.7	7.9	5.8	3.8	7.7	8.3	5.0	8.3	N	93.0	0.001
	22:00	10.8	9.9	8.2	7.6	9.0	10.5	6.9	6.1	N	91.2	0.008
	23:00	9.4	8.7	7.3	7.2	8.1	9.3	5.5	5.9	WNW	89.8	0.000
6/8/2013	0:00	8.0	7.7	5.6	5.9	7.1	7.5	3.9	7.9	WNW	88.9	0.000
	1:00	10.9	10.7	8.7	8.8	9.8	11.3	7.0	5.1	W	88.5	0.000
	2:00	13.9	13.2	10.6	11.2	11.7	13.7	9.9	5.4	WNW	86.3	0.000
	3:00	10.5	10.3	8.4	7.7	10.0	10.4	6.6	5.7	W	87.2	0.000
	4:00	11.7	11.1	9.4	7.0	10.8	11.2	7.6	4.7	W	89.5	0.000
	5:00	12.0	11.9	9.4	6.1	11.1	11.3	7.8	2.8	WSW	92.1	0.000
	6:00	19.6	19.6	16.4	12.1	17.9	20.3	15.6	2.3	WSW	89.1	0.000
	7:00	30.9	29.5	25.8	20.4	25.8	29.6	24.8	8.0	W	80.4	0.000
	8:00	29.3	27.5	23.5	19.0	24.0	27.7	23.2	6.9	WNW	76.9	0.000
	9:00	30.2	28.2	24.1	19.7	24.7	28.5	23.5	5.3	W	72.2	0.000
	10:00	28.2	27.0	23.2	17.7	24.0	26.3	21.0	7.7	W	69.7	0.000
	11:00	27.0	26.2	22.8	16.1	23.2	24.5	19.4	5.1	W	66.2	0.001
	12:00	24.5	23.8	21.0	13.9	22.1	22.5	18.0	5.8	W	65.5	0.001
	13:00	24.8	24.0	21.7	14.0	22.2	22.5	18.5	7.5	W	67.0	0.000
	14:00	24.5	23.5	20.9	13.2	22.3	22.2	17.4	6.0	W	62.5	0.000
	15:00	20.7	20.1	17.9	9.9	20.4	19.1	14.7	5.8	W	55.9	0.000
	16:00	18.1	16.9	15.1	7.4	18.7	16.4	11.6	7.0	W	52.4	0.000
	17:00	15.4	14.7	12.6	5.3	17.0	13.7	9.6	4.7	W	49.1	0.000
Daily Average/Mode/Sum [C]		**15.7**	**15.0**	**12.6**	**9.0**	**14.1**	**14.8**	**11.0**	**6.0**	**W**	**79.7**	**0.180**

Lab Analysis (µg/m³) [D]							
Total Particulates	9	8	10	10	9	11	9
Hexavalent Chromium	0.0010	0.0022	0.0022	0.0019	0.00077	<0.00067	0.0013

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Sunday, June 09, 2013
(6/8/2013-6/9/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]						
		PAM-1 *(AM-1)*	PAM-2 *(AM-11)*	PAM-3 *(AM-9)*	PAM-4 *(AM-8)*	PAM-5 *(AM-6)*	PAM-6 *(AM-4)*	PAM-7 *(AM-2)*
6/8/2013	16:00	18.1	16.9	15.1	7.4	18.7	16.4	11.6
	17:00	15.4	14.7	12.6	5.3	17.0	13.7	9.6
	18:00	14.6	13.1	10.5	4.4	15.6	12.6	8.1
	19:00	13.2	11.6	8.8	3.1	14.2	10.9	7.3
	20:00	14.7	13.2	9.8	4.0	14.0	12.4	9.1
	21:00	18.6	15.0	11.6	6.0	16.1	17.7	13.0
	22:00	32.8	29.5	24.4	17.5	27.2	34.1	27.6
	23:00	30.0	30.0	25.0	18.7	26.9	30.3	24.5
6/9/2013	0:00	28.1	26.8	22.8	17.4	24.1	26.4	22.2
	1:00	25.0	24.6	19.7	15.2	21.6	25.3	20.1
	2:00	26.7	27.2	22.0	17.6	23.2	27.7	21.5
	3:00	28.3	28.3	22.9	18.3	24.5	29.0	22.9
	4:00	28.8	28.9	23.1	18.8	24.5	29.1	23.2
	5:00	30.6	29.4	25.1	20.2	26.1	30.7	25.4
	6:00	33.3	32.6	26.9	21.3	27.0	32.5	27.7
	7:00	28.2	27.7	23.3	16.4	24.0	27.1	22.6
	8:00	27.6	27.3	23.0	16.1	23.8	26.1	22.2
	9:00	29.0	30.5	24.8	18.4	27.0	26.2	22.7
	10:00	24.4	25.1	21.8	14.2	24.5	21.4	17.9
	11:00	24.1	24.8	20.8	13.5	24.3	20.8	17.6
	12:00	20.3	18.7	16.0	8.4	21.1	19.3	14.7
	13:00	22.4	21.5	17.8	10.3	22.4	21.2	16.7
	14:00	25.1	24.9	21.3	13.7	24.7	22.6	18.5
	15:00	27.8	27.6	24.0	15.0	26.2	25.8	21.0
	16:00	26.4	26.6	23.7	14.1	25.4	26.6	20.2
	17:00	29.8	29.8	25.6	17.1	27.9	29.3	23.9
Daily Average/Mode/Sum [C]		**24.7**	**24.1**	**20.1**	**13.5**	**22.8**	**23.7**	**18.9**

Date	Time	Weather [B]			
		Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/8/2013	16:00	7.0	W	52.4	0.000
	17:00	4.7	W	49.1	0.000
	18:00	5.8	W	47.7	0.000
	19:00	5.6	W	49.8	0.000
	20:00	4.3	WNW	52.8	0.000
	21:00	2.9	W	58.2	0.000
	22:00	1.6	SSE	72.4	0.000
	23:00	2.0	WSW	73.9	0.000
6/9/2013	0:00	2.4	N	70.0	0.000
	1:00	3.0	NNW	70.5	0.000
	2:00	3.3	N	65.9	0.000
	3:00	3.8	N	66.6	0.001
	4:00	2.1	NNE	66.3	0.000
	5:00	1.9	ENE	65.8	0.000
	6:00	1.9	ENE	68.3	0.000
	7:00	2.0	ENE	64.8	0.000
	8:00	2.4	ENE	63.2	0.000
	9:00	2.9	SSE	66.0	0.000
	10:00	3.8	SSE	62.6	0.000
	11:00	3.4	SSE	58.9	0.000
	12:00	3.0	SSE	52.3	0.000
	13:00	4.4	SSE	52.9	0.000
	14:00	4.3	SSE	54.3	0.000
	15:00	5.4	SE	60.2	0.000
	16:00	4.9	SSE	64.5	0.000
	17:00	4.5	SE	65.1	0.000
Daily Average/Mode/Sum [C]		**3.6**	**SSE**	**61.3**	**0.001**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Monday, June 10, 2013
(6/9/2013-6/10/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]							Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-8)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/9/2013	16:00	26.4	26.6	23.7	14.1	25.4	26.6	20.2	4.9	SSE	64.5	0.000
	17:00	29.8	29.8	25.6	17.1	27.9	29.3	23.9	4.5	SE	65.1	0.000
	18:00	31.9	31.9	27.5	19.1	29.5	33.7	27.0	4.0	SE	66.6	0.000
	19:00	34.1	34.2	29.5	21.2	31.0	35.3	28.6	2.6	SSE	67.2	0.000
	20:00	34.8	35.1	30.4	21.6	31.3	36.0	29.2	3.2	SSE	68.6	0.000
	21:00	30.9	30.3	25.6	17.8	27.3	31.4	25.7	3.5	SSE	74.1	0.000
	22:00	28.2	26.3	21.4	14.5	26.3	26.8	23.1	4.6	S	72.3	0.000
	23:00	29.2	28.8	24.0	18.0	27.0	27.7	24.1	3.9	SSW	77.3	0.000
6/10/2013	0:00	26.0	25.6	21.4	14.9	23.5	25.7	21.3	4.5	SE	79.9	0.000
	1:00	24.0	23.9	19.7	13.5	21.6	24.7	19.4	6.0	SE	79.2	0.000
	2:00	25.2	25.3	20.8	15.0	22.7	25.7	20.8	5.3	SE	81.8	0.000
	3:00	35.7	36.9	31.1	26.0	31.5	35.8	32.4	5.2	SSE	87.6	0.013
	4:00	41.7	44.6	37.6	32.9	37.4	43.6	39.6	3.7	ENE	94.6	0.089
	5:00	28.2	27.9	23.2	18.0	23.8	27.8	24.9	3.9	ENE	95.8	0.013
	6:00	22.9	23.1	18.6	12.9	19.8	22.0	19.7	3.5	ENE	96.4	0.002
	7:00	17.4	17.5	14.1	7.5	16.6	16.4	14.5	3.1	E	94.8	0.000
	8:00	14.3	16.3	17.0	10.1	14.3	13.4	11.5	4.8	S	92.8	0.001
	9:00	21.9	24.1	19.8	14.6	21.5	21.8	25.8	3.1	SSE	91.3	0.026
	10:00	22.1	21.9	20.4	13.9	21.3	22.1	22.1	3.7	SE	91.3	0.008
	11:00	31.8	31.4	28.7	21.6	30.3	27.0	27.6	2.8	SSE	89.6	0.005
	12:00	49.2	44.2	37.4	31.3	41.9	38.8	50.7	2.8	S	90.3	0.003
	13:00	38.3	36.7	33.2	24.6	30.1	35.2	27.8	5.1	SSE	88.3	0.000
	14:00	27.1	28.0	24.3	17.6	25.1	26.6	24.1	4.8	SSE	89.5	0.046
	15:00	27.7	29.3	29.3	ND	29.1	30.8	23.9	5.8	SSW	92.7	0.446
	16:00	26.5	27.2	21.8	ND	23.1	22.6	19.0	6.3	SSW	93.0	0.002
	17:00	31.3	34.5	27.9	ND	24.4	25.6	22.4	3.5	SSE	92.4	0.014
Daily Average/Mode/Sum [C]		**29.1**	**29.3**	**25.2**	**18.2**	**26.3**	**28.2**	**25.0**	**4.2**	**SSE**	**83.7**	**0.668**

Lab Analysis (µg/m³) [D]	
Total Particulates	Not analyzed
Hexavalent Chromium	

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7)

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Tuesday, June 11, 2013
(6/10/2013-6/11/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-7)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	OSAM-1 (MD Sci Ctr)	OSAM-2 (Aqua)	OSAM-3 (Rec Pier)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/10/2013	16:00	26.5	27.2	21.8	ND	23.1	22.6	19.0	8.7	6.6	ND	6.3	SSW	93.0	0.002
	17:00	31.3	34.5	27.9	ND	24.4	25.6	22.4	10.2	12.8	ND	3.5	SSE	92.4	0.014
	18:00	34.3	31.7	27.7	ND	30.9	27.2	27.1	9.5	9.7	ND	5.6	S	91.0	0.000
	19:00	35.8	32.1	25.2	ND	31.3	27.5	28.7	8.7	8.0	ND	6.5	SSW	90.4	0.004
	20:00	38.5	28.7	22.4	ND	31.8	42.3	36.2	9.8	9.5	ND	6.6	SSW	91.7	0.109
	21:00	15.9	14.9	16.2	ND	15.1	13.6	8.5	4.6	4.5	ND	3.4	W	96.7	0.607
	22:00	9.2	4.7	4.0	ND	6.7	7.1	2.2	3.2	0.6	ND	4.5	W	97.5	0.005
	23:00	9.3	5.4	4.2	ND	7.4	7.5	2.4	3.6	1.3	ND	9.6	W	95.3	0.000
6/11/2013	0:00	10.7	7.0	5.9	ND	8.8	8.3	4.4	4.9	3.4	ND	9.4	W	94.4	0.000
	1:00	12.3	9.9	7.4	ND	10.0	10.5	5.9	5.1	2.6	ND	7.7	W	95.2	0.000
	2:00	11.0	8.4	5.6	ND	8.8	9.3	4.2	4.0	1.4	ND	6.5	W	93.1	0.000
	3:00	11.8	9.4	7.0	ND	9.8	10.8	5.3	4.9	2.2	ND	4.8	WSW	94.4	0.000
	4:00	14.4	12.2	9.4	ND	12.1	13.7	8.2	5.6	3.1	ND	3.4	WSW	96.2	0.000
	5:00	17.0	14.6	11.3	ND	13.7	15.9	10.7	7.1	4.4	ND	5.3	WSW	96.4	0.000
	6:00	20.5	17.4	13.2	ND	14.9	17.3	13.3	7.5	4.8	ND	6.9	W	95.5	0.000
	7:00	18.3	15.3	12.3	ND	14.2	15.7	10.1	6.8	9.9	ND	5.0	W	91.9	0.000
	8:00	14.7	11.4	9.7	ND	12.6	13.3	8.6	5.6	4.0	ND	7.0	W	85.1	0.000
	9:00	13.5	12.2	10.1	ND	13.3	13.3	7.3	5.8	3.8	ND	6.8	W	78.8	0.000
	10:00	13.3	11.4	9.7	ND	13.6	11.8	6.2	5.2	3.4	ND	9.4	W	65.8	0.000
	11:00	14.9	12.8	11.2	ND	14.9	12.5	6.5	5.3	3.7	ND	13.1	W	59.1	0.000
	12:00	18.8	16.1	13.7	ND	16.7	15.5	9.6	6.4	5.4	ND	13.4	W	57.2	0.000
	13:00	20.3	18.3	14.7	ND	17.9	16.9	10.2	7.9	5.8	ND	13.1	W	57.2	0.000
	14:00	22.3	20.2	16.4	ND	19.2	18.6	11.7	8.7	6.6	ND	12.9	W	57.1	0.000
	15:00	21.7	19.4	16.1	ND	19.2	17.9	11.5	7.9	6.8	ND	14.7	W	54.9	0.000
	16:00	20.8	18.0	15.1	ND	18.2	19.3	11.3	6.9	5.8	ND	15.5	WNW	52.4	0.000
	17:00	19.7	17.2	13.9	ND	17.3	16.4	10.6	6.2	5.3	ND	14.6	W	53.9	0.000
Daily Average/Mode/Sum [C]		**19.1**	**16.5**	**13.5**	**ND**	**16.4**	**16.5**	**11.6**	**6.5**	**5.2**	**ND**	**8.3**	**W**	**81.8**	**0.741**

Lab Analysis (µg/m³) [D]										
Total Particulates	11	10	11	11	18	12	<3	ND	5	6
Hexavalent Chromium	0.0026	0.00076	0.0012	0.0014	0.0014	0.0012	0.0071	ND	<0.00073	0.00091

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Wednesday, June 12, 2013
(6/11/2013-6/12/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-7)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	OSAM-1 (MD Sci Ctr)	OSAM-2 (Aqua)	OSAM-3 (Rec Pier)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/11/2013	16:00	20.8	18.0	15.1	ND	18.2	19.3	11.3	6.9	5.8	ND	15.5	WNW	52.4	0.000
	17:00	19.7	17.2	13.9	ND	17.3	16.4	10.6	6.2	5.3	ND	14.6	W	53.9	0.000
	18:00	16.9	14.4	12.3	ND	15.5	14.6	9.0	5.5	4.0	ND	14.4	W	55.1	0.000
	19:00	15.7	12.9	10.8	ND	14.0	13.6	8.0	5.6	3.3	ND	14.6	WNW	57.8	0.000
	20:00	19.7	17.8	13.7	ND	16.5	17.7	11.6	7.3	5.2	ND	10.1	W	60.1	0.000
	21:00	21.3	19.4	14.9	ND	17.4	19.5	12.7	7.9	5.8	ND	7.2	W	64.6	0.000
	22:00	24.8	22.7	18.1	ND	20.0	22.7	15.9	9.1	7.0	ND	5.9	W	67.8	0.000
	23:00	27.6	26.3	20.4	ND	22.4	26.9	18.1	10.5	8.2	ND	6.4	W	70.0	0.000
6/12/2013	0:00	30.5	28.6	21.9	ND	23.5	28.9	20.1	11.4	9.8	ND	5.9	W	71.1	0.000
	1:00	34.1	31.3	24.6	ND	25.8	32.3	23.1	13.1	10.7	ND	6.6	W	72.5	0.000
	2:00	33.5	31.2	23.8	ND	25.2	31.3	22.2	12.6	10.8	ND	5.9	W	74.7	0.000
	3:00	35.1	32.8	24.4	ND	25.6	32.5	23.7	12.9	11.2	ND	5.8	W	77.3	0.000
	4:00	34.9	32.6	24.9	ND	25.8	32.8	23.3	13.0	11.4	ND	5.0	W	80.1	0.000
	5:00	36.5	34.4	25.7	ND	27.0	34.1	25.0	14.1	12.5	ND	5.2	W	82.3	0.000
	6:00	37.4	35.1	27.0	ND	27.6	34.5	25.5	14.3	12.6	ND	3.1	WSW	82.1	0.000
	7:00	38.9	37.3	29.1	ND	30.4	37.2	27.4	13.6	11.9	ND	2.2	SW	78.5	0.000
	8:00	42.7	39.9	31.4	ND	33.7	39.8	31.9	13.5	11.8	ND	2.6	WSW	77.8	0.000
	9:00	38.3	36.8	30.2	ND	30.7	36.0	27.1	15.7	12.8	ND	3.9	W	71.8	0.000
	10:00	31.1	28.8	23.2	ND	25.1	27.4	20.4	12.1	10.3	ND	9.1	WNW	65.9	0.000
	11:00	37.1	35.3	28.8	ND	29.8	33.4	25.0	13.8	12.4	ND	7.5	W	59.7	0.000
	12:00	53.6	51.3	42.6	ND	41.0	47.8	37.0	19.3	19.1	ND	7.9	WNW	57.0	0.000
	13:00	58.3	55.9	47.1	ND	43.8	51.2	40.1	21.0	21.1	ND	10.3	W	55.1	0.000
	14:00	58.5	56.0	46.9	ND	44.3	50.1	40.4	21.4	21.9	ND	8.1	WNW	49.3	0.000
	15:00	56.3	53.7	44.8	ND	43.4	48.8	39.1	21.5	20.4	42.8	8.3	WNW	47.8	0.000
	16:00	56.9	47.5	44.8	38.1	44.8	49.4	39.8	21.2	21.0	38.3	5.7	W	47.3	0.000
	17:00	50.6	34.1	38.8	25.4	40.8	44.4	35.2	18.4	19.6	32.5	5.9	W	48.2	0.000
Daily Average/Mode/Sum [C]		**35.8**	**32.7**	**26.9**	**31.8**	**28.1**	**32.4**	**24.0**	**13.1**	**11.8**	**37.8**	**7.6**	**W**	**64.6**	**0.000**

	Lab Analysis (µg/m³) [D]									
Total Particulates	16	20	19	18	17	18	20	20	9	18
Hexavalent Chromium	0.0015	0.0019	0.0053	0.0023	0.0023	0.0040	0.0052	0.0021	0.0015	0.0020

Weather Day Classification [E]
Dry/Heavy Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Thursday, June 13, 2013
(6/12/2013-6/13/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-7)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	OSAM-1 (MD Sci Ctr)	OSAM-2 (Aqua)	OSAM-3 (Rec Pier)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/12/2013	16:00	56.9	47.5	44.8	38.1	44.8	49.4	39.8	21.2	21.0	38.3	5.7	W	47.3	0.000
	17:00	50.6	34.1	38.8	25.4	40.8	44.4	35.2	18.4	19.6	32.5	5.9	W	48.2	0.000
	18:00	45.5	26.8	34.8	21.9	38.4	41.9	31.2	17.4	18.7	28.7	3.6	W	47.8	0.000
	19:00	48.3	4.8	35.4	24.6	39.7	45.1	34.6	17.7	18.2	29.0	4.7	ENE	50.8	0.000
	20:00	47.5	1.7	34.8	24.0	38.4	46.2	35.0	18.2	17.1	27.5	5.6	ENE	55.9	0.000
	21:00	46.8	35.8	36.9	25.1	37.4	45.2	35.3	19.2	19.0	28.2	4.4	SSE	68.9	0.000
	22:00	57.3	55.4	49.7	31.4	43.5	55.0	42.8	23.0	25.3	33.2	3.3	SE	75.4	0.000
	23:00	60.1	57.2	44.4	32.7	45.2	58.4	45.3	23.5	22.9	36.2	2.6	SE	74.6	0.000
6/13/2013	0:00	59.9	58.2	45.3	33.7	45.9	58.8	45.5	22.3	22.2	34.4	2.7	ENE	71.3	0.000
	1:00	65.3	63.2	49.0	36.5	48.6	62.6	48.6	23.9	24.2	37.1	3.6	SE	75.2	0.000
	2:00	65.6	63.7	49.9	36.2	47.6	60.8	48.2	24.1	25.4	36.8	5.1	SE	77.9	0.000
	3:00	65.3	63.6	48.6	36.1	48.3	61.6	49.0	24.4	25.2	38.1	7.1	SSE	77.8	0.000
	4:00	71.2	69.3	53.1	38.6	51.8	66.2	53.8	26.3	28.1	40.1	5.7	SSE	82.6	0.016
	5:00	75.1	72.8	56.4	40.1	53.8	68.5	56.5	26.5	29.6	41.7	5.1	SE	84.7	0.001
	6:00	70.6	69.0	51.3	37.3	50.4	63.9	52.2	24.9	27.0	38.1	3.7	ENE	84.3	0.000
	7:00	58.4	57.9	45.1	30.9	41.6	51.5	41.2	21.4	22.6	31.3	4.9	SSE	84.3	0.000
	8:00	50.3	52.1	41.9	26.8	37.2	45.5	35.7	19.6	21.4	27.0	3.7	SSE	87.7	0.000
	9:00	37.7	39.4	28.1	19.6	29.4	35.0	27.6	14.2	15.8	21.9	5.9	W	89.3	0.250
	10:00	23.3	22.3	16.0	11.4	18.9	21.6	15.1	8.3	6.2	15.3	5.6	W	80.8	0.001
	11:00	10.0	9.0	6.3	3.7	10.4	8.3	3.8	3.8	1.8	6.7	11.0	W	66.4	0.000
	12:00	7.3	6.3	4.4	1.8	8.8	5.4	1.3	2.5	0.6	4.3	9.8	WSW	56.4	0.000
	13:00	7.6	7.1	5.6	1.9	9.9	6.5	2.1	2.7	1.2	4.6	13.4	W	51.6	0.000
	14:00	10.7	10.4	8.3	3.9	13.4	9.5	4.9	3.5	2.5	6.5	14.5	W	52.5	0.000
	15:00	12.0	11.7	9.4	4.2	14.6	10.7	5.9	4.2	2.3	7.4	13.1	W	50.8	0.000
	16:00	18.8	17.4	13.7	12.3	18.3	13.6	15.3	5.7	1.8	15.7	9.5	WSW	85.2	0.413
	17:00	18.3	16.1	11.9	ND	14.6	14.9	ND	7.1	1.6	10.7	7.2	W	93.7	0.001
Daily Average/Mode/Sum [C]		**43.9**	**37.4**	**33.2**	**23.9**	**34.3**	**40.4**	**32.2**	**16.3**	**16.2**	**25.8**	**6.4**	**W**	**70.1**	**0.682**

Lab Analysis (µg/m³) [D]										
Total Particulates	20	23	<3	17	21	25	21	24	12	23
Hexavalent Chromium	0.0016	0.0035	0.0031	0.00097	0.0022	0.0016	0.0016	0.0046	<0.00068	0.0022

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Friday, June 14, 2013
(6/13/2013-6/14/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-7)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	OSAM-1 (MD Sci Ctr)	OSAM-2 (Aqua)	OSAM-3 (Rec Pier)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/13/2013	16:00	18.8	17.4	13.7	12.3	18.3	13.6	ND	5.7	1.8	15.7	9.5	WSW	85.2	0.413
	17:00	18.3	16.1	11.9	ND	14.6	14.9	ND	7.1	1.6	10.7	7.2	W	93.7	0.001
	18:00	17.8	16.3	12.0	7.5	14.4	15.7	ND	6.8	2.2	10.7	9.2	W	91.7	0.000
	19:00	14.4	12.5	9.0	5.8	11.8	12.7	8.2	5.7	1.4	8.9	12.0	W	82.6	0.000
	20:00	17.4	14.6	10.4	7.1	13.0	14.8	8.3	6.5	2.4	10.7	12.6	WNW	72.1	0.000
	21:00	8.1	5.8	3.9	2.6	6.7	6.8	3.0	3.6	0.1	5.2	8.8	W	65.7	0.000
	22:00	8.3	5.7	4.0	2.1	6.7	7.0	2.7	3.7	0.1	4.8	9.1	WNW	65.1	0.000
	23:00	6.7	4.3	3.3	1.9	6.1	5.9	2.4	3.5	0.0	4.1	7.8	WNW	61.3	0.000
6/14/2013	0:00	6.2	3.8	2.3	1.2	5.1	5.3	1.9	3.3	0.0	3.5	6.6	NW	62.6	0.000
	1:00	4.1	2.8	1.1	0.5	3.2	3.7	0.7	3.2	0.0	1.9	6.2	NNW	71.2	0.003
	2:00	2.9	2.1	0.3	0.2	1.9	2.6	0.2	10.1	0.0	1.1	9.1	N	70.5	0.000
	3:00	2.7	1.9	0.2	0.2	1.5	2.3	0.4	48.8	0.0	0.6	10.0	N	75.0	0.000
	4:00	2.7	2.0	0.3	0.3	1.9	2.7	0.4	11.3	0.0	0.6	6.4	N	74.5	0.008
	5:00	3.3	2.5	0.5	0.5	2.1	3.2	0.7	11.0	0.0	1.1	5.9	NNW	77.8	0.004
	6:00	3.7	2.8	1.1	0.4	2.2	2.0	1.2	9.6	0.0	1.6	7.3	N	81.4	0.000
	7:00	4.3	3.3	1.7	0.6	2.7	3.1	1.5	8.0	0.0	2.3	5.2	N	80.9	0.012
	8:00	5.5	4.2	2.1	1.0	3.9	4.0	2.1	8.5	0.0	3.9	7.9	NNW	82.2	0.018
	9:00	6.4	4.7	2.5	1.2	3.9	4.2	2.3	8.7	0.0	4.0	10.3	N	72.4	0.000
	10:00	6.0	4.8	3.0	1.4	4.1	4.0	2.4	7.4	0.0	4.2	10.5	NNE	55.2	0.000
	11:00	6.5	5.4	3.1	1.7	5.2	4.4	2.8	6.1	0.1	4.7	6.4	N	47.0	0.000
	12:00	8.5	8.2	4.9	2.7	7.1	5.6	3.3	6.4	0.1	9.9	7.2	NNE	44.4	0.000
	13:00	11.8	9.4	7.0	4.1	9.6	7.9	4.8	6.9	0.5	9.4	6.9	NNW	45.3	0.000
	14:00	12.2	10.1	8.3	4.4	10.7	8.3	4.9	7.1	0.7	9.9	8.9	N	43.3	0.000
	15:00	11.6	9.4	7.7	4.0	11.0	8.1	4.6	6.4	0.6	8.6	6.4	WNW	40.5	0.000
	16:00	11.5	9.6	7.9	3.7	11.6	7.8	4.7	5.7	0.7	7.2	5.9	WNW	35.9	0.000
	17:00	11.7	10.0	7.7	3.6	11.7	7.7	4.8	4.8	0.7	7.6	6.4	WNW	33.5	0.000
Daily Average/Mode/Sum [C]		**8.9**	**7.3**	**5.0**	**2.8**	**7.3**	**6.9**	**3.0**	**8.3**	**0.5**	**5.9**	**8.1**	**N**	**65.8**	**0.459**

Lab Analysis (µg/m³) [D]										
Total Particulates	10	11	9	4	8	6	6	ND	8	<3
Hexavalent Chromium	0.0016	0.0032	0.0026	0.0016	<0.00069	0.0025	0.004	ND	0.0014	0.00075

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Saturday, June 15, 2013
(6/14/2013-6/15/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-11)*	PAM-3 *(AM-9)*	PAM-4 *(AM-7)*	PAM-5 *(AM-6)*	PAM-6 *(AM-4)*	PAM-7 *(AM-2)*	OSAM-1 *(MD Sci Ctr)*	OSAM-2 *(Aqua)*	OSAM-3 *(Rec Pier)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/14/2013	16:00	11.5	9.6	7.9	3.7	11.6	7.8	4.7	5.7	0.7	8.6	5.9	WNW	35.9	0.000
	17:00	11.7	10.0	7.7	3.6	11.7	7.7	4.8	4.8	0.7	7.2	6.4	WNW	33.5	0.000
	18:00	11.9	10.2	7.9	3.6	11.8	12.8	5.1	4.8	0.7	7.6	8.1	NNW	35.0	0.000
	19:00	14.3	11.4	9.0	4.5	12.5	12.2	5.8	5.3	1.1	8.0	7.2	NNW	37.7	0.000
	20:00	16.0	13.4	10.4	5.9	13.7	14.6	6.9	6.2	1.5	9.2	6.0	N	42.6	0.000
	21:00	20.7	15.7	14.4	7.5	15.1	19.6	9.6	6.6	2.0	12.5	5.6	WNW	46.3	0.000
	22:00	16.0	13.7	10.8	6.4	12.6	15.4	7.0	8.3	1.7	11.8	4.7	NNW	48.5	0.000
	23:00	15.3	13.6	10.8	6.7	13.1	15.2	6.8	7.2	1.5	10.5	5.1	N	52.4	0.000
6/15/2013	0:00	16.5	16.4	13.0	8.3	14.2	16.7	7.7	8.2	1.9	10.5	3.6	N	55.8	0.000
	1:00	17.8	16.1	12.7	8.2	14.7	18.0	8.5	7.8	2.2	12.6	2.9	N	59.8	0.000
	2:00	18.2	16.5	12.9	8.6	15.0	18.8	8.6	8.3	2.0	11.7	3.3	NNW	61.0	0.000
	3:00	19.0	17.9	13.4	9.3	15.5	19.4	9.0	8.9	2.3	12.4	5.0	N	64.8	0.000
	4:00	19.1	18.1	13.6	9.4	15.4	19.7	9.7	9.1	2.3	11.4	3.3	N	66.1	0.000
	5:00	19.6	18.3	13.6	9.7	15.6	20.1	9.5	9.3	2.2	11.6	5.4	N	68.3	0.000
	6:00	19.5	17.9	13.6	9.9	15.3	18.3	9.8	9.1	2.3	12.0	4.0	N	66.8	0.000
	7:00	17.6	16.7	12.9	9.2	14.4	17.5	8.5	8.5	2.0	12.3	4.8	WNW	60.4	0.000
	8:00	17.6	16.7	13.0	8.7	14.6	16.7	8.2	7.7	2.2	11.1	4.0	W	56.2	0.000
	9:00	16.4	15.5	12.0	7.7	14.7	15.3	7.3	6.9	2.1	10.2	6.7	W	51.8	0.000
	10:00	15.1	14.2	12.2	7.1	14.9	13.5	6.5	7.7	1.8	10.5	6.2	W	49.4	0.000
	11:00	13.7	13.0	10.6	6.1	14.4	11.9	5.5	5.4	1.3	9.3	7.8	W	47.6	0.000
	12:00	13.8	12.5	10.1	5.7	14.5	11.7	5.7	5.2	1.6	8.3	6.6	W	42.4	0.000
	13:00	16.7	15.4	12.9	7.1	16.6	14.4	7.0	6.5	2.3	8.3	7.3	W	39.8	0.000
	14:00	18.0	16.6	13.9	8.1	17.9	15.9	7.8	7.2	3.0	10.3	10.0	W	38.8	0.000
	15:00	14.3	13.2	11.1	5.5	15.4	11.9	6.0	5.6	1.5	11.5	9.2	W	35.3	0.000
	16:00	14.2	13.1	10.8	5.4	15.3	11.4	6.0	5.5	2.5	9.1	9.2	W	34.3	0.000
	17:00	16.6	14.3	19.6	6.2	16.3	13.4	7.2	5.9	3.5	22.6	11.5	W	35.6	0.000
Daily Average/Mode/Sum [C]		**16.2**	**14.6**	**11.9**	**7.0**	**14.5**	**15.0**	**7.3**	**7.0**	**1.9**	**10.8**	**6.1**	**W**	**48.7**	**0.000**

Lab Analysis (µg/m³) [D]										
Total Particulates	18	19	28	19	12	14	21	24	15	21
Hexavalent Chromium	0.0015	0.0018	0.0022	0.0014	<0.00068	0.0027	0.0013	0.0010	0.0018	0.0021

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Sunday, June 16, 2013
(6/15/2013-6/16/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-7)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	OSAM-1 (MD Sci Ctr)	OSAM-2 (Aqua)	OSAM-3 (Rec Pier)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/15/2013	16:00	14.2	13.1	10.8	5.4	15.3	11.4	6.0	5.5	2.5	22.6	9.2	W	34.3	0.000
	17:00	16.6	14.3	19.6	6.2	16.3	13.4	7.2	5.9	3.5	9.8	11.5	W	35.6	0.000
	18:00	17.4	14.8	11.7	6.4	16.1	14.3	7.1	6.5	3.3	10.4	10.4	W	35.7	0.000
	19:00	18.5	15.4	12.2	6.8	16.5	15.3	7.5	7.0	3.3	11.4	7.2	W	34.3	0.000
	20:00	23.6	19.1	12.9	8.2	17.7	17.5	9.6	8.0	3.9	12.3	6.1	W	35.3	0.000
	21:00	23.6	23.1	17.7	12.5	21.9	20.7	10.0	9.2	4.5	14.4	2.9	W	37.7	0.000
	22:00	31.0	28.6	22.8	15.7	25.4	28.0	14.4	13.0	7.9	18.5	2.2	W	45.0	0.000
	23:00	37.1	31.9	26.2	18.4	28.4	32.6	17.3	14.7	9.6	20.0	2.9	SW	56.4	0.000
6/16/2013	0:00	39.5	34.5	28.6	24.3	30.5	36.1	18.7	15.3	10.6	20.8	2.8	W	57.2	0.000
	1:00	49.5	41.2	34.8	25.3	36.2	44.3	23.3	15.9	11.4	25.1	1.9	W	60.8	0.000
	2:00	35.6	29.9	24.6	20.1	27.2	31.0	16.1	14.2	8.6	20.3	3.5	N	60.2	0.000
	3:00	28.6	23.9	19.1	14.4	21.6	25.9	13.3	12.4	6.1	17.0	4.8	N	59.2	0.000
	4:00	28.0	22.9	18.3	13.3	21.0	25.0	12.7	10.8	5.2	15.9	2.3	N	58.3	0.000
	5:00	35.7	31.9	25.8	18.6	27.6	31.8	16.8	12.3	7.1	18.5	1.4	WSW	66.7	0.000
	6:00	39.9	35.3	28.0	19.7	29.3	34.7	18.7	14.5	9.9	20.8	1.4	N	68.4	0.000
	7:00	38.5	36.5	31.1	22.9	33.7	37.4	19.0	15.2	9.8	21.6	0.6	N	64.1	0.000
	8:00	48.6	41.7	34.1	23.7	35.4	42.7	23.4	18.0	13.6	25.1	0.8	N	64.3	0.000
	9:00	45.4	40.5	32.0	22.6	33.8	39.8	21.4	15.7	13.3	24.3	2.6	S	71.3	0.000
	10:00	33.3	29.5	23.9	16.1	26.4	29.5	15.2	12.6	9.0	18.5	4.8	WSW	62.2	0.000
	11:00	28.3	25.5	20.9	13.6	24.0	24.5	12.7	11.1	7.2	16.3	6.1	WSW	53.4	0.000
	12:00	28.5	25.2	20.9	13.1	24.0	24.5	12.7	10.6	7.1	16.4	9.6	W	49.2	0.000
	13:00	27.1	24.0	20.0	12.7	23.1	23.7	12.4	9.8	6.5	16.4	9.6	WSW	49.8	0.000
	14:00	23.2	20.3	17.2	10.4	20.4	19.4	10.0	8.5	5.0	13.7	11.8	W	47.9	0.000
	15:00	19.2	16.5	14.3	8.1	17.7	15.7	7.9	7.1	3.7	10.9	14.0	W	49.1	0.000
	16:00	17.9	15.1	12.8	7.3	16.3	14.4	6.8	6.9	3.2	11.0	15.0	W	49.6	0.000
	17:00	17.8	14.9	12.1	6.9	15.6	14.1	7.2	6.5	1.8	11.5	13.1	W	51.8	0.000
Daily Average/Mode/Sum [C]		**29.5**	**25.8**	**21.3**	**14.3**	**23.9**	**25.7**	**13.4**	**11.0**	**6.8**	**17.1**	**6.1**	**W**	**52.2**	**0.000**

Lab Analysis (µg/m³) [D]										
Total Particulates	17	17	19	20	20	21	20	19	9	21
Hexavalent Chromium	0.0033	0.0037	0.0039	0.0030	0.0029	0.0026	0.0032	0.0033	0.0025	0.0025

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Monday, June 17, 2013
(6/16/2013-6/17/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-7)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	OSAM-1 (MD Sci Ctr)	OSAM-2 (Aqua)	OSAM-3 (Rec Pier)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/16/2013	16:00	17.9	15.1	12.8	7.3	16.3	14.4	6.8	6.9	3.2	11.0	15.0	W	49.6	0.000
	17:00	17.8	14.9	12.1	6.9	15.6	14.1	7.2	6.5	1.8	11.5	13.1	W	51.8	0.000
	18:00	20.3	17.0	13.2	7.9	16.4	17.4	8.5	7.2	2.8	13.6	8.8	W	56.1	0.000
	19:00	19.6	16.5	13.4	7.5	16.8	16.8	7.9	7.8	2.5	13.4	9.5	W	56.7	0.000
	20:00	20.8	17.1	13.9	8.2	17.0	17.5	8.5	8.2	2.6	13.5	6.9	W	58.6	0.000
	21:00	15.9	12.8	10.4	6.1	13.8	13.7	6.2	6.6	1.2	10.1	8.7	W	58.1	0.000
	22:00	11.7	8.8	7.1	4.1	10.4	9.9	3.8	4.7	0.2	7.2	9.1	W	56.8	0.000
	23:00	10.2	7.2	5.3	3.0	9.0	8.5	3.2	4.0	0.2	6.0	7.3	W	57.1	0.000
6/17/2013	0:00	10.2	7.5	5.4	3.3	9.2	8.3	3.3	4.0	0.1	5.9	8.7	W	58.0	0.000
	1:00	10.4	7.8	5.6	3.0	9.0	8.5	3.2	4.1	0.1	5.9	6.6	W	60.4	0.000
	2:00	10.9	8.3	5.9	3.8	9.5	9.0	3.6	4.4	0.1	6.2	7.0	WNW	61.1	0.000
	3:00	11.4	8.7	5.9	3.8	9.2	9.7	3.7	4.7	0.2	6.5	9.8	WNW	61.1	0.000
	4:00	11.7	8.8	6.4	4.0	9.2	9.6	3.8	4.6	0.2	6.4	9.4	W	62.4	0.000
	5:00	11.7	9.1	6.7	4.1	9.6	10.2	3.8	5.0	0.1	7.1	5.5	W	64.5	0.000
	6:00	12.0	9.2	7.2	4.0	9.7	9.5	3.8	5.0	0.2	7.1	6.1	WNW	64.3	0.000
	7:00	13.0	10.2	7.7	4.5	10.5	10.5	4.5	5.7	0.2	7.4	5.2	W	63.0	0.000
	8:00	17.5	14.1	11.5	6.0	14.4	14.0	6.6	6.6	0.5	10.3	4.9	W	63.3	0.000
	9:00	21.4	16.5	13.2	7.7	16.0	15.7	7.3	6.8	1.2	11.3	5.2	WNW	59.9	0.000
	10:00	22.8	20.2	16.1	9.6	19.0	19.0	8.6	7.9	2.9	13.6	8.0	W	59.1	0.000
	11:00	23.2	20.9	16.8	9.7	21.1	19.2	8.7	8.1	3.5	14.7	6.6	W	56.0	0.000
	12:00	22.4	20.0	16.4	9.2	21.2	18.1	8.6	7.9	3.2	14.3	7.3	W	54.2	0.000
	13:00	23.3	20.5	17.0	9.5	21.8	18.4	9.2	8.2	3.6	15.0	9.7	WNW	51.8	0.000
	14:00	21.9	17.5	15.8	8.3	21.4	17.2	8.7	7.8	3.1	14.4	9.1	W	47.7	0.000
	15:00	22.1	4.6	16.4	7.8	21.8	17.2	8.9	10.5	3.7	14.6	6.5	W	45.9	0.000
	16:00	21.7	1.8	15.8	10.2	21.5	17.1	8.6	7.4	4.8	14.5	8.5	W	45.9	0.000
	17:00	22.4	3.2	15.7	8.2	21.6	17.4	8.9	7.6	4.8	14.5	9.5	W	45.9	0.000
Daily Average/Mode/Sum [C]		**17.1**	**12.2**	**11.3**	**6.4**	**15.0**	**13.9**	**6.4**	**6.5**	**1.8**	**10.6**	**8.1**	**W**	**56.5**	**0.000**

Lab Analysis (µg/m³) [D]										
Total Particulates	16	12	14	4	14	18	11	15	15	21
Hexavalent Chromium	0.0012	0.0053	0.0015	<0.00068	0.0013	0.0019	0.0018	<0.00068	0.00099	<0.00067

Weather Day Classification [E]
Dry/Heavy Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Tuesday, June 18, 2013
(6/17/2013-6/18/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-7)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	OSAM-1 (MD Sci Ctr)	OSAM-2 (Aqua)	OSAM-3 (Rec Pier)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/17/2013	16:00	21.7	1.8	15.8	10.2	21.5	17.1	8.6	7.4	4.8	14.5	8.5	W	45.9	0.000
	17:00	22.4	3.2	15.7	8.2	21.6	17.4	8.9	7.6	4.8	14.5	9.5	W	45.9	0.000
	18:00	24.1	2.7	16.8	9.2	22.4	20.3	9.5	8.7	5.4	16.0	9.4	W	48.4	0.000
	19:00	29.7	5.2	21.1	12.2	25.5	27.6	13.3	11.1	7.6	28.2	5.7	SW	59.4	0.000
	20:00	31.1	6.4	21.6	13.2	24.8	32.8	14.3	11.7	7.8	26.2	6.2	WSW	63.7	0.000
	21:00	28.9	6.6	19.6	12.4	22.9	48.1	12.6	11.0	6.8	18.9	7.6	WSW	62.4	0.000
	22:00	31.9	7.6	21.7	14.0	24.2	28.5	19.6	11.8	7.5	21.7	5.1	W	65.1	0.000
	23:00	39.1	17.3	28.6	18.0	28.2	33.6	24.9	14.0	10.9	23.2	4.3	S	73.7	0.000
6/18/2013	0:00	29.8	11.8	19.8	12.7	22.2	26.3	12.6	12.0	7.8	17.2	4.8	SE	77.8	0.000
	1:00	26.6	27.1	22.0	12.7	19.9	22.5	11.2	10.6	7.1	17.1	2.8	SSE	77.0	0.000
	2:00	21.6	23.4	16.3	9.8	16.2	18.1	8.5	9.2	5.2	13.2	3.1	SE	78.3	0.000
	3:00	31.3	38.3	26.1	18.9	24.3	20.8	10.9	10.2	7.3	13.9	2.9	SSE	79.5	0.000
	4:00	46.0	37.3	24.9	19.5	33.4	41.1	21.4	11.8	9.1	21.2	3.1	SSW	80.9	0.000
	5:00	40.7	34.1	23.0	16.0	28.1	37.7	19.0	12.3	8.8	22.9	1.9	S	83.5	0.000
	6:00	49.8	46.7	33.6	24.2	34.6	42.6	21.8	14.5	12.3	32.2	2.3	S	85.7	0.000
	7:00	60.3	50.8	39.5	26.6	41.4	56.5	28.9	18.5	20.3	34.8	3.0	WSW	88.0	0.000
	8:00	58.7	50.4	39.9	26.6	40.2	50.0	26.8	19.4	18.2	32.8	1.8	S	86.6	0.000
	9:00	55.0	48.5	37.3	25.2	39.1	47.1	26.1	18.0	16.2	34.4	2.3	SE	83.9	0.000
	10:00	52.5	47.3	37.1	24.6	38.4	46.3	25.6	16.7	14.8	33.2	1.9	SSE	81.0	0.000
	11:00	51.2	46.8	35.7	23.5	36.8	43.2	24.4	18.6	15.8	32.6	3.6	W	75.6	0.000
	12:00	44.7	39.4	30.9	20.5	33.0	37.3	20.6	15.7	13.6	28.7	5.1	W	71.7	0.005
	13:00	38.6	31.3	27.7	17.7	29.6	31.8	17.3	16.2	12.7	24.6	3.9	W	65.2	0.002
	14:00	26.3	20.5	17.0	10.5	20.6	20.6	11.7	10.2	6.1	17.9	4.1	NNE	66.3	0.003
	15:00	19.7	14.6	13.9	8.0	16.5	16.8	8.8	7.8	4.0	13.4	5.2	ENE	74.5	0.146
	16:00	ND	13.7	11.5	7.0	13.6	14.2	7.7	6.7	1.8	11.0	7.2	E	88.7	0.044
	17:00	18.2	11.3	10.6	6.4	12.1	13.3	7.2	6.6	1.2	9.9	7.3	E	86.5	0.015
Daily Average/Mode/Sum [C]		**36.0**	**24.8**	**24.1**	**15.7**	**26.6**	**31.2**	**16.2**	**12.2**	**9.1**	**22.1**	**4.7**	**W**	**72.9**	**0.215**

Lab Analysis (µg/m³) [D]										
Total Particulates	4	14	9	12	10	12	6	14	13	15
Hexavalent Chromium	0.0012	0.0019	0.0012	0.0016	0.0024	0.0024	0.0014	0.0017	0.00071	<0.00067

Weather Day Classification [E]
Rain Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Wednesday, June 19, 2013
(6/18/2013-6/19/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-11)*	PAM-3 *(AM-9)*	PAM-4 *(AM-7)*	PAM-5 *(AM-6)*	PAM-6 *(AM-4)*	PAM-7 *(AM-2)*	OSAM-1 *(MD Sci Ctr)*	OSAM-2 *(Aqua)*	OSAM-3 *(Rec Pier)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/18/2013	16:00	ND	13.7	11.5	7.0	13.6	14.2	7.7	6.7	1.8	11.0	7.2	E	88.7	0.044
	17:00	18.2	11.3	10.6	6.4	12.1	13.3	7.2	6.6	1.2	9.9	7.3	E	86.5	0.015
	18:00	19.1	13.3	10.5	6.6	12.8	14.4	7.3	6.8	1.7	10.0	5.7	ENE	87.7	0.010
	19:00	19.3	19.4	10.7	6.7	12.8	13.8	8.8	6.5	1.3	15.2	4.1	NNW	86.1	0.001
	20:00	18.2	18.1	10.1	6.2	12.2	13.4	8.3	6.1	0.7	14.1	2.0	ENE	82.4	0.000
	21:00	19.3	19.2	10.7	7.0	12.8	14.5	7.8	5.8	0.7	12.1	2.3	ENE	82.3	0.000
	22:00	24.2	22.1	13.5	9.3	15.7	19.4	9.8	7.7	3.5	18.1	2.5	ENE	80.7	0.000
	23:00	29.0	28.1	18.2	11.9	19.5	24.5	13.0	8.5	3.1	19.6	2.4	NNW	80.4	0.000
6/19/2013	0:00	31.8	29.6	19.6	13.4	21.4	26.3	14.0	9.1	3.8	20.1	4.6	N	81.6	0.000
	1:00	24.6	17.5	14.1	9.5	16.4	19.6	10.0	7.5	1.7	15.7	4.7	N	81.4	0.000
	2:00	19.2	15.0	11.6	7.8	12.9	14.9	7.5	6.9	1.2	12.0	6.0	NNW	81.3	0.000
	3:00	16.2	11.8	9.5	6.2	11.1	12.5	6.0	6.1	0.6	10.3	6.6	NNW	81.1	0.000
	4:00	17.0	12.9	10.0	6.4	11.7	13.0	6.5	6.5	0.9	10.3	4.6	N	82.4	0.000
	5:00	19.6	14.8	11.6	7.4	13.2	15.4	7.6	7.0	1.2	12.3	5.4	N	83.1	0.000
	6:00	24.3	19.6	15.6	9.8	15.8	18.9	10.3	8.9	2.5	14.0	4.3	NNW	81.8	0.000
	7:00	26.7	21.5	17.0	11.4	18.5	22.0	11.7	9.7	2.9	16.7	4.0	NNE	81.4	0.000
	8:00	19.0	14.8	11.7	7.5	13.5	15.5	7.7	7.1	1.1	11.4	5.2	NNE	75.0	0.000
	9:00	13.7	9.7	7.4	4.4	9.8	9.9	5.1	6.2	0.3	7.8	6.9	ENE	69.6	0.000
	10:00	12.5	8.4	6.3	3.5	9.1	8.1	4.5	4.9	0.2	6.8	6.4	ENE	65.6	0.000
	11:00	11.4	7.1	6.0	3.2	9.3	7.1	3.8	4.2	0.1	7.4	5.4	ENE	56.3	0.000
	12:00	11.4	7.3	6.3	3.1	10.1	7.3	3.9	3.6	0.2	7.1	3.8	NNW	50.9	0.000
	13:00	11.6	8.9	8.0	3.6	11.4	7.6	3.9	3.7	0.4	7.7	4.7	E	49.9	0.000
	14:00	17.0	12.4	11.3	6.5	15.8	9.4	6.3	4.2	0.2	8.1	3.7	S	51.9	0.000
	15:00	14.9	10.9	9.8	5.1	13.9	10.2	5.5	4.7	0.2	8.1	4.4	SSE	51.5	0.000
	16:00	14.7	11.5	10.5	5.6	14.0	8.4	4.7	4.2	4.5	7.8	4.0	SSE	47.2	0.000
	17:00	15.4	11.0	9.6	5.1	14.4	8.2	4.4	3.9	4.8	6.6	3.3	SE	47.4	0.000
Daily Average/Mode/Sum [C]		**18.7**	**15.0**	**11.2**	**6.9**	**13.6**	**13.9**	**7.4**	**6.3**	**1.6**	**11.6**	**4.7**	**ENE**	**72.8**	**0.070**

Lab Analysis (µg/m³) [D]										
Total Particulates	4	14	9	12	10	12	6	14	13	15
Hexavalent Chromium	0.0010	0.0018	0.0025	0.0014	0.0030	0.0020	<0.00063	0.0022	0.0020	0.0018

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Thursday, June 20, 2013
(6/19/2013-6/20/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 (AM-1)	PAM-2 (AM-11)	PAM-3 (AM-9)	PAM-4 (AM-7)	PAM-5 (AM-6)	PAM-6 (AM-4)	PAM-7 (AM-2)	OSAM-1 (MD Sci Ctr)	OSAM-2 (Aqua)	OSAM-3 (Rec Pier)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/19/2013	16:00	14.7	11.5	10.5	5.6	14.0	8.4	4.7	4.2	4.5	7.8	4.0	SSE	47.2	0.000
	17:00	15.4	11.0	9.6	5.1	14.4	8.2	4.4	3.9	4.8	6.6	3.3	SE	47.4	0.000
	18:00	13.2	11.5	11.2	6.6	12.8	9.6	4.2	4.8	5.6	6.5	5.2	SSE	48.7	0.000
	19:00	13.6	15.8	13.2	8.2	13.6	10.7	4.8	5.0	7.6	6.7	4.1	SSE	48.7	0.000
	20:00	13.1	6.5	9.5	6.4	12.0	10.6	4.8	5.5	5.3	6.6	3.2	SSE	48.9	0.000
	21:00	13.0	0.3	8.8	5.4	11.5	11.0	4.9	6.1	4.6	8.6	2.6	SSE	49.8	0.000
	22:00	15.7	4.9	10.1	6.5	12.5	14.1	6.2	7.8	6.0	9.6	3.5	W	55.2	0.000
	23:00	19.0	14.7	13.2	9.0	15.2	17.1	8.4	8.3	6.6	10.7	2.9	W	58.6	0.000
6/20/2013	0:00	24.3	21.3	16.6	11.6	19.5	26.8	11.4	9.6	8.2	14.1	2.5	ESE	67.6	0.000
	1:00	19.2	15.1	12.0	9.2	18.9	27.3	10.7	8.1	6.4	12.7	3.7	WSW	73.1	0.000
	2:00	18.6	16.4	12.3	8.5	13.6	19.1	7.8	8.3	6.8	11.9	4.0	WSW	83.7	0.000
	3:00	20.2	18.0	12.8	9.3	14.3	18.2	8.6	9.5	7.9	13.1	4.1	W	87.5	0.000
	4:00	19.7	17.9	12.4	8.8	13.7	18.2	8.1	9.5	7.6	10.7	4.1	WSW	85.7	0.000
	5:00	19.0	17.4	12.5	8.7	13.7	17.4	7.9	9.3	7.5	10.2	3.4	W	82.1	0.000
	6:00	18.6	16.3	11.6	8.4	13.4	15.1	7.8	8.7	6.8	10.1	3.0	WSW	82.1	0.000
	7:00	15.5	12.8	9.5	6.8	11.6	13.5	6.3	7.3	5.2	12.8	3.2	WSW	76.4	0.000
	8:00	12.6	10.0	7.3	5.0	10.3	10.2	4.6	6.2	4.3	8.7	4.8	WSW	68.5	0.000
	9:00	12.5	10.0	7.7	4.5	10.3	9.4	4.2	4.8	4.2	10.8	4.6	WSW	59.4	0.000
	10:00	14.3	11.3	9.2	5.5	12.9	10.7	5.3	4.9	4.6	7.5	4.6	SE	62.0	0.000
	11:00	14.0	11.7	9.1	5.3	13.1	9.7	4.7	5.1	5.2	7.3	5.5	SE	61.4	0.000
	12:00	13.4	10.8	8.5	5.1	12.9	9.5	4.5	4.9	4.8	7.3	7.5	SE	53.4	0.000
	13:00	14.7	11.7	10.8	5.6	13.9	11.1	5.4	6.5	5.3	8.5	7.7	SSE	47.2	0.000
	14:00	14.1	11.4	11.1	5.7	13.5	10.5	5.4	6.0	5.4	8.5	7.8	SSE	44.4	0.000
	15:00	14.7	13.0	13.1	6.6	14.5	10.9	5.6	5.3	5.9	9.1	6.8	SSE	42.8	0.000
	16:00	17.5	13.7	11.5	7.3	16.3	11.9	6.2	5.0	6.8	9.3	5.6	SSE	43.0	0.000
	17:00	18.2	14.0	11.4	7.3	17.5	14.7	7.2	5.2	6.2	9.9	4.6	S	43.7	0.000
Daily Average/Mode/Sum [C]		**16.1**	**12.7**	**11.0**	**7.0**	**13.8**	**13.6**	**6.3**	**6.5**	**5.9**	**9.4**	**4.5**	**SSE**	**60.3**	**0.000**

Lab Analysis (µg/m³) [D]										
Total Particulates	14	12	7	16	19	14	14	9	11	12
Hexavalent Chromium	0.0018	0.0016	0.00098	<0.00065	0.00089	0.00092	0.0016	0.00085	0.0017	0.00076

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Friday, June 21, 2013
(6/20/2013-6/21/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-11)*	PAM-3 *(AM-9)*	PAM-4 *(AM-7)*	PAM-5 *(AM-6)*	PAM-6 *(AM-4)*	PAM-7 *(AM-2)*	OSAM-1 *(MD Sci Ctr)*	OSAM-2 *(Aqua)*	OSAM-3 *(Rec Pier)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/20/2013	16:00	17.5	13.7	11.5	7.3	16.3	11.9	6.2	5.0	6.8	9.3	5.6	SSE	43.0	0.000
	17:00	18.2	14.0	11.4	7.3	17.5	14.7	7.2	5.2	6.2	9.9	4.6	S	43.7	0.000
	18:00	19.7	13.9	11.1	7.6	19.1	21.8	10.5	5.6	5.5	10.7	5.1	SSW	43.5	0.000
	19:00	23.2	14.9	11.1	9.0	23.5	33.8	15.2	6.8	5.5	11.4	5.9	SSW	45.5	0.000
	20:00	23.9	15.0	11.2	8.8	23.0	38.6	16.5	7.2	5.6	12.3	6.2	S	49.1	0.000
	21:00	24.9	16.3	11.4	9.9	21.3	43.7	18.2	8.0	5.9	13.7	5.8	SSW	53.5	0.000
	22:00	21.1	16.8	11.6	8.6	16.6	33.1	11.6	8.3	6.2	16.2	5.7	SW	56.8	0.000
	23:00	17.6	15.8	11.1	7.9	13.9	18.4	7.6	8.5	6.0	21.9	5.3	SW	55.2	0.000
6/21/2013	0:00	17.7	15.9	11.1	8.4	13.8	17.2	7.8	8.8	6.2	20.8	5.2	WSW	56.4	0.000
	1:00	18.8	16.3	11.8	8.8	14.7	18.4	8.5	9.3	6.4	18.7	3.3	WSW	58.4	0.000
	2:00	18.4	16.3	11.8	8.8	14.4	17.8	8.2	9.4	6.2	22.5	4.9	WSW	58.9	0.000
	3:00	18.1	15.9	11.3	9.1	14.3	18.0	8.1	9.2	6.2	16.9	3.0	WSW	59.4	0.000
	4:00	20.3	18.1	13.5	10.3	15.8	19.9	9.6	10.7	7.3	15.0	2.6	WSW	64.3	0.000
	5:00	21.6	20.5	15.3	11.2	16.9	21.4	10.1	11.1	7.3	15.3	2.7	W	63.4	0.000
	6:00	18.7	17.2	13.0	9.9	15.1	16.9	8.7	9.4	6.0	13.8	3.0	W	59.7	0.000
	7:00	16.5	14.4	11.4	8.2	13.5	14.6	6.8	8.0	5.3	11.9	3.6	W	53.0	0.000
	8:00	16.2	14.3	11.2	7.9	13.7	13.7	7.0	7.5	5.0	12.6	1.7	W	49.8	0.000
	9:00	17.2	14.5	11.8	7.5	15.9	15.4	7.4	7.3	5.0	13.2	2.8	SSE	47.2	0.000
	10:00	19.1	17.0	13.8	8.4	18.8	16.8	9.1	7.9	5.8	13.6	2.8	SSE	39.8	0.000
	11:00	16.9	15.7	13.4	7.9	17.1	15.5	7.7	7.6	5.5	13.4	4.4	SSE	39.4	0.000
	12:00	16.1	15.8	15.3	7.9	17.0	13.6	6.7	6.3	5.4	12.6	6.2	SE	40.3	0.000
	13:00	16.9	18.0	14.4	10.7	18.4	14.5	7.3	6.7	4.9	11.7	4.6	SSE	37.8	0.000
	14:00	15.9	15.6	12.4	9.9	17.3	12.1	6.3	5.8	4.1	9.9	5.5	SSE	34.5	0.000
	15:00	12.9	10.3	11.3	5.0	13.1	9.3	4.8	5.6	3.7	9.9	6.4	SSE	35.2	0.000
	16:00	11.9	3.0	8.2	3.9	12.4	8.3	4.1	5.2	3.4	8.7	7.0	SE	34.3	0.000
	17:00	11.1	0.3	7.7	3.4	12.0	7.7	4.0	4.5	2.9	7.9	5.9	SE	41.2	0.000
Daily Average/Mode/Sum [C]		**18.1**	**14.6**	**11.9**	**8.2**	**16.4**	**18.7**	**8.7**	**7.5**	**5.6**	**13.6**	**4.6**	**SSE**	**48.6**	**0.000**

Lab Analysis (µg/m³) [D]										
Total Particulates	6	9	10	17	15	22	7	13	12	10
Hexavalent Chromium	0.0043	0.0043	0.0059	0.0054	0.0081	0.0052	0.0028	0.0054	0.0070	0.0036

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Saturday, June 22, 2013
(6/21/2013-6/22/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-11)*	PAM-3 *(AM-9)*	PAM-4 *(AM-7)*	PAM-5 *(AM-6)*	PAM-6 *(AM-4)*	PAM-7 *(AM-2)*	OSAM-1 *(MD Sci Ctr)*	OSAM-2 *(Aqua)*	OSAM-3 *(Rec Pier)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/21/2013	16:00	11.9	3.0	8.2	3.9	12.4	8.3	4.1	5.2	3.4	8.7	7.0	SE	34.3	0.000
	17:00	11.1	0.3	7.7	3.4	12.0	7.7	4.0	4.5	2.9	7.9	5.9	SE	41.2	0.000
	18:00	11.8	0.3	10.1	4.4	12.7	10.3	4.3	4.4	3.7	9.0	5.9	SSE	45.6	0.000
	19:00	14.1	0.3	8.8	4.2	13.2	11.5	4.8	6.9	3.8	9.6	5.4	SE	47.3	0.000
	20:00	22.5	0.3	12.0	9.2	17.2	15.2	10.1	6.4	4.8	10.0	4.7	SSE	49.3	0.000
	21:00	27.8	0.3	10.1	9.0	19.9	37.1	17.1	7.7	5.8	13.1	3.9	SW	56.0	0.000
	22:00	27.5	0.3	14.4	14.3	22.1	21.1	11.1	8.8	6.7	13.3	3.2	S	64.2	0.000
	23:00	34.4	0.3	20.0	19.2	27.9	20.1	12.5	8.9	8.3	14.8	3.8	SSE	73.4	0.000
6/22/2013	0:00	27.7	0.3	14.8	12.0	19.9	24.8	12.0	9.2	6.5	18.2	4.4	WSW	77.5	0.000
	1:00	22.8	0.3	13.3	9.6	16.1	20.6	9.5	9.1	6.8	15.7	4.9	WSW	79.1	0.000
	2:00	23.0	0.3	13.3	9.5	15.6	20.5	9.5	9.4	6.6	26.0	5.0	WSW	81.4	0.000
	3:00	22.0	0.3	12.4	9.0	15.1	19.4	8.9	8.9	6.3	27.3	4.6	WSW	84.0	0.000
	4:00	22.1	0.3	12.6	8.7	14.8	19.6	8.7	8.8	6.3	19.4	3.9	WSW	85.8	0.000
	5:00	24.5	0.3	14.7	9.8	16.0	20.3	9.5	9.4	7.0	14.7	2.3	WSW	86.6	0.000
	6:00	23.7	0.3	14.1	9.5	15.7	18.7	9.5	9.2	7.1	19.3	3.1	WSW	86.8	0.000
	7:00	23.1	0.3	13.5	9.2	15.5	19.5	9.1	8.4	6.7	21.4	3.1	SW	84.0	0.000
	8:00	18.2	0.4	10.9	7.1	13.2	14.5	6.6	6.5	5.1	17.0	2.7	WSW	72.3	0.000
	9:00	18.0	0.6	10.5	6.0	13.4	15.8	6.0	5.4	4.7	14.4	3.8	WSW	64.6	0.000
	10:00	16.5	0.7	10.4	6.0	15.1	14.9	5.8	6.1	3.9	12.9	4.9	W	59.8	0.000
	11:00	15.8	0.8	10.7	5.1	15.0	12.3	5.5	4.4	4.1	13.0	6.0	WSW	54.8	0.000
	12:00	18.4	0.8	15.1	7.9	18.1	15.0	7.2	4.9	5.1	12.3	4.6	SSE	54.1	0.000
	13:00	18.6	0.3	16.8	6.2	16.9	13.1	6.6	7.1	4.9	12.5	6.6	SE	57.3	0.000
	14:00	18.4	0.3	12.9	6.0	16.3	13.0	6.9	7.9	5.0	12.0	7.9	SSE	57.8	0.000
	15:00	18.1	0.3	12.7	6.1	15.6	13.3	7.0	7.3	4.9	12.4	7.5	SSE	58.6	0.000
	16:00	17.5	0.3	11.4	5.3	15.7	12.2	6.3	7.0	4.7	11.5	7.3	SE	58.6	0.000
	17:00	17.2	0.3	10.2	5.0	15.3	11.3	6.1	5.2	4.5	11.9	6.6	SSE	57.7	0.000
Daily Average/Mode/Sum [C]		**20.3**	**0.5**	**12.4**	**7.9**	**16.2**	**16.5**	**8.0**	**7.2**	**5.4**	**14.5**	**5.0**	**WSW**	**64.3**	**0.000**

Lab Analysis (µg/m³) [D]										
Total Particulates	8	13	13	12	15	20	21	8	17	5
Hexavalent Chromium	0.0040	0.0036	0.0044	0.0040	0.0032	0.0041	0.0027	0.0038	0.0059	0.0057

Weather Day Classification [E]
Dry/Light Wind Day

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

PRE-CONSTRUCTION AIR MONITORING SUMMARY

Harbor Point
Baltimore, MD
Project No. 130467USA

Sample Collection Date: Sunday, June 23, 2013
(6/22/2013-6/23/2013)

Date	Time	RAM Total Particulates (µg/m³) [A]										Weather [B]			
		PAM-1 *(AM-1)*	PAM-2 *(AM-11)*	PAM-3 *(AM-9)*	PAM-4 *(AM-7)*	PAM-5 *(AM-6)*	PAM-6 *(AM-4)*	PAM-7 *(AM-2)*	OSAM-1 *(MD Sci Ctr)*	OSAM-2 *(Aqua)*	OSAM-3 *(Rec Pier)*	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Precipitation (in)
6/22/2013	16:00	17.5	0.3	11.4	5.3	15.7	12.2	6.3	7.0	4.7	11.5	7.3	SE	58.6	0.000
	17:00	17.2	0.3	10.2	4.9	15.3	11.3	6.1	5.2	4.5	11.9	6.6	SSE	57.7	0.000
	18:00	17.2	0.3	9.7	5.3	14.6	13.4	6.2	5.3	4.7	11.9	6.1	SSE	58.0	0.000
	19:00	17.7	0.3	10.6	6.4	16.3	16.6	7.4	4.9	4.4	10.0	7.0	S	54.8	0.000
	20:00	14.6	0.3	6.7	3.6	13.2	19.4	6.5	5.0	3.7	9.3	7.0	SSW	56.4	0.000
	21:00	14.4	0.3	7.8	4.4	11.4	12.7	5.4	5.5	4.4	15.2	6.4	SW	61.8	0.000
	22:00	15.7	0.3	8.4	5.5	11.9	12.9	5.8	5.7	4.2	13.9	6.8	WSW	65.8	0.000
	23:00	17.0	0.3	9.3	6.1	12.5	13.9	6.5	6.5	4.6	13.1	5.1	WSW	69.2	0.000
6/23/2013	0:00	18.8	0.3	10.1	7.2	13.1	15.6	6.9	6.8	5.0	13.8	3.5	WSW	71.9	0.000
	1:00	18.4	0.3	10.0	6.9	13.1	15.5	6.8	6.5	4.9	13.9	2.6	SW	74.1	0.000
	2:00	28.2	0.3	11.4	9.7	19.6	31.7	13.4	7.5	5.8	13.9	3.1	SSW	76.7	0.000
	3:00	20.0	0.3	10.6	7.8	17.0	31.2	12.4	8.9	16.2	11.9	3.9	SW	80.0	0.000
	4:00	24.1	0.3	13.2	9.0	15.8	23.6	11.2	26.2	17.7	14.7	2.8	WSW	81.8	0.000
	5:00	19.4	0.3	10.9	7.6	13.9	18.7	7.2	6.9	5.3	14.6	3.0	W	84.0	0.000
	6:00	21.3	0.3	12.6	9.8	15.3	16.1	7.8	6.8	5.3	14.2	1.3	W	82.3	0.000
	7:00	23.0	0.5	14.1	9.6	16.8	18.4	9.1	9.1	6.8	14.3	2.3	ESE	78.6	0.000
	8:00	19.3	0.5	11.1	7.9	15.2	14.8	7.2	7.2	5.4	11.2	2.0	N	78.9	0.000
	9:00	18.9	0.5	11.0	7.3	14.7	14.5	7.4	7.6	5.7	11.5	2.7	SSW	79.5	0.000
	10:00	19.7	0.5	11.9	7.6	14.5	14.2	7.2	7.0	6.9	12.0	2.6	SSE	87.3	0.013
	11:00	17.3	0.4	9.8	6.1	12.7	12.8	6.6	5.3	5.4	10.8	4.1	E	90.8	0.006
	12:00	18.1	0.5	10.5	6.3	13.9	12.8	6.4	5.8	5.1	11.3	5.3	SSE	83.1	0.000
	13:00	19.7	0.3	12.5	7.5	15.7	14.3	7.8	6.2	6.2	12.9	4.3	SSE	82.0	0.000
	14:00	20.2	0.4	13.2	8.2	16.8	14.5	7.2	6.7	7.2	13.5	3.9	SSE	73.8	0.000
	15:00	19.1	52.9	12.4	6.8	17.2	12.5	6.2	6.3	6.5	11.3	3.5	SSE	67.5	0.000
	16:00	19.7	72.2	13.2	6.7	17.2	13.7	7.4	6.3	6.9	11.9	4.3	SSE	76.1	0.000
	17:00	17.0	68.1	9.7	5.2	14.9	12.1	5.8	5.0	5.5	10.4	4.9	SE	76.7	0.000
Daily Average/Mode/Sum [C]		**19.0**	**7.7**	**10.9**	**6.9**	**14.9**	**16.1**	**7.5**	**7.2**	**6.3**	**12.5**	**4.3**	**SSE**	**73.4**	**0.018**

Lab Analysis (µg/m³) [D]										
Total Particulates	6	7	14	6	10	12	17	9	15	<3
Hexavalent Chromium	0.0045	0.0019	0.0013	0.0013	0.00095	0.0019	0.0027	0.0018	0.023	<0.00067

Weather Day Classification [E]
Out of Classification

Notes:

RAM = Real-time air monitor total particulate results collected using a DataRam 4000.

PAM = Perimeter Air Monitor units (1 through 7). OSAM = Off-Site Air Monitor units.

AM = Air Monitoring stations (1 through 12)

ND = No Data (typically equipment or telemetry malfunction)

[A] RAM measurements were taken every minute and are presented as hourly averages.

[B] Weather readings were taken every 5 minutes. Wind speed and humidity are presented as hourly averages. Wind direction is presented as an hourly mode. Precipitation is presented as an hourly sum.

[C] RAM data, wind speed, and humidity summaries are shown as daily averages. Wind direction is shown as the daily mode. Precipitation is presented as a daily sum.

[D] Lab analysis indicates 24-hour Time Weighted Average (TWA). Total Particulates by NIOSH Method 0500 (converted from mg/m³ to µg/m³). Hexavalent Chromium by OSHA Method ID-215.

[E] Rain day = precip ≥ 0.1 inches. Dry/light wind day = wind ≤ 7 mph, RH < 70%. Dry/heavy wind day = wind > 7 mph, RH < 70%.

GTA
USA, LLC

APPENDIX E

IMPACTOR SUMMARY

IMPACTOR SUMMARY

Harbor Point
Baltimore, Maryland
Project No. 130467USA

END DATE	AM-1		AM-4		AM-7		AM-11		Weather				
	PART $\mu g/M^3$	CrVI ng/M^3	PART $\mu g/M^3$	CrVI ng/M^3	PART $\mu g/M^3$	CrVI ng/M^3	PART $\mu g/M^3$	CrVI ng/M^3	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Rainfall (in)	Sampling Matrix
12-Jun	18.264	1.4	28.2	1.8	17.9	1.19	0.849	2.1	8.3	W	82	0.741	C12
13-Jun	13.05	1.18	23.599	2.7	16.362	2.9	14.331	2.9	7.6	W	65	0	D14
14-Jun	26.853	1.3	6.7	2.2	4.368	2.2	9.194	2.0	6.4	W	70	0.682	C13
15-Jun	10.634	2.2	7.231	0.91	20.263	0.7	4.836	1.8	8.1	N	66	0.459	C14
20-Jun	15.375	2.4	24.255	<0.63	28.291	2.0	21.127	1.7	4.5	SSE	60.3	0	A27
21-Jun	39.206	2.0	25.889	1.9	34.848	2.7	38.835	4.7	4.6	SSE	48.6	0	A28
22-Jun	100.36	1.9	21.227	1.5	20.13	1.6	20.359	1.5	5.0	WSW	64.3	0	A29
23-Jun	2.885	1.3	5.485	1.4	11.608	1.9	<0.134	2.3	4.3	SSE	73.4	0.018	D8

NS = No Sample
NA = Not Analyzed
Weather Sampling Matrix Codes: A=Dry/Light Wind, B=Dry/Heavy Wind, C=Rain Day, D=Out of Classification

APPENDIX F

OFF-SITE AIR MONITORING STATION

SUMMARY

OFF-SITE AIR MONITORING SUMMARY

Harbor Point
Baltimore, Maryland
Project No. 130467USA

END DATE	OSAM-1			OSAM-2			OSAM-3			OSAM-4			Weather				
	RAM $\mu g/M^3$	PART $\mu g/M^3$	CrVI ng/M^3	RAM $\mu g/M^3$	PART $\mu g/M^3$	CrVI ng/M^3	RAM $\mu g/M^3$	PART $\mu g/M^3$	CrVI ng/M^3	RAM $\mu g/M^3$	PART $\mu g/M^3$	CrVI ng/M^3	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Rainfall (in)	Sampling Matrix
11-Jun	6.5	NS	NS	5.2	5	<0.73	NS	6	0.91				8.3	W	82	0.741	C12
12-Jun	13.1	20	2.1	11.8	9	1.5	37.8	18	2.0				7.6	W	65	0	D14
13-Jun	16.3	24	4.6	16.2	12	<0.68	25.8	23	2.2				6.4	W	70	0.682	C13
14-Jun	8.3	NS	NS	0.5	8	1.4	5.9	<3	0.75				8.1	N	66	0.459	C14
15-Jun	7.0	24	1.0	1.9	15	1.8	10.8	21	2.1				6.1	W	49	0	A24
16-Jun	11.0	19	3.3	6.8	9	2.5	17.1	21	2.5				6.1	W	52	0	A25
17-Jun	6.5	15	<0.68	1.8	15	0.99	10.6	21	<0.67				8.1	W	56.5	0	D15
18-Jun	12.2	14	1.7	9.1	13	0.71	22.1	15	<0.67				4.7	W	72.9	0.215	C15
19-Jun	6.3	14	2.2	1.6	13	2.0	11.6	15	1.8				4.7	ENE	72.8	0.07	A26
20-Jun	6.5	9	0.85	5.9	11	1.7	9.4	12	0.76				4.5	SSE	60.3	0	A27
21-Jun	7.5	13	5.4	5.6	12	7.0	13.6	10	3.6				4.6	SSE	48.6	0	A28
22-Jun	7.2	8	3.8	5.4	17	5.9	14.5	5	5.7				5.0	WSW	64.3	0	A29
23-Jun	7.2	9	1.8	6.3	15	23	12.5	<3	<0.67				4.3	SSE	73.4	0.018	D8
24-Jun																	
25-Jun		16	9.5		NS	NS		15	13		15	11					
26-Jun		5	4.4		NS	NS		17	11		24	11					
27-Jun		15	7.4		NS	NS		14	10		14	10					
28-Jun		19	2.0		11	2.4		22	2.5		14	3.6					
29-Jun		12	2.5		7	2.8		8	4.8		7	6.2					
30-Jun		11	5.9		19	2.0		21	3.3		18	2.0					
1-Jul		6	4.7		10	5.8		8	3.7		16	4.1					
2-Jul		12	2.3		7	2.6		19	4.1		12	3.1					
3-Jul		10	2.9		12	2.1		NS	NS		18	9.5					
4-Jul		15	6.0		10	4.9		21	7.7		22	4.0					
5-Jul		11	5.4		11	3.6		17	3.5		14	8.9					
6-Jul		5	2.8		5	1.9		9	3.7		10	5.0					
7-Jul		10	2.4		7	3.0		6	3.0		5	4.8					
8-Jul		73	2.4		11	2.0		5	1.5		10	3.0					
9-Jul		17	2.1		11	3.6		22	5.1		25	3.1					

NS = No Sample
Weather Sampling Matrix Codes: A=Dry/Light Wind, B=Dry/Heavy Wind, C=Rain Day, D=Out of Classification
Shaded cells indicate no data

APPENDIX G

CHAIN OF CUSTODY FORMS AND

LABORATORY ANALYSIS REPORTS

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041310844
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	04/30/13 9:20 AM
Analysis Date:	5/1/2013
Collected:	4/28/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249419	PAM-1	14400	0.152	0.011	0.003	
041310844-0001						
249416	PAM-2	14400	3.319	0.230	0.003	
041310844-0002						
249438	PAM-3	14400	0.202	0.014	0.003	
041310844-0003						
249448	PAM-4	14400	0.194	0.013	0.003	
041310844-0004						
249436	PAM-5	14400	0.161	0.011	0.003	
041310844-0005						
249427	PAM-6	14400	0.180	0.012	0.003	
041310844-0006						
249415	PAM-7	14400	0.164	0.011	0.003	
041310844-0007						
249418	PAM-1	14832	0.252	0.017	0.003	
041310844-0008						
249435	PAM-2	14544	0.198	0.014	0.003	
041310844-0009						
249408	PAM-3	14184	0.200	0.014	0.004	
041310844-0010						
249437	PAM-4	14544	0.197	0.014	0.003	
041310844-0011						

Analyst(s)

Shane Feret (38)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 05/01/2013 11:52:36

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041310844
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	04/30/13 9:20 AM
Analysis Date:	5/1/2013
Collected:	4/28/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249434	PAM-5	14400	0.188	0.013	0.003	
041310844-0012						
249447	PAM-6	14904	0.192	0.013	0.003	
041310844-0013						
249446	PAM-7	14760	0.112	0.008	0.003	
041310844-0014						
249412	PAM-1	14976	0.209	0.014	0.003	
041310844-0017						
249401	PAM-2	14616	0.173	0.012	0.003	
041310844-0018						
249445	PAM-3	14400	0.109	0.008	0.003	
041310844-0019						
249406	PAM-4	14688	0.152	0.010	0.003	
041310844-0020						
249403	PAM-5	14472	0.183	0.013	0.003	
041310844-0021						
249442	PAM-6	14904	0.154	0.010	0.003	
041310844-0022						
249425	PAM-7	15120	0.163	0.011	0.003	
041310844-0023						
249410	PAM-1	14760	0.156	0.011	0.003	
041310844-0024						

Analyst(s)

Shane Feret (38)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 05/01/2013 11:52:36

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041310844
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	04/30/13 9:20 AM
Analysis Date:	5/1/2013
Collected:	4/28/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249417	PAM-2	14616	0.132	0.009	0.003	
041310844-0025						
249420	PAM-3	14832	0.177	0.012	0.003	
041310844-0026						
249432	PAM-4	14904	0.170	0.011	0.003	
041310844-0027						
249413	PAM-5	14904	0.182	0.012	0.003	
041310844-0028						
249428	PAM-6	14616	0.158	0.011	0.003	
041310844-0029						
249424	PAM-7	15192	0.128	0.008	0.003	
041310844-0030						
249421	PAM-1	15120	<0.05	<0.003	0.003	
041310844-0031						
249404	PAM-1	15120	0.199	0.013	0.003	
041310844-0032						
249409	PAM-2	14472	0.188	0.013	0.003	
041310844-0033						
249407	PAM-3	14400	0.214	0.015	0.003	
041310844-0034						
249441	PAM-4	15192	0.170	0.011	0.003	
041310844-0035						

Analyst(s)

Shane Feret (38)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 05/01/2013 11:52:36

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041310844
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	04/30/13 9:20 AM
Analysis Date:	5/1/2013
Collected:	4/28/2013

Project: **130467 USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249429	PAM-5	14328	0.134	0.009	0.003	
041310844-0036						
249431	PAM-6	14688	0.195	0.013	0.003	
041310844-0037						
249411	PAM-7	15192	0.181	0.012	0.003	
041310844-0038						
249405		0	<0.05	N/A	N\A	Field Blank
041310844-0015						
249426		0	<0.05	N/A	N\A	Field Blank
041310844-0016						

Notes: Discernable field blank submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (38)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 05/01/2013 11:52:36

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041310844

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL	State/Province: MD Zip/Postal Code: 20707	City: LAUREL	State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: MARYLAND	
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: ~~ZEFON INTERNATIONAL~~ 37mm 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON INTERNATIONAL/7P53P
Lot #: 28127

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249419	5.0μ PVC	CrVI/OSHA 215; TOTAL PART. NIOSH 0500	~~14,400L~~ 1.0 L/min	4/24/13/1230	~~BALTIMORE, MD~~ PAM-1	15.817 mg
249416	"	" " "	14,400L	4/24/13/1235	PAM-2	12.684 mg
249438	"	" " "	14,400L	" /12:40	PAM-3	14.763 mg
249448	"	" " "	14,400L	" /12:47	PAM-4	13.979 mg
249436	"	" " "	14,400L	" /12:50	PAM-5	12.937 mg
249427	"	" " "	14,400L	" /13:00	PAM-6	14.355 mg
249415	"	" " "	14,400L	" /13:06	PAM-7	12.738 mg

RECEIVED CINNAMINSON, N.J. 2013 APR 30 A 11:31

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Terrence Ogden	4/24/13	Scott W. Cummings	4/24/13
Scott W. Cummings	4/29/13	AK FX	4/30/13 9:20A

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSA 0500 FROM SAME SAMPLE CASSETTE.

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041310844

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL	State/Province: MD Zip/Postal Code: 20707	City: LAUREL	State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: MD	
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gt2eng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm cassette
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	Lot #: 28127

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249418	5.0 u PVC	Cr VI, OSHA 215; TOTAL PARTIC NIOSH 0500	14,832 L	4/25/13 1236	PAM-1	
249435	"	"	14,544 L	1252	PAM-2	
249408	"	"	14,184 L	1256	PAM-3	
249437	"	"	14,544 L	1307	PAM-4	
249434	"	"	14,400 L	1313	PAM-5	
249447	"	"	14,904 L	1321	PAM-6	
249446	"	"	14,760 L	1333	PAM-7	
249405	"	"	NA	1236	FIELD BLANK	
249426	"	"	NA	1236	[redacted] BLANK MEDIA	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
[signature]	4/29/13	Scott W Cimmyotti	4/29/13
Scott W Cimmyotti	4/29/13		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

041310844

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041310844

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON			**Bill To Company:** GEO-TECHNOLOGY ASSOCIATES, INC.		
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.			**Attention To:** SAM STEVENSON		
Street: 14280 PARK CENTER DRIVE			**Street:** 14280 PARK CENTER DRIVE		
City: LAUREL	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** LAUREL	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446 **Fax :** (410) 792-7395			**Phone :** (410) 792-9446 **Fax :** (410) 792-7395		
Project Name: 130467 USA			**U.S. State where Samples Collected:** MD		
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**	**Sampled By (Signature):**		
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** ssteverson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37 mm 3 piece cassette
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: ZEFON INTERNATIONAL / P53P
☐	☒	☐	☐	☐	☐	☐	Lot #: 28127

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249412	5.0 µ PVC	GII/OSHA 215; Total Particulate NIOSH 0500	~~10 L/min~~ 14.976 L	4/26/13 12:57	PAM-1	13.997 mg
249401	"	"	14,616 L	4/26/13 13:13	PAM-2	15.784 mg
249445	"	"	14,400 L	4/26/13 13:25	PAM-3	15.667 mg
249406	"	"	14,688 L	4/26/13 13:36	PAM-4	13.089 mg
249403	"	"	14,472 L	4/26/13 13:42	PAM-5	14.611 mg
249442	"	"	14,904 L	4/26/13 13:54	PAM-6	13.203 mg
249425	"	"	~~15,120~~ L	4/26/13 14:04	PAM-7	13.739 mg

RECEIVED
2013 APR 30 A 11:31
CINNAMINSON, N.J.

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Shichan Chou ~~Shichan~~ Shichan Chou	4/26/13		4/26/13
Scott W Cummings	4/29/13		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041310844

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL	State/Province: MD Zip/Postal Code: 20707	City: LAUREL	State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: MD	
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm 3 piece cassette
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: ZEFON INTERNATIONAL / 7PS3P
☐	☒	☐	☐	☐	☐	☐	Lot #: 28127

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249410	5.0 μ PVC	Cr VI OSHA 215; Total Port. NIOSH 0500	14760 L	4/27/13 12:45	PAM-1	12.994 mg
249417	"	"	14616 L	4/27/13 12:58	PAM-2	16.014 mg
249420	"	"	14832 L	4/27/13 13:15	PAM-3	15.084 mg
249432	"	"	14904 L	4/27/13 13:30	PAM-4	13.784 mg
249413	"	"	14904 L	4/27/13 13:39	PAM-5	18, 308 mg
249428	"	"	14616 L	4/27/13 13:53	PAM-6	14.046 mg
249424	"	"	15192 L	4/27/13 14:02	PAM-7	13, 353 mg

RECEIVED CINNAMINSON, N.J. 2013 APR 30 A 11:31

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Sam Stevenson	4/29/13	Scott W. Cummings	4/29/13
Scott W. Cummings	4/29/13		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

SWC

041310844

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041310844

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MD
Number of Samples in Shipment:	Date of Shipment:
Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: SStevenson@gt2eng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm 3 piece cassette
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: ZEFON INTERNATIONAL / 7P53P
☐	☒	☐	☐	☐	☐	☐	Lot #: 28127

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249421	5.0 μ PVC	Cr VI / OSHA 215; Total Part. NIOSH 0500	15120 L	4/28/13 12:33	PAM-1	14.698 mg
249404	"	"	15120 L	4/28/13 12:33	PAM-1	15.412 mg
249409	"	"	14472 L	4/28/13 12:49	PAM-2	14.036 mg
249407	"	"	14400 L	4/28/13 12:57	PAM-3	14.824 mg
249441	"	"	15192 L	4/28/13 13:13	PAM-4	13.013 mg
249429	"	"	14328 L	4/28/13 13:26	PAM-5	15.314 mg
249431	"	"	14688 L	4/28/13 13:42	PAM-6	14.443 mg
249411	"	"	15192 L	4/28/13 13:53	PAM-7	15.769 mg

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Shane Chang	4/29/2013	Scott W Cummings	4/29/13
Scott W Cummings	4/29/2013		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSA 0500 FROM SAME SAMPLE CASSETTE.

SWC

041310844

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 5/7/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 5/1/2013. The results are tabulated on the attached data pages for the following client designated project:

130467 USA

The reference number for these samples is EMSL Order #011301787. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301787
CustomerID:	GTA51
CustomerPO:	041310844
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/01/13 11:00 AM
Collected:	4/28/2013

Analytical Results

Client Sample Description 249419 PAM-1 ***Collected:*** 4/24/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	5/3/2013	MM	5/3/2013	

Client Sample Description 249416 PAM-2 ***Collected:*** 4/24/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	5/3/2013	MM	5/3/2013	

Client Sample Description 249438 PAM-3 ***Collected:*** 4/24/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	5/3/2013	MM	5/3/2013	

Client Sample Description 249448 PAM-4 ***Collected:*** 4/24/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00095	0.00069	µg/m³	5/3/2013	MM	5/3/2013	

Client Sample Description 249436 PAM-5 ***Collected:*** 4/24/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	5/3/2013	MM	5/3/2013	

Client Sample Description 249427 PAM-6 ***Collected:*** 4/24/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	5/3/2013	MM	5/3/2013	

Client Sample Description 249415 PAM-7 ***Collected:*** 4/24/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	5/3/2013	MM	5/3/2013	

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301787
CustomerID:	GTA51
CustomerPO:	041310844
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/01/13 11:00 AM
Collected:	4/28/2013

Analytical Results

Client Sample Description 249418 PAM-1 ***Collected:*** 4/25/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00067	µg/m³	5/3/2013	MM	5/3/2013	

Client Sample Description 249435 PAM-2 ***Collected:*** 4/25/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0020	0.00069	µg/m³	5/3/2013	MM	5/3/2013	

Client Sample Description 249408 PAM-3 ***Collected:*** 4/25/2013 ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00071	µg/m³	5/3/2013	MM	5/3/2013	

Client Sample Description 249437 PAM-4 ***Collected:*** 4/25/2013 ***Lab ID:*** *0011*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0014	0.00069	µg/m³	5/3/2013	MM	5/3/2013	

Client Sample Description 249434 PAM-5 ***Collected:*** 4/25/2013 ***Lab ID:*** *0012*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	5/3/2013	MM	5/3/2013	

Client Sample Description 249447 PAM-6 ***Collected:*** 4/25/2013 ***Lab ID:*** *0013*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00071	0.00067	µg/m³	5/3/2013	MM	5/4/2013	

Client Sample Description 249446 PAM-7 ***Collected:*** 4/25/2013 ***Lab ID:*** *0014*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00073	0.00068	µg/m³	5/3/2013	MM	5/4/2013	

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301787
CustomerID:	GTA51
CustomerPO:	041310844
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/01/13 11:00 AM
Collected:	4/28/2013

Analytical Results

Client Sample Description 249405 Field Blank — ***Collected:*** 4/25/2013 — ***Lab ID:*** *0015*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	5/3/2013	MM	5/4/2013	

Client Sample Description 249426 Media Blank — ***Collected:*** 4/25/2013 — ***Lab ID:*** *0016*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	5/3/2013	MM	5/4/2013	

Client Sample Description 249412 PAM-1 — ***Collected:*** 4/26/2013 — ***Lab ID:*** *0017*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00067	µg/m³	5/3/2013	MM	5/4/2013	

Client Sample Description 249401 PAM-2 — ***Collected:*** 4/26/2013 — ***Lab ID:*** *0018*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00068	µg/m³	5/3/2013	MM	5/4/2013	

Client Sample Description 249445 PAM-3 — ***Collected:*** 4/26/2013 — ***Lab ID:*** *0019*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	5/3/2013	MM	5/4/2013	

Client Sample Description 249406 PAM-4 — ***Collected:*** 4/26/2013 — ***Lab ID:*** *0020*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0011	0.00068	µg/m³	5/3/2013	MM	5/4/2013	

Client Sample Description 249403 PAM-5 — ***Collected:*** 4/26/2013 — ***Lab ID:*** *0021*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0017	0.00069	µg/m³	5/3/2013	MM	5/6/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301787
CustomerID:	GTA51
CustomerPO:	041310844
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 05/01/13 11:00 AM
Collected: 4/28/2013

Project: **130467 USA**

Analytical Results

Client Sample Description 249442 PAM-6 ***Collected:*** 4/26/2013 ***Lab ID:*** *0022*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00067	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249425 PAM-7 ***Collected:*** 4/26/2013 ***Lab ID:*** *0023*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0033	0.00066	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249410 PAM-1 ***Collected:*** 4/27/2013 ***Lab ID:*** *0024*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0037	0.00068	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249417 PAM-2 ***Collected:*** 4/27/2013 ***Lab ID:*** *0025*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0028	0.00068	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249420 PAM-3 ***Collected:*** 4/27/2013 ***Lab ID:*** *0026*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0038	0.00067	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249432 PAM-4 ***Collected:*** 4/27/2013 ***Lab ID:*** *0027*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0043	0.00067	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249413 PAM-5 ***Collected:*** 4/27/2013 ***Lab ID:*** *0028*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0038	0.00067	µg/m³	5/3/2013	MM	5/6/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301787
CustomerID:	GTA51
CustomerPO:	041310844
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 05/01/13 11:00 AM
Collected: 4/28/2013

Project: **130467 USA**

Analytical Results

Client Sample Description 249428 PAM-6 ***Collected:*** 4/27/2013 ***Lab ID:*** *0029*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0042	0.00068	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249424 PAM-7 ***Collected:*** 4/27/2013 ***Lab ID:*** *0030*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0060	0.00066	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249421 PAM-1 ***Collected:*** 4/28/2013 ***Lab ID:*** *0031*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00066	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249404 PAM-1 ***Collected:*** 4/28/2013 ***Lab ID:*** *0032*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0024	0.00066	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249409 PAM-2 ***Collected:*** 4/28/2013 ***Lab ID:*** *0033*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0038	0.00069	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249407 PAM-3 ***Collected:*** 4/28/2013 ***Lab ID:*** *0034*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0051	0.00069	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249441 PAM-4 ***Collected:*** 4/28/2013 ***Lab ID:*** *0035*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00066	µg/m³	5/3/2013	MM	5/6/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301787
CustomerID:	GTA51
CustomerPO:	041310844
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/01/13 11:00 AM
Collected:	4/28/2013

Analytical Results

Client Sample Description 249429 PAM-5 ***Collected:*** 4/28/2013 ***Lab ID:*** *0036*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0011	0.00070	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249431 PAM-6 ***Collected:*** 4/28/2013 ***Lab ID:*** *0037*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0055	0.00068	µg/m³	5/3/2013	MM	5/6/2013	MM

Client Sample Description 249411 PAM-7 ***Collected:*** 4/28/2013 ***Lab ID:*** *0038*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0036	0.00066	µg/m³	5/3/2013	MM	5/6/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011301787

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: Date of Shipment: Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: ~~ZEFON INTERNATIONAL~~ 37mm 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON INTERNATIONAL / ZA53P
Lot #: 28127

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
1	249419	5.0μ PVC	CrVI / OSHA 215; TOTAL PART. NIOSH 0500	~~14,400L~~ NO LIMIT	4/24/13 1230	BALTIMORE, MD PAM-1	15.817 mg
2	249416	"	" " "	14,400L	4/24/13 1235	PAM-2	12.684 mg
3	249438	"	" " "	14,400L	" 12:40	PAM-3	14.763 mg
4	249448	"	" " "	14,400L	" 12:47	PAM-4	13.979 mg
5	249436	"	" " "	14,400L	" 12:50	PAM-5	12.937 mg
6	249427	"	" " "	14,400L	" 13:00	PAM-6	14.355 mg
7	249415	"	" " "	14,400L	" 13:06	PAM-7	12.738 mg

RECEIVED APR 30 AM 8:33 CINNAMINSON, N.J.

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Terrence Python	4/24/13	Scott W. Cummings	4/24/13
Scott W. Cummings	4/29/13	DR FX	4/30/13 9:20A
			5/1/13 1100

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

LEFT MESS- ENV? 12:55pm 5/1/13 -EZ * Per Client. these were Sampled at doors 5/1 DR

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 01130178 7

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MD
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: sstevenson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm Cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 28127

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
8	249418	5.0 u PVC	Cr VI, OSHA 215; TOTAL PARTIC NOSH 0500	14,832 L	4/25/13 1236	PAM-1	
9	249435	"	"	14,544 L	1252	PAM-2	
10	249408	"	"	14,184 L	1256	PAM-3	
11	249437	"	"	14,544 L	1301	PAM-4	
12	249434	"	"	14,400 L	1313	PAM-5	
13	249447	"	"	14,904 L	1321	PAM-6	
14	249446	"	"	14,760 L	1333	PAM-7	
15	249405	"	"	NA	1236	FIELD BLANK	
16	249426	"	"	NA	1236	[redacted] BLANK MEDIA	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Kim Coffin	4/29/13	Scott W Cimmyotti	4/29/13
Scott W Cimmyotti	4/29/13		5/1/13 1100

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

01130178 7

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 01130178?

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON			Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.			Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE			Street: 14280 PARK CENTER DRIVE
City: LAUREL	State/Province: MD	Zip/Postal Code: 20707	City: LAUREL / State/Province: MD / Zip/Postal Code: 20707
Phone: (410) 792-9446	Fax: (410) 792-7395		Phone: (410) 792-9446 / Fax: (410) 792-7395
Project Name: 130467 USA			U.S. State where Samples Collected: MD
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail			Email Results To: SSTEVENSON@GTAENG.COM

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37 mm 3 piece cassette
Manufacturer/Part #: ZEFON INTERNATIONAL / P53P
Lot #: 28127

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
17	249412	5.0 µ PVC	GravII/OSHA 215; Total Dust NIOSH 0500	~~14976 L~~ ~~10 L/min~~	4/26/13 12:57	PAM-1	13.997 mg
18	249401	"	"	14,616 L	4/26/13 13:13	PAM-2	15.784 mg
19	249445	"	"	14,400 L	4/26/13 13:25	PAM-3	15.667 mg
20	249406	"	"	14,688 L	4/26/13 13:36	PAM-4	13.089 mg
21	249403	"	"	14,472 L	4/26/13 13:42	PAM-5	14.611 mg
22	249442	"	"	14,904 L	4/26/13 13:54	PAM-6	13.203 mg
23	249425	"	"	15,120 L	4/26/13 14:04	PAM-7	13.739 mg

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Shichan, Chan [illegible] Shichan	4/26/13	[signature]	4/26/13
Scott A Cummings	4/29/13		5/1/13 1100

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

01130178?

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011301787

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MD
Number of Samples in Shipment: Date of Shipment: Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm 3 piece cassette
Manufacturer/Part #: ZEFON INTERNATIONAL / ZPS3P
Lot #: 28127

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
24	249410	5.0 µ PVC	Cr IV OSHA 215; Total Part. NIOSH 0500	14760 L	4/29/13 12:45	PAM-1	12.994 mg
25	249417	"	"	14616 L	4/29/13 12:58	PAM-2	16.014 mg
26	249420	"	"	14832 L	4/29/13 13:15	PAM-3	15.084 mg
27	249432	"	"	14904 L	4/29/13 13:30	PAM-4	13.784 mg
28	249413	"	"	14904 L	4/29/13 13:39	PAM-5	18.308 mg
29	249428	"	"	14616 L	4/29/13 13:53	PAM-6	14.046 mg
30	249424	"	"	15192 L	4/29/13 14:02	PAM-7	13.353 mg

CINNAMINSON, NJ 08077 200 ROUTE 130 NORTH EMSL ANALYTICAL, INC. 03 APR 30 A 11:31

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Shannon Scott W. Cummings	4/29/13 4/29/13	Scott W. Cummings	4/29/13 5/1/13 1100

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

011301787

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011301787

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011301787

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL	State/Province: MD	Zip/Postal Code: 20707	City: LAUREL	State/Province: MD	Zip/Postal Code: 20707
Phone: (410) 792-9446	Fax: (410) 792-7395		Phone: (410) 792-9446	Fax: (410) 792-7395	
Project Name: 130467 USA			U.S. State where Samples Collected: MD		
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):		
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm 3 piece cassette
Manufacturer/Part #: ZEFON INTERNATIONAL / 7P53P
Lot #: 28127

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
35	249421	5.0 μ PVC	Cr VI / OSHA 215; Total Part. NIOSH 0500	15120 L	4/28/13 12:33	PAM-1	14.698 mg
34	249404	"	"	15120 L	4/28/13 12:33	PAM-1	15.412 mg
33	249409	"	"	14472 L	4/28/13 12:47	PAM-2	14.036 mg
31	249407	"	"	14400 L	4/28/13 12:57	PAM-3	14.824 mg
35	249441	"	"	15192 L	4/28/13 13:13	PAM-4	13.013 mg
30	249429	"	"	14328 L	4/28/13 13:26	PAM-5	15.314 mg
37	249431	"	"	14688 L	4/28/13 13:42	PAM-6	14.443 mg
38	249411	"	"	15192 L	4/28/13 13:53	PAM-7	15.769 mg

RECEIVED BY EMSL CINNAMINSON LAB

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	4/29/2013	Scott W Cummings	4/29/13
Scott W Cummings	4/29/2013		5/1/13 1100

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

SWC

011301787

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041311522
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/07/13 10:10 AM
Analysis Date:	5/8/2013
Collected:	5/5/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249439	PAM- 1	15729	0.121	0.008	0.003	
041311522-0001						
249433	PAM- 2	14473	<0.05	<0.003	0.003	
041311522-0002						
249443	PAM- 3	14406	0.153	0.011	0.003	
041311522-0003						
249449	PAM- 4	14942	0.212	0.014	0.003	
041311522-0004						
249422	PAM- 5	14582	0.410	0.028	0.003	
041311522-0005						
249430	PAM- 6	14403	0.257	0.018	0.003	
041311522-0006						
249400	PAM- 7	14909	2.014	0.135	0.003	
041311522-0007						
249440	PAM-1	15007	0.106	0.007	0.003	
041311522-0009						
249423	PAM-2	14618	0.102	0.007	0.003	
041311522-0010						
249402	PAM-3	14389	0.152	0.011	0.003	
041311522-0011						
249322	PAM-4	14883	1.453	0.098	0.003	
041311522-0012						

Analyst(s)

Shane Feret (50)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 05/17/2013 11:02:08 Replaces the Inital Report 05/10/2013 08:39:54. Reason Code: Data Entry-Change to Sample Volume

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041311522
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/07/13 10:10 AM
Analysis Date:	5/8/2013
Collected:	5/5/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249335	PAM-5	14781	0.174	0.012	0.003	
041311522-0013						
249337	PAM-6	14267	0.079	0.006	0.004	
041311522-0014						
249414	PAM-7	14822	0.081	0.005	0.003	
041311522-0015						
249329	PAM-1	15309	0.082	0.005	0.003	
041311522-0016						
249313	PAM-2	15004	0.169	0.011	0.003	
041311522-0017						
249327	PAM-3	14308	0.148	0.010	0.003	
041311522-0018						
249344	PAM-4	14460	0.158	0.011	0.003	
041311522-0019						
249320	PAM-5	14791	0.206	0.014	0.003	
041311522-0020						
249326	PAM-6	14187	0.197	0.014	0.004	
041311522-0021						
249332	PAM-7	14841	0.178	0.012	0.003	
041311522-0022						
249304	PAM-1	14910	0.120	0.008	0.003	
041311522-0023						

Analyst(s)

Shane Feret (50)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 05/17/2013 11:02:08 Replaces the Inital Report 05/10/2013 08:39:54. Reason Code: Data Entry-Change to Sample Volume

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041311522
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/07/13 10:10 AM
Analysis Date:	5/8/2013
Collected:	5/5/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249328	PAM-2	14484	0.142	0.010	0.003	
041311522-0024						
249302	PAM-3	14413	0.170	0.012	0.003	
041311522-0025						
249323	PAM-4	14768	0.103	0.007	0.003	
041311522-0026						
249338	PAM-5	14768	0.544	0.037	0.003	
041311522-0027						
249318	PAM-6	14413	0.174	0.012	0.003	
041311522-0028						
249339	PAM-7	14342	0.109	0.008	0.003	
041311522-0029						
249317	PAM-1	15883	0.364	0.023	0.003	
041311522-0030						
249342	PAM-2	15620	0.397	0.025	0.003	
041311522-0031						
249343	PAM-3	15691	0.384	0.024	0.003	
041311522-0032						
249340	PAM-4	15691	0.378	0.024	0.003	
041311522-0033						
249346	PAM-5	15620	0.364	0.023	0.003	
041311522-0034						

Analyst(s)

Shane Feret (50)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 05/17/2013 11:02:08 Replaces the Inital Report 05/10/2013 08:39:54. Reason Code: Data Entry-Change to Sample Volume

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order: 041311522
CustomerID: GTA51
CustomerPO:
ProjectID:

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 05/07/13 10:10 AM
Analysis Date: 5/8/2013
Collected: 5/5/2013

Project: **130467 USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249305	PAM-6	15620	0.124	0.008	0.003	
041311522-0035						
249345	PAM-7	15762	<0.05	<0.003	0.003	
041311522-0036						
249336	PAM-1	15351	0.250	0.016	0.003	
041311522-0037						
249319	PAM-2	14904	0.223	0.015	0.003	
041311522-0038						
249333	PAM-3	15258	0.223	0.015	0.003	
041311522-0039						
249348	PAM-4	15347	0.204	0.013	0.003	
041311522-0040						
249300	PAM-5	15315	0.217	0.014	0.003	
041311522-0041						
249314	PAM-6	15390	0.240	0.016	0.003	
041311522-0042						
249321	PAM-7	15397	0.178	0.012	0.003	
041311522-0043						
249303	PAM-2	15155	0.128	0.008	0.003	
041311522-0044						
249306	PAM-7	15274	0.136	0.009	0.003	
041311522-0045						

Analyst(s)

Shane Feret (50)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 05/17/2013 11:02:08 Replaces the Inital Report 05/10/2013 08:39:54. Reason Code: Data Entry-Change to Sample Volume

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041311522
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/07/13 10:10 AM
Analysis Date:	5/8/2013
Collected:	5/5/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249309	PAM-1	15206	0.246	0.016	0.003	
041311522-0046						
249311	PAM-5	15338	0.168	0.011	0.003	
041311522-0047						
249316	PAM-3	15134	0.231	0.015	0.003	
041311522-0048						
249334	PAM-6	15052	0.193	0.013	0.003	
041311522-0049						
249347	PAM-4	15152	0.150	0.010	0.003	
041311522-0050						
249444	MEDIA BLANK	0	<0.05	N/A	N\A	Field Blank
041311522-0008						

Notes: Discernable field blank submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (50)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 05/17/2013 11:02:08 Replaces the Inital Report 05/10/2013 08:39:54. Reason Code: Data Entry-Change to Sample Volume

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041311522

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041311522

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MD
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: sstevenson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm cassette
Manufacturer/Part #: Zefon TP53P
Lot #: 28127 (1-100)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249439	5.0 µ PVC	CrVI OSHA 215; Total Metals NIOSH 0500	15,729	4/29/13 1234	PAM-1	
249433			14,473	1245	PAM-2	
249443			14,406	1254	PAM-3	
249449			14,942	1309	PAM-4	
249422			14,582	1325	PAM-5	
249430			14,403	1338	PAM-6	
249400			14,909	1350	PAM-7	
249444			NA	1350	MEDIA BLANK	

RECEIVED MAY -1 A 10:54 EMSL CINNAMINSON, N.J.

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Teresa Pyron Terrence Perkins	4/29/13	Scott W. Cummings	4/29/13
Scott W. Cummings	4/30/13	AK FK	5/6/13
Scott W. Cummings	5/6/13		5/7/13 10:10

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSA 0500 FROM SAME SAMPLE CASSETTE.

50

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 04131522

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected:
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: SStevenson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm cassette
Manufacturer/Part #: Zefon 7853P
Lot #: 28127 (1-100)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249440	5.0 µ PVC	Cr VI OSHA 215; TOTAL FABRIC NIOSH 0500	15,007	4/30/13 1228	PAM-1	
249423	↓	↓	14,618	1236	PAM-2	
249402			14,389	1250	PAM-3	
249322			14,883	1307	PAM-4	
249335			14,781	1320	PAM-5	
249337			14,267	1329	PAM-6	
249444			14,822	1340	PAM-7	

CINNAMINSON N.J. 2013 MAY -7 A 10:54

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Jason Royer	4/30/13	Jamal Stevens	4/30/13
Jamal Stevens	4/30/13	Scott Cummings	5/6/13
Scott Cummings	5/6/13		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

04131522

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041311522

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041311522

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: SSTEVENSON@GTAENG.COM

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm, 3 PIECE CASSETTE
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: ZEFON 7P53P
☐	☒	☐	☐	☐	☐	☐	Lot #: 2B127 (1 - 100)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249329	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,309	5/1/13 13:00	PAM-1	
249313			15,004	5/1/13 13:07	PAM-2	
249327			14,308	5/1/13 13:10	PAM-3	
249344			14,460	5/1/13 13:13	PAM-4	
249320			14,791	5/1/13 13:16	PAM-5	
249326			14,187	5/1/13 13:22	PAM-6	
249332			14,841	5/1/13 13:27	PAM-7	

CINNAMINSON, N.J.
FEB 14 A 10:54

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	5/1/13	Scott W Cummings	5/1/13
Scott W Cummings	5/6/13		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 04131522

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

04131522

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL / State/Province: MD / Zip/Postal Code: 20707		City: LAUREL / State/Province: MD / Zip/Postal Code: 20707	
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: MARYLAND	
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm, 3 PIECE CASSETTE
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: ZEFON 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	Lot #: 2B127 (1 – 100)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249304	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	14,910	5/2/13 16:40	PAM 1	
249328			14,484	5/2/13 16:48	PAM 2	
249302			14,413	5/2/13 17:02	PAM 3	
249323			14,768	5/2/13 17:09	PAM 4	
249336			14,~~13~~768 (SWS)	5/2/13 17:15	PAM 5	
249318			14,~~342~~413 (SWS)	5/2/13 17:21	PAM 6	
249339			14,342 (SWS)	5/2/13 17:25	PAM 7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tammy Perkins	5/3/13	[illegible]	5/6/13
[illegible]	5/6/13	Scott W. Cummings	5/6/13
Scott W. Cummings	5/6/13		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

RECEIVED MAY 1 - AM 8:54 CINNAMINSON, NJ

0413111522

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041311522

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041311522

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL	State/Province: MD Zip/Postal Code: 20707	City: LAUREL	State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: MARYLAND	
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm, 3 PIECE CASSETTE
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: ZEFON 7P53P
☐	☒	☐	☐	☐	☐	☐	Lot #: 28127 (1 - 100)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249317	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,993	5/3/13 16:20	PAM 1	
249342			15,620	" 16:28	" 2	
249343			15,691	" 16:42	" 3	
249340			15,691	" 16:49	" 4	
249346			15,620	" 16:55	" 5	
249305			15,620	" 17:01	" 6	
249345			15,762	" 17:05	" 7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tyquina Dickie	5/3/13		5/6/13
Neal Stamp	5/6/13	Scott W Cummings	5/6/13
Scott W Cummings	5/6/13		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 04131522

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL	State/Province: MD	Zip/Postal Code: 20707	City: LAUREL	State/Province: MD	Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA			U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm, 3 PIECE CASSETTE
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: ZEFON 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	Lot #: 28127 (1 - 100)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249336	5.0μ PVC	CrVI OSHA 215 /	15,351	45/5/13 16:10	PAM 1	
249319		TOTAL PARTICULATES	14,904	5/5/13 16:21	PAM 2	
249333		NIOSH 0500	15,258	5/5/13 16:30	PAM 3	
249348			15,347	5/5/13 16:41	PAM 4	
249300			15,315	5/5/13 16:50	PAM 5	
249314			15,390	5/5/13 17:00	PAM 6	
249321			15,397	5/15/13 17:09	PAM 7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Jason DeRun	5/6/2013	Scott W Cummings	5/6/13
Scott W Cummings	5/6/13		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

0413111522

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 04131522

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL / State/Province: MD / Zip/Postal Code: 20707		City: LAUREL / State/Province: MD / Zip/Postal Code: 20707	
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: MARYLAND	
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssterenson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm, 3 PIECE CASSETTE
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: ZEFON 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	Lot #: 28127 (1 - 100)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249303	5.0µ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,155	5/4/13 16:30	PAM 2	
249306			15,274	5/4/13 17:10	PAM 7	
249309			15,206	5/4/13 16:20	PAM 1	
249311			15,338	5/4/13 17:02	PAM 5	
249316			15,134	5/4/13 16:44	PAM 3	
249334			15,052	5/4/13 17:05	PAM 6	
249347			15,152	5/4/13 16:50	PAM 4	

RECEIVED CINNAMINSON, N.J. MAY 7 A 10:54

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Sam Re Run Scott W Cumming	5/6/2013 5/6/13	Scott W Cumming	5/6/13

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

04131522

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 5/14/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 5/8/2013. The results are tabulated on the attached data pages for the following client designated project:

130467 USA

The reference number for these samples is EMSL Order #011301915. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301915
CustomerID:	GTA51
CustomerPO:	041311522
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/08/13 9:00 AM
Collected:	5/5/2013

Analytical Results

Client Sample Description 249439 PAM-1 ***Collected:*** 4/29/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00083	0.00051	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249433 PAM-2 ***Collected:*** 4/29/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0011	0.00069	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249443 PAM-3 ***Collected:*** 4/29/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0020	0.00069	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249449 PAM-4 ***Collected:*** 4/29/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0014	0.00067	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249422 PAM-5 ***Collected:*** 4/29/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0037	0.00069	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249430 PAM-6 ***Collected:*** 4/29/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0017	0.00069	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249400 PAM-7 ***Collected:*** 4/29/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00067	µg/m³	5/10/2013	MM	5/13/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301915
CustomerID:	GTA51
CustomerPO:	041311522
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/08/13 9:00 AM
Collected:	5/5/2013

Analytical Results

Client Sample Description 249444 Media Blank ***Collected:*** 4/29/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.015	0.010	µg/filter	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249440 PAM-1 ***Collected:*** 4/30/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00072	0.00067	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249423 PAM-2 ***Collected:*** 4/30/2013 ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0010	0.00068	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249402 PAM-3 ***Collected:*** 4/30/2013 ***Lab ID:*** *0011*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0037	0.00070	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249322 PAM-4 ***Collected:*** 4/30/2013 ***Lab ID:*** *0012*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00067	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249335 PAM-5 ***Collected:*** 4/30/2013 ***Lab ID:*** *0013*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0025	0.00068	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249337 PAM-6 ***Collected:*** 4/30/2013 ***Lab ID:*** *0014*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0011	0.00070	µg/m³	5/10/2013	MM	5/13/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301915
CustomerID:	GTA51
CustomerPO:	041311522
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/08/13 9:00 AM
Collected:	5/5/2013

Project: **130467 USA**

Analytical Results

Client Sample Description 249414 PAM-7 ***Collected:*** 4/30/2013 ***Lab ID:*** *0015*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249329 PAM-1 ***Collected:*** 5/1/2013 ***Lab ID:*** *0016*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00072	0.00065	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249313 PAM-2 ***Collected:*** 5/1/2013 ***Lab ID:*** *0017*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00067	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249327 PAM-3 ***Collected:*** 5/1/2013 ***Lab ID:*** *0018*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0017	0.00070	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249344 PAM-4 ***Collected:*** 5/1/2013 ***Lab ID:*** *0019*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0017	0.00069	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249320 PAM-5 ***Collected:*** 5/1/2013 ***Lab ID:*** *0020*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0011	0.00068	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249326 PAM-6 ***Collected:*** 5/1/2013 ***Lab ID:*** *0021*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0015	0.00071	µg/m³	5/10/2013	MM	5/14/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301915
CustomerID:	GTA51
CustomerPO:	041311522
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/08/13 9:00 AM
Collected:	5/5/2013

Project: **130467 USA**

Analytical Results

Client Sample Description 249332 PAM-7 ***Collected:*** 5/1/2013 ***Lab ID:*** *0022*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00067	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249304 PAM-1 ***Collected:*** 5/2/2013 ***Lab ID:*** *0023*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00078	0.00067	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249328 PAM-2 ***Collected:*** 5/2/2013 ***Lab ID:*** *0024*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249302 PAM-3 ***Collected:*** 5/2/2013 ***Lab ID:*** *0025*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249323 PAM-4 ***Collected:*** 5/2/2013 ***Lab ID:*** *0026*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0010	0.00068	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249338 PAM-5 ***Collected:*** 5/2/2013 ***Lab ID:*** *0027*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00088	0.00068	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249318 PAM-6 ***Collected:*** 5/2/2013 ***Lab ID:*** *0028*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0016	0.00069	µg/m³	5/10/2013	MM	5/14/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301915
CustomerID:	GTA51
CustomerPO:	041311522
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/08/13 9:00 AM
Collected:	5/5/2013

Analytical Results

Client Sample Description 249339 PAM-7 ***Collected:*** 5/2/2013 ***Lab ID:*** *0029*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0011	0.00070	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249317 PAM-1 ***Collected:*** 5/3/2013 ***Lab ID:*** *0030*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00063	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249342 PAM-2 ***Collected:*** 5/3/2013 ***Lab ID:*** *0031*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0014	0.00064	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249343 PAM-3 ***Collected:*** 5/3/2013 ***Lab ID:*** *0032*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0020	0.00064	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249340 PAM-4 ***Collected:*** 5/3/2013 ***Lab ID:*** *0033*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00064	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249346 PAM-5 ***Collected:*** 5/3/2013 ***Lab ID:*** *0034*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0015	0.00064	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249305 PAM-6 ***Collected:*** 5/3/2013 ***Lab ID:*** *0035*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00064	µg/m³	5/10/2013	MM	5/14/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301915
CustomerID:	GTA51
CustomerPO:	041311522
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/08/13 9:00 AM
Collected:	5/5/2013

Analytical Results

Client Sample Description 249345 PAM-7 ***Collected:*** 5/3/2013 ***Lab ID:*** *0036*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00063	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249336 PAM-1 ***Collected:*** 5/5/2013 ***Lab ID:*** *0037*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00065	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249319 PAM-2 ***Collected:*** 5/5/2013 ***Lab ID:*** *0038*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00067	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249333 PAM-3 ***Collected:*** 5/5/2013 ***Lab ID:*** *0039*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00066	µg/m³	5/10/2013	MM	5/14/2013	MM

Client Sample Description 249348 PAM-4 ***Collected:*** 5/5/2013 ***Lab ID:*** *0040*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00074	0.00065	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249300 PAM-5 ***Collected:*** 5/5/2013 ***Lab ID:*** *0041*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00065	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249314 PAM-6 ***Collected:*** 5/5/2013 ***Lab ID:*** *0042*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00065	µg/m³	5/10/2013	MM	5/13/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301915
CustomerID:	GTA51
CustomerPO:	041311522
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 05/08/13 9:00 AM
Collected: 5/5/2013

Project: **130467 USA**

Analytical Results

Client Sample Description 249321 PAM-7 ***Collected:*** 5/5/2013 ***Lab ID:*** *0043*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00065	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249303 PAM-2 ***Collected:*** 5/4/2013 ***Lab ID:*** *0044*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00066	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249306 PAM-7 ***Collected:*** 5/4/2013 ***Lab ID:*** *0045*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00066	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249309 PAM-1 ***Collected:*** 5/4/2013 ***Lab ID:*** *0046*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00066	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249311 PAM-5 ***Collected:*** 5/4/2013 ***Lab ID:*** *0047*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00065	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249316 PAM-3 ***Collected:*** 5/4/2013 ***Lab ID:*** *0048*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00066	µg/m³	5/10/2013	MM	5/13/2013	MM

Client Sample Description 249334 PAM-6 ***Collected:*** 5/4/2013 ***Lab ID:*** *0049*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00066	µg/m³	5/10/2013	MM	5/13/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011301915
CustomerID:	GTA51
CustomerPO:	041311522
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/08/13 9:00 AM
Collected:	5/5/2013

Project: **130467 USA**

Analytical Results

Client Sample Description 249347
PAM-4

Collected: 5/4/2013 ***Lab ID:*** *0050*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0014	0.00066	µg/m³	5/10/2013	MM	5/14/2013	MM

Definitions:
ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 01301915

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON			Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.			Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE			Street: 14280 PARK CENTER DRIVE
City: LAUREL	State/Province: MD	Zip/Postal Code: 20707	City: LAUREL / State/Province: MD / Zip/Postal Code: 20707
Phone: (410) 792-9446	Fax: (410) 792-7395		Phone: (410) 792-9446 / Fax: (410) 792-7395
Project Name: 130467 USA			U.S. State where Samples Collected: MD
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail			Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37 mm cassette
Manufacturer/Part #: Zefon TP53P
Lot #: 28127 (1-100)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
1	249439	5.0 µ PVC	CrVI OSHA 215; Total Particulate NIOSH 0500	15,729	4/29/13 1234	DAM-1	
2	249433			14,473	1245	DAM-2	
3	249443			14,406	1254	DAM-3	
4	249449			14,942	1309	DAM-4	
5	249422			14,582	1325	DAM-5	
6	249430			14,403	1338	DAM-6	
7	249400			14,909	1350	DAM-7	
8	249444			NA	1350	MEDIA BLANK	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Teresa Pyron	4/29/13		4/29/13
Terrence Perkins	4/30/13		5/6/13
Scott A. Cummings	5/6/13	Scott A. Cummings AK FX	5/7/13 10:10A

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.
Received: Travis Allen 5/8/13 9:00AM

per Sam – Not welding, plating, painting env. 5/8 3:00pm -TA
left message – Welding, plating, painting env? 5/8 1:00pm -TA

01130191S

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 01130915

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected:
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: SStevenson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 28127 (1-100)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
(9)	249440	5.0 µ PVC	Cr VI OSHA 215; TOTAL FABRIC NIOSH 0500	15,007	4/30/13 1228	PAM-1	BLANK
(10)	249423	↓	↓	14,618	1236	PAM-2	
(11)	249402			14,389	1250	PAM-3	
(12)	249322			14,883	1307	PAM-4	
(13)	249335			14,781	1320	PAM-5	
(14)	249337			14,267	1329	PAM-6	
(15)	249414			14,822	1340	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Terry Rowe	4/30/13	Kent Thigpen	4/30/13
Kent Thigpen	4/30/13	Scott Cummings	5/6/13
Scott Cummings	5/6/13	Received: Travi Albert	5/8/13 9:00 AM

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

01130915

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 01130191 5

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: SSteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (1 - 100)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
16	249329	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,309	5/1/13 13:00	PAM-1	
17	249313			15,004	5/1/13 13:07	PAM-2	
18	249327			14,308	5/1/13 13:10	PAM-3	
19	249344			14,460	5/1/13 13:13	PAM-4	
20	249320			14,791	5/1/13 13:16	PAM-5	
21	249326			14,187	5/1/13 13:22	PAM-6	
22	249332			14,841	5/1/13 13:27	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	5/1/13	Scott W Cummings	5/1/13
	5/6/13	Received: Travis Allen	5/8/13 9:00AM

Comments:

* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

01130191 5

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 01130915

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

Report To Contact Name: Sam Stevenson		**Bill To Company:** Geo-Technology Associates, Inc.	
Company Name: Geo-Technology Associates, Inc.		**Attention To:** Sam Stevenson	
Street: 14280 Park Center Drive		**Street:** 14280 Park Center Drive	
City: Laurel	**State/Province:** MD **Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD **Zip/Postal Code:** 20707
Phone: (410) 792-9446 **Fax:** (410) 792-7395		**Phone:** (410) 792-9446 **Fax:** (410) 792-7395	
Project Name: 130467 USA			**U.S. State where Samples Collected:** Maryland
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**	**Sampled By (Signature):**
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 2B127 (1 – 100)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
23	249304	5.0μ PVC	CrVI OSHA 215 / Total Particulates NIOSH 0500	14,910	5/2/13 16:40	PAM 1	
24	249328			14,484	5/2/13 16:48	PAM 2	
25	249302			14,413	5/2/13 17:02	PAM 3	
26	249323			14,768	5/2/13 17:09	PAM 4	
27	249336			~~14,413~~ 14,768	5/2/13 17:15	PAM 5	
28	249318			~~14,342~~ 14,413	5/2/13 17:21	PAM 6	
29	249339			14,342	5/2/13 17:25	PAM 7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Jeremy Perkins	5/3/13		
Jamal Hayes	5/6/13		
Scott W. Cline	5/6/13	Scott W. Cline	5/6/13
		Received: Evan Valliere	5/8/13 9:00AM

Comments:

* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.

011301915

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 01130915

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 2B127 (1 - 100)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
31	249317	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,993	5/3/13 16:20	PAM 1	
32	249342			15,620	" 16:28	" 2	
33	249343			15,691	" 16:42	" 3	
34	249340			15,691	" 16:49	" 4	
35	249346			15,620	" 16:55	" 5	
36	249305			15,620	" 17:01	" 6	
	249345			15,762	" 17:05	" 7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tyanna Dickie	5/3/13		5/6/13
Scott W Cummins	5/6/13	Scott W Cummins	5/6/13
	5/6/13	Received: Travis Allcut	5/8/13 9:00AM

Comments:

* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

01130915

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 01130915

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

01130915

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: SSTEVENSON@GTAENG.COM

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 2B127 (1 - 100)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
37	249336	5.0µ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,351	45/5/13 16:10	PAM 1	
38	249319			19,904	5/5/13 16:21	PAM 2	
39	249333			15,258	5/5/13 16:30	PAM 3	
40	249348			15,347	5/5/13 16:41	PAM 4	
41	249300			15,315	5/5/13 16:50	PAM 5	
42	249314			15,390	5/5/13 17:00	PAM 6	
43	249321			15,397	5/5/13 17:09	PAM 7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	5/6/2013	Scott W Cummings	5/6/13
	5/6/13	Received: Travis Allen	5/8/13 9:00AM

Comments:

* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011301915

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011301915

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: SSTEVENSON@GTAENG.COM

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 2B127 (1 - 100)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249303	5.0μ PVC	CrII OSHA 215 / TOTAL PARTICULATES NIOSH 6500	15,155	5/4/13 16:30	PAM 2	
249306			15,274	5/4/13 17:10	PAM 7	
249309			15,206	5/4/13 16:20	PAM 1	
249311			15,338	5/4/13 17:02	PAM 5	
249316			15,134	5/4/13 16:44	PAM 3	
249334			15,052	5/4/13 17:05	PAM 6	
249347			15,152	5/4/13 16:50	PAM 4	

RECEIVED CINNAMINSON, N.J. MAY 1 A 9:51

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Travis DeRue / Scott W Cummings	5/6/2013 5/6/13	Scott W Cummings	5/6/13
		Received: Travis Allnut	5/8/13 9:00AM

Comments:

* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

011301915

Interdepartmental Analysis COC

For EMSL Internal Use Only

Client Name: Geo-Technology Associates Date: 5/7/13

Primary Lab Order #: 041311522

Secondary Lab Client Code: +_____ Inter Dept Analysis

(+04INTDEP or +32INTDEP)

Primary Lab	
Samples Received By:	**Print Name of Person Relinquishing Samples**
☐ *Branch Lab***	
☒ Asbestos Lab	Shane J. Feret
☐ Chemistry Lab	
☐ Lead Lab	
☐ Microbiology Lab	
☐ Materials Science Lab	
☐ Industrial Hygiene Lab	

Secondary Lab	
Samples Relinquished To:	**Print Name of Person Receiving Samples**
☐ *Branch Lab***	
☐ Asbestos Lab	
☒ Chemistry Lab	Travis Albert
☐ Lead Lab	
☐ Microbiology Lab	
☐ Materials Science Lab	
☐ Industrial Hygiene Lab	

☐ **Pink Interdepartmental Sheet Attached** ☐ **Copy of Client COC Attached**

Instructions to Secondary Lab	
1. Login Samples As Per Instructions (use +04INTDEP as Bill-To, and Client ID if needed)	
2. Use Primary Lab Person as Contact Under the Bill-To ID	
3. Under PO Field, Enter Primary Lab Order # (noted above)	
4. Under Project Field, Enter Client's Project From Client's COC (if attached)	
5. Perform The Analysis Requested on COC Per Client's Instructions	☑
6. Perform Analysis As Per Description Below:	☐

Instructions to Secondary Lab – Reporting & Billing
1. Create Report and Internal Invoice
2. Report Results To Client – Follow Instructions on Client's COC
3. Do Not Mail Report Or Invoice, but Return to Primary Lab

~PRIMARY LAB RECEIVES SAMPLES ORIGINALLY WILL BE RESPONSIBLE FOR~
~DISBURSING REPORT AND INVOICE TOGETHER WITH ORIGINAL ORDER~

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041312334
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/15/13 9:20 AM
Analysis Date:	5/16/2013
Collected:	5/13/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249301	1	15172	0.219	0.014	0.003	
041312334-0001						
249308	2	15198	0.265	0.017	0.003	
041312334-0002						
249349	3	15308	0.183	0.012	0.003	
041312334-0003						
249312	4	14888	0.220	0.015	0.003	
041312334-0004						
249325	5	15026	0.238	0.016	0.003	
041312334-0005						
249307	6	15080	0.543	0.036	0.003	
041312334-0006						
249324	7	15109	0.241	0.016	0.003	
041312334-0007						
249341	1	15317	0.093	0.006	0.003	
041312334-0008						
249310	2	15443	0.108	0.007	0.003	
041312334-0009						
249331	3	15100	0.115	0.008	0.003	
041312334-0010						
249330	4	14904	0.105	0.007	0.003	
041312334-0011						

Analyst(s)

Shane Feret (50)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 05/21/2013 10:09:59 Replaces the Inital Report 05/17/2013 12:50:03. Reason Code: Data Entry-Change to Sample ID

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041312334
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/15/13 9:20 AM
Analysis Date:	5/16/2013
Collected:	5/13/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249244	5	15287	0.127	0.008	0.003	
041312334-0012						
249222	6	15443	0.178	0.012	0.003	
041312334-0013						
249246	7	15443	0.126	0.008	0.003	
041312334-0014						
249227	1	14877	0.145	0.010	0.003	
041312334-0016						
249213	2	14670	0.148	0.010	0.003	
041312334-0017						
249226	3	14650	<0.05	<0.003	0.003	
041312334-0018						
249228	4	14620	0.229	0.016	0.003	
041312334-0019						
249236	5	14580	0.199	0.014	0.003	
041312334-0020						
249230	6	14696	0.153	0.010	0.003	
041312334-0021						
249207	7	14645	0.188	0.013	0.003	
041312334-0022						
249208	2	14646	0.247	0.017	0.003	
041312334-0023						

Analyst(s)

Shane Feret (50)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 05/21/2013 10:09:59 Replaces the Inital Report 05/17/2013 12:50:03. Reason Code: Data Entry-Change to Sample ID

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041312334
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/15/13 9:20 AM
Analysis Date:	5/16/2013
Collected:	5/13/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249221	3	14749	0.306	0.021	0.003	
041312334-0024						
249232	4	14749	0.285	0.019	0.003	
041312334-0025						
249240	5	14615	0.322	0.022	0.003	
041312334-0026						
249243	6	15127	0.470	0.031	0.003	
041312334-0027						
249242	7	15232	0.249	0.016	0.003	
041312334-0028						
249220	1	14522	0.178	0.012	0.003	
041312334-0029						
249223	2	14500	0.128	0.009	0.003	
041312334-0030						
249234	3	14450	<0.05	<0.003	0.003	
041312334-0031						
249247	4	14450	<0.05	<0.003	0.003	
041312334-0032						
249206	5	14490	0.238	0.016	0.003	
041312334-0033						
249224	6	14200	0.551	0.039	0.004	
041312334-0034						

Analyst(s)

Shane Feret (50)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 05/21/2013 10:09:59 Replaces the Inital Report 05/17/2013 12:50:03. Reason Code: Data Entry-Change to Sample ID

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041312334
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/15/13 9:20 AM
Analysis Date:	5/16/2013
Collected:	5/13/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249218	7	14220	0.305	0.021	0.004	
041312334-0035						
249231	PAM-1	14331	0.113	0.008	0.003	
041312334-0036						
249245	PAM-2	14169	0.094	0.007	0.004	
041312334-0037						
249229	PAM-3	14280	0.108	0.008	0.004	
041312334-0038						
249233	PAM-4	14310	0.127	0.009	0.003	
041312334-0039						
249205	PAM-5	14320	0.122	0.009	0.003	
041312334-0040						
249214	PAM-6	14440	0.287	0.020	0.003	
041312334-0041						
249216	PAM-7	14380	0.142	0.010	0.003	
041312334-0042						
249225	PAM-1	14584	0.112	0.008	0.003	
041312334-0043						
249241	PAM-2	14395	0.111	0.008	0.003	
041312334-0044						
249201	PAM-3	14447	0.120	0.008	0.003	
041312334-0045						

Analyst(s)

Shane Feret (50)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 05/21/2013 10:09:59 Replaces the Inital Report 05/17/2013 12:50:03. Reason Code: Data Entry-Change to Sample ID

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041312334
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/15/13 9:20 AM
Analysis Date:	5/16/2013
Collected:	5/13/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249235	PAM-4	14428	0.098	0.007	0.003	
041312334-0046						
249210	PAM-5	14418	0.144	0.010	0.003	
041312334-0047						
249204	PAM-6	14477	2.794	0.193	0.003	
041312334-0048						
249200	PAM-7	14507	0.108	0.007	0.003	
041312334-0049						
249248	Media blank	0	<0.05	N/A	N\A	
041312334-0050						
249338	Field blank 1	0	<0.05	N/A	N\A	Field Blank
041312334-0015						

Notes: Discernable field blank submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (50)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 05/21/2013 10:09:59 Replaces the Inital Report 05/17/2013 12:50:03. Reason Code: Data Entry-Change to Sample ID

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041312334

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

Report To Contact Name: Sam Stevenson		Bill To Company: Geo-Technology Associates, Inc.	
Company Name: Geo-Technology Associates, Inc.		Attention To: Sam Stevenson	
Street: 14280 Park Center Drive		Street: 14280 Park Center Drive	
City: Laurel / State/Province: MD / Zip/Postal Code: 20707		City: Laurel / State/Province: MD / Zip/Postal Code: 20707	
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: Maryland	
Number of Samples in Shipment: 7	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): TP
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 28127 (1-100)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249301	5.0μ PVC	Cr VI OSHA 215 / Total Particulates NIOSH 0500	15,172	5/6/13 16:00	1	
249308			15,198	" 16:08	2	
249349			15,308	" 16:20	3	
249312			14,888	" 16:25	4	
249325			15,026	" 16:33	5	
249307			15,080	" 16:40	6	
249324			15,109	" 16:49	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tammy Perkins	5/6/13	Scott W Cummings	5/8/13
Scott W Cummings	5/14/13	VC FX	5/15/13 920

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.

CINNAMINSON, N.J.
2013 MAY 15 A 11:40

041312334

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041312334

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL	State/Province: MD	Zip/Postal Code: 20707	City: LAUREL	State/Province: MD	Zip/Postal Code: 20707
Phone: (410) 792-9446	Fax: (410) 792-7395	Phone: (410) 792-9446	Fax: (410) 792-7395
Project Name: 130467 USA		U.S. State where Samples Collected: MARYLAND	
Number of Samples in Shipment: 7	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): TP
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (1 - 100) + (101 - 200)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249341	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,317	5/7/13 16:05	1	LOT 28127 (1-100)
249310			15,443	16:18	2	
249331			15,100	16:25	3	
249330			14,904	16:33	4	
249244			15,287	16:42	5	LOT 28127 (101-200)
249222			15,443	16:50	6	
24924C			15,443	17:00	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tammy Perkins Scott W Cummings	5/8/13 5/14/13	Scott W Cummings	5/8/13

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041312334

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

Report To Contact Name: Sam Stevenson		Bill To Company: Geo-Technology Associates, Inc.	
Company Name: Geo-Technology Associates, Inc.		Attention To: Sam Stevenson	
Street: 14280 Park Center Drive		Street: 14280 Park Center Drive	
City: Laurel / State/Province: MD / Zip/Postal Code: 20707		City: Laurel / State/Province: MD / Zip/Postal Code: 20707	
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: Maryland	
Number of Samples in Shipment: 8	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): TP
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 2B127 (101 - 200)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249338	5.0μ PVC	Cr VI OSHA 215 / Total Particulates NIOSH 0500	0	5/8/13 16:30	4* ~~FB~~ Field Blank 1	
249227			14,977	16:30	1	
249213			14,670	16:45	2	
249226			14,650	16:50	3	
249228			14,620	16:55	4	
249236			14,580	17:00	5	
249230			14,696	17:05	6	
249207			14,645	17:10	7	

RECEIVED MAY 15 A 11:40

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Terri Pelz	5/9/13	Scott W Cumming	5/8/13
Scott W Cumming	5/14/13		

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.

041312334

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041312334

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL / State/Province: MD / Zip/Postal Code: 20707		City: LAUREL / State/Province: MD / Zip/Postal Code: 20707	
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: MARYLAND	
Number of Samples in Shipment: 6 / Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): TP	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm, 3 PIECE CASSETTE
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: ZEFON 7P53P
☐	☒	☐	☐	☐	☐	☐	Lot #: 28127 (101 - 200)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
* 249411 SUB	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	~~15,173~~ SWC	5/10/13 16:05	1 SWC	RUN TIME INTERRUPTION - VOL UNKN
249209			14,646	16:10	2	
249221			14,749	16:20	3	
249232			14,749	16:25	4	
249240			14,615	16:30	5	
249243			15,127	17:10	6	
249242			15,232	17:18	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Travis Pettit	5/13/13	Scott W Cummings	5/13/13
Scott W Cummings	5/14/13		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041312334

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: 7 Date of Shipment: 5/14/13	Purchase Order: Sampled By (Signature): T.P.
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 2B127 (101 - 200)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249220	5.0μ PVC	Cr VI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	14,522	5/11/13 16:10	1	
249223			14,500	16:20	2	
249234			14,450	16:25	3	
249247			14,450	16:30	4	
249206			14,490	16:39	5	
249224			14,200	16:50	6	
249218			14,220	17:00	7	

RECEIVED MAY 15 A 11:40 CINNAMINSON, NJ

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	5/13/13	Scott W Cummings	5/13/13
Scott W Cummings	5/14/13		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

041312334

EMSL ANALYTICAL, INC.
LABORATORY · PRODUCTS · TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041312334

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL	State/Province: MD Zip/Postal Code: 20707	City: LAUREL	State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: MARYLAND	
Number of Samples in Shipment: 7	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (101 -206)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249231	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	~~14402~~ 14,331	5/12/13 16:56	PAM-1	
249243			~~14400~~ 14,169	5/12/13 16:04	PAM-2	
249229			~~14328~~ 14,220	5/12/13 16:13	PAM-3	
249233			~~14400~~ 14,310	5/12/13 16:21	PAM-4	
249205			~~14400~~ 14,320	5/12/13 16:31	PAM-5	
249214			~~14400~~ 14,400	5/12/13 16:50	PAM-6	
249216			~~14400~~ 14,380	5/12/13 16:58	PAM-7	

CINNAMINSON, N.J. 2013 MAY 15 A 11:40

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Shichan Choy	5/13/2013	Scott W Cimmino	5/13/13
Scott W Cimmino	5/14/2013		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

041312334

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041312334

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON			Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.		
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.			Attention To: SAM STEVENSON		
Street: 14280 PARK CENTER DRIVE			Street: 14280 PARK CENTER DRIVE		
City: LAUREL	State/Province: MD	Zip/Postal Code: 20707	City: LAUREL	State/Province: MD	Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395			Phone: (410) 792-9446 Fax: (410) 792-7395		
Project Name: 130467 USA			U.S. State where Samples Collected: MARYLAND		
Number of Samples in Shipment: 8	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): Scott W Cummings		
Please Provide results: ☐ Fax ☒ Email ☒ Mail			Email Results To: ssteverson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm, 3 PIECE CASSETTE
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: ZEFON 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	Lot #: 28127 (101 – 200)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249225	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	14,584	5/13/13 16:00	PAM-1	
249241			14,395	16:18	PAM-2	
249201			14,447	16:25	PAM-3	
249235			14,428	16:31	PAM-4	
249210			14,418	16:40	PAM-5	
249204			14,477	17:05	PAM-6	
249200			14,507	17:16	PAM-7	
249248			—	—	MEDIA BLANK	

RECEIVED CINNAMINSON, N.J. 2013 MAY 15 A 11:40

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	5/14/13		

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

041312334

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 5/22/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 5/16/2013. The results are tabulated on the attached data pages for the following client designated project:

130467 USA

The reference number for these samples is EMSL Order #011302079. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302079
CustomerID:	GTA51
CustomerPO:	041312334
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 05/16/13 4:00 PM
Collected:

Project: **130467 USA**

Analytical Results

Client Sample Description 249341 Pam-1 ***Collected:*** ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00065	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249310 Pam-2 ***Collected:*** ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00065	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249331 Pam-3 ***Collected:*** ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00066	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249330 Pam-4 ***Collected:*** ***Lab ID:*** *0011*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00067	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249244 Pam-5 ***Collected:*** ***Lab ID:*** *0012*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00082	0.00065	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249222 Pam-6 ***Collected:*** ***Lab ID:*** *0013*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00065	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249246 Pam-7 ***Collected:*** ***Lab ID:*** *0014*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00065	µg/m³	5/20/2013	MM	5/20/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302079
CustomerID:	GTA51
CustomerPO:	041312334
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 05/16/13 4:00 PM
Collected:

Project: **130467 USA**

Analytical Results

Client Sample Description 249338 Field Blank 1 ***Collected:*** ***Lab ID:*** *0015*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249227 Pam-1 ***Collected:*** ***Lab ID:*** *0016*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0020	0.00067	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249213 Pam-2 ***Collected:*** ***Lab ID:*** *0017*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249226 Pam-3 ***Collected:*** ***Lab ID:*** *0018*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249228 Pam-4 ***Collected:*** ***Lab ID:*** *0019*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249236 Pam-5 ***Collected:*** ***Lab ID:*** *0020*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249230 Pam-6 ***Collected:*** ***Lab ID:*** *0021*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	5/20/2013	MM	5/21/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302079
CustomerID:	GTA51
CustomerPO:	041312334
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 05/16/13 4:00 PM
Collected:

Project: **130467 USA**

Analytical Results

Client Sample Description 249207 Pam-7 ***Collected:*** ***Lab ID:*** *0022*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249220 Pam-1 ***Collected:*** ***Lab ID:*** *0029*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249223 Pam-2 ***Collected:*** ***Lab ID:*** *0030*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0015	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249234 Pam-3 ***Collected:*** ***Lab ID:*** *0031*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249247 Pam-4 ***Collected:*** ***Lab ID:*** *0032*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249206 Pam-5 ***Collected:*** ***Lab ID:*** *0033*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249224 Pam-6 ***Collected:*** ***Lab ID:*** *0034*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0039	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302079
CustomerID:	GTA51
CustomerPO:	041312334
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 05/16/13 4:00 PM
Collected:

Project: **130467 USA**

Analytical Results

Client Sample Description 249218 Pam-7 ***Collected:*** ***Lab ID:*** *0035*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00080	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249231 Pam-1 ***Collected:*** ***Lab ID:*** *0036*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249245 Pam-2 ***Collected:*** ***Lab ID:*** *0037*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0047	0.00071	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249229 Pam-3 ***Collected:*** ***Lab ID:*** *0038*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0036	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249233 Pam-4 ***Collected:*** ***Lab ID:*** *0039*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249205 Pam-5 ***Collected:*** ***Lab ID:*** *0040*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0021	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249214 Pam-6 ***Collected:*** ***Lab ID:*** *0041*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0033	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302079
CustomerID:	GTA51
CustomerPO:	041312334
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/16/13 4:00 PM
Collected:	

Analytical Results

Client Sample Description 249216 Pam-7 ***Collected:*** ***Lab ID:*** *0042*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249248 Media Blank 1 ***Collected:*** ***Lab ID:*** *0050*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	5/20/2013	MM	5/21/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL / State/Province: MD / Zip/Postal Code: 20707		City: LAUREL / State/Province: MD / Zip/Postal Code: 20707	
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: MARYLAND	
Number of Samples in Shipment: 7	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): TP
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 2B127 (1 - 100)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
1	249301	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,172	5/6/13 16:00	1	
2	249308			15,198	" 16:08	2	
3	249349			15,308	" 16:20	3	
4	249312			14,888	" 16:25	4	
5	249325			15,026	" 16:33	5	
6	249307			15,080	" 16:40	6	
7	249324			15,109	" 16:49	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Jennifer Perkins	5/6/13	Scott W Cummings	5/8/13
Scott W Cummings	5/14/13	VE FX	5/15/13 920
			5/16/13 9:00p

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

4 per client return samples w/out analysis
AG 5/17

011302079

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 0807
Phone: (800) 220-367
Fax: (856) 858-350

Report To Contact Name: Sam Stevenson		Bill To Company: Geo-Technology Associates, Inc	
Company Name: Geo-Technology Associates, Inc.		Attention To: Sam Stevenson	
Street: 14280 Park Center Drive		Street: 14280 Park Center Drive	
City: Laurel	State/Province: MD	Zip/Postal Code: 20707	City: Laurel	State/Province: MD	Zip/Postal Code: 207
Phone: (410) 792-9446 Fax: (410) 792-7395			Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA			U.S. State where Samples Collected: Marylan
Number of Samples in Shipment: 7	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): TP
Please Provide results: ☐ Fax ☒ Email ☒ Mail			Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece Casse
Manufacturer/Part #: Zefon 7P53
Lot #: 28127 (1 - 100, 101 - 200)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
(8) 249341	5.0µ PVC	CrVI OSHA 215 /	15,317	5/7/13 16:05	1	Lot 28127 (1-100)
(9) 249310		Total Particulates	15,443	16:18	2	
(10) 249331		NIOSH 0500	15,100	16:25	3	
(11) 249330			14,904	16:33	4	
(12) 249244			15,287	16:42	5	Lot 28127 (101-200)
(13) 249222			15,443	16:50	6	
(14) 249246			15,443	17:00	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	5/8/13	Scott W Cummings	5/8/13
Scott W Cummings	5/14/13		5/16/13 4:00p

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassett

011302079

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

Report To Contact Name: Sam Stevenson		Bill To Company: Geo-Technology Associates, Inc.	
Company Name: Geo-Technology Associates, Inc.		Attention To: Sam Stevenson	
Street: 14280 Park Center Drive		Street: 14280 Park Center Drive	
City: Laurel	State/Province: MD	Zip/Postal Code: 20707	City: Laurel	State/Province: MD	Zip/Postal Code: 2070
Phone: (410) 792-9446	Fax: (410) 792-7395		Phone: (410) 792-9446	Fax: (410) 792-7395
Project Name: 130467 USA			U.S. State where Samples Collected: Maryland
Number of Samples in Shipment: 8	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): TP
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm, 3 piece cassette
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	Lot #: 28127 (101 - 200)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
15 249338	5.0µ PVC	CrVI OSHA 215 /	0	5/9/13 16:30	~~(EB)~~ Field Bank 1	
16 249227		Total Particulates	14,977	16:30	1	
17 249213		NIOSH 0500	14,670	16:45	2	
18 249226			14,650	16:50	3	
19 249224			14,620	16:55	4	
20 249236			14,590	17:00	5	
21 249230			14,696	17:05	6	
22 249207			14,645	17:10	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Terri Pelz	5/9/13	Scott W Cumming	5/8/13
Scott W Cumming	5/14/13		5/16/13 4:00pm

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette

011302079

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

Report To Contact Name: Sam Stevenson	Bill To Company: Geo-Technology Associates, Inc.
Company Name: Geo-Technology Associates, Inc.	Attention To: Sam Stevenson
Street: 14280 Park Center Drive	Street: 14280 Park Center Drive
City: Laurel State/Province: MD Zip/Postal Code: 20707	City: Laurel State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: Maryland
Number of Samples in Shipment: 6 Date of Shipment: 5/14/13	Purchase Order: Sampled By (Signature): TP
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 28127 (101 - 200)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
*	249411 SOC	5.0 µ PVC	Cr VI OSHA 215 / Total Particulates NIOSH 0500	15,173 SOC	5/10/13 16:05	SOC	Run time interruption - Vol Un
23	249209			14,646	16:10	2	
24	249221			14,749	16:20	3	
25	249232			14,749	16:25	4	
26	249240			14,615	16:30	5	
27	249243			15,127	17:10	6	
28	249242			15,232	17:15	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Travis Pyles	5/13/13	Scott W Cummings	5/13/13
Scott W Cummings	5/14/13		5/16/13 4:00p

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.

011302079

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

Report To Contact Name: Sam Stevenson		Bill To Company: Geo-Technology Associates, Inc.	
Company Name: Geo-Technology Associates, Inc.		Attention To: Sam Stevenson	
Street: 14280 Park Center Drive		Street: 14280 Park Center Drive	
City: Laurel	State/Province: MD	City: Laurel	State/Province: MD
Zip/Postal Code: 20707		Zip/Postal Code: 20707	
Phone: (410) 792-9446	Fax: (410) 792-7395	Phone: (410) 792-9446	Fax: (410) 792-7395
Project Name: 130467 USA		U.S. State where Samples Collected: Maryland	
Number of Samples in Shipment: 7	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): T.P.
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 28127 (101 - 200)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
29 249220	5.0μ PVC	Cr VI OSHA 215 / Total Particulates NIOSH 0500	14,522	5/11/13 16:10	1	
30 249223			14,500	16:20	2	
31 249234			14,450	16:25	3	
32 249247			14,450	16:30	4	
33 249206			14,490	16:39	5	
34 249224			14,200	16:50	6	
35 249218			14,220	17:00	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	5/13/13 5/14/13	Scott W Cummings	5/13/13 5/16/13 4:00pm

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.

011302079

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

Report To Contact Name: Sam Stevenson			Bill To Company: Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			Attention To: Sam Stevenson		
Street: 14280 Park Center Drive			Street: 14280 Park Center Drive		
City: Laurel	State/Province: MD	Zip/Postal Code: 20707	City: Laurel	State/Province: MD	Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395			Phone: (410) 792-9446 Fax: (410) 792-7395		
Project Name: 130467 USA			U.S. State where Samples Collected: Maryland		
Number of Samples in Shipment: 7	Date of Shipment: 5/14/13		Purchase Order:	Sampled By (Signature):	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			Email Results To: ssteverson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐ _____

Media Type: 37mm, 3 piece cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 2B127 (101 - 200)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
36	249231	5.0µ PVC	CrVI OSHA 215 / Total Particulates NIOSH 0500	~~1400~~ 14,331	5/12/13 16:56	PAM-1	
37	249245			~~1400~~ 14,169	5/12/13 16:04	PAM-2	
38	249229			~~1400~~ 14,280	5/12/13 16:13	PAM-3	
39	249233			~~1400~~ 14,310	5/12/13 16:21	PAM-4	
40	249205			~~1400~~ 14,320	5/12/13 16:31	PAM-5	
41	249214			~~1400~~ 14,400	5/12/13 16:50	PAM-6	
42	249216			~~1400~~ 14,380	5/12/13 16:58	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Shiehan Chou	5/13/2013		5/13/13
Scott W Cimmino	5/14/2013		5/16/13 4:00p

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.

011302079

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL ANALYTICAL, INC
200 ROUTE 130 NORTH
CINNAMINSON, NJ 0807
PHONE: (800) 220-367
FAX: (856) 858-350

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 2070
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAN
Number of Samples in Shipment: 8 Date of Shipment: 5/14/13	Purchase Order: Sampled By (Signature): Scott W Cumming
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: SSteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSET
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (101 - 200)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
43	249225	5.0μ PVC	Cr VI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	14,584	5/13/13 16:00	PAM-1	
44	249241			14,395	16:18	PAM-2	
45	249201			14,447	16:25	PAM-3	
46	249235			14,428	16:31	PAM-4	
47	249210			14,418	16:40	PAM-5	
48	249204			14,477	17:05	PAM-6	
49	249200			14,507	17:16	PAM-7	
50	249248			—	—	MEDIA BLANK	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cumming	5/14/13		5/16/13 4:00p

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

011302079

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041314073
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/03/13 8:50 AM
Analysis Date:	6/3/2013
Collected:	5/29/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249610 *041314073-0001*	PAM 2	15139	0.296	0.020	0.003	
249614 *041314073-0002*	PAM 3	15489	0.353	0.023	0.003	
249612 *041314073-0003*	PAM 4	15140	0.322	0.021	0.003	
249615 *041314073-0004*	PAM 5	15129	0.305	0.020	0.003	
249631 *041314073-0005*	PAM 6	15376	0.405	0.026	0.003	
249602 *041314073-0006*	PAM 7	14943	0.434	0.029	0.003	
249634 *041314073-0007*	Media Blank 2	0	<0.05	N/A	N\A	Field Blank

Notes: Discernable field blank submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (7)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/04/2013 11:01:40

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041314073

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041314073

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: 7 Date of Shipment:	Purchase Order: Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm, 3 PIECE CASSETTE
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: ZEFON 7P53P
☐	☒	☐	☐	☐	☐	☐	Lot #: 28127 (-)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249610	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,139	5/29/13 17:45	PAM-2	
249614			15,489	17:50	PAM-3	
249612			15,140	18:00	PAM-4	
249615			15,129	18:10	PAM-5	
249631			15,376	18:20	PAM-6	
249602			14,943	18:35	PAM-7	
249634			—		MEDIA BLANK 2	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott Cummings	2013-05-29	KD FX 8:50 AM	6-3-2013

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

(27)

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041314077
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/03/13 8:50 AM
Analysis Date:	6/4/2013
Collected:	5/24/2013

Project: **130467 USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249692	PAM 1	14515	<0.05	<0.003	0.003	
041314077-0001						
249696	PAM 2	14540	<0.05	<0.003	0.003	
041314077-0002						
249673	PAM 3	15425	0.071	0.005	0.003	
041314077-0003						
249682	PAM 4	14984	0.107	0.007	0.003	
041314077-0004						
249686	PAM 5	14597	0.094	0.006	0.003	
041314077-0005						
249683	PAM 6	14633	0.118	0.008	0.003	
041314077-0006						
249695	PAM 7	14652	0.117	0.008	0.003	
041314077-0007						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (7)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/04/2013 11:04:58

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041314077

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

Report To Contact Name: Sam Stevenson		Bill To Company: Geo-Technology Associates, Inc.	
Company Name: Geo-Technology Associates, Inc.		Attention To: Sam Stevenson	
Street: 14280 Park Center Drive		Street: 14280 Park Center Drive	
City: Laurel / State/Province: MD / Zip/Postal Code: 20707		City: Laurel / State/Province: MD / Zip/Postal Code: 20707	
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: Maryland	
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm, 3 piece cassette
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	Lot #: 28127 (201 - 300)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249692	5.0μ PVC	CrVI OSHA 215 / Total Particulates NIOSH 0500	14,515	5/24/13 18:00	1	
249696			14,540	18:10	2	
249673			15,425	18:17	3	
249682			14,984	18:22	4	
249686			14,597	18:31	5	
249683			14,633	18:37	6	
249695			14,652	18:47	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Terrence Perkins	5/28/13	Scott Lumm	5/29/13
		FX 8:50AM	6-3-2013

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041314078
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/03/13 8:50 AM
Analysis Date:	6/4/2013
Collected:	5/23/2013

Project: **130467 USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249662	PAM 1	14544	0.099	0.007	0.003	
041314078-0001						
249691	PAM 2	14541	0.135	0.009	0.003	
041314078-0002						
249677	PAM 3	14568	0.147	0.010	0.003	
041314078-0003						
249688	PAM 4	14564	0.183	0.013	0.003	
041314078-0004						
249679	PAM 5	14496	0.187	0.013	0.003	
041314078-0005						
249672	PAM 6	14605	0.321	0.022	0.003	
041314078-0006						
249652	PAM 7	14605	0.188	0.013	0.003	
041314078-0007						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (7)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/04/2013 13:39:12

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041314078

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041314078

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: 7 Date of Shipment:	Purchase Order: Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (201 - 300)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249662	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	14.544	5/23/13 18:00	PAM 1	
249691			14.541	5/23/13 18:04	PAM 2	
249677			14.568	5/23/13 18:10	PAM 3	
249688			14.564	5/23/13 18:15	PAM 4	
249679			14.496	5/23/13 18:20	PAM 5	
249672			14.605	5/23/13 18:21	PAM 6	
249652			14.605	5/23/13 18:24	PAM 7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	5/24/13		5/24/13
		KD FX 8:50 pm	6-3-2013

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/10/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/4/2013. The results are tabulated on the attached data pages for the following client designated project:

130467 USA

The reference number for these samples is EMSL Order #011302356. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302356
CustomerID:	GTA51
CustomerPO:	041314073
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/04/13 9:00 AM
Collected:	5/29/2013

Project: **130467 USA**

Analytical Results

Client Sample Description 249610 PAM-2 ***Collected:*** 5/29/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0021	0.00066	µg/m³	6/7/2013	MM	6/7/2013	MM

Client Sample Description 249614 PAM-3 ***Collected:*** 5/29/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00065	µg/m³	6/7/2013	MM	6/7/2013	MM

Client Sample Description 249612 PAM-4 ***Collected:*** 5/29/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0030	0.00066	µg/m³	6/7/2013	MM	6/7/2013	MM

Client Sample Description 249615 PAM-5 ***Collected:*** 5/29/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0024	0.00066	µg/m³	6/7/2013	MM	6/7/2013	MM

Client Sample Description 249631 PAM-6 ***Collected:*** 5/29/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0039	0.00065	µg/m³	6/7/2013	MM	6/7/2013	MM

Client Sample Description 249602 PAM-7 ***Collected:*** 5/29/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00067	µg/m³	6/7/2013	MM	6/7/2013	MM

Client Sample Description 249634 Media Blank 2 ***Collected:*** 5/29/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	6/7/2013	MM	6/7/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302356

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

011302356

Report To Contact Name: Sam Stevenson		Bill To Company: Geo-Technology Associates, Inc.	
Company Name: Geo-Technology Associates, Inc.		Attention To: Sam Stevenson	
Street: 14280 Park Center Drive		Street: 14280 Park Center Drive	
City: Laurel / State/Province: MD / Zip/Postal Code: 20707		City: Laurel / State/Province: MD / Zip/Postal Code: 20707	
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: Maryland	
Number of Samples in Shipment: 7	Date of Shipment:	Purchase Order:	Sampled By (Signature): Scott Summy
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 28129 (-)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
1	249610	5.0μ PVC	CrVI OSHA 215 /	15,139	5/29/13 17:45	PAM-2	per Sam-
2	249614		TOTAL PARTICULATES	15,489	17:50	PAM-3	Not welding, plating, painting etc.
3	249612		NIOSH 0500	15,140	18:00	PAM-4	6/4 11:30AM -TA
4	249615			15,129	18:10	PAM-5	
5	249631			15,376	18:20	PAM-6	
6	249602			14,943	18:35	PAM-7	
7	249634			—		Media Blank 2	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott Summy	2013-05-29	Travis Allen	6/4/13 9:00AM

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.

(877)

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315164
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/12/13 9:15 AM
Analysis Date:	6/13/2013
Collected:	6/3/2013

Project: **130467 USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249629	PAM-1	15191	0.085	0.006	0.003	
041315164-0001						
249618	PAM-2	15334	0.113	0.007	0.003	
041315164-0002						
249619	PAM-3	15180	0.319	0.021	0.003	
041315164-0003						
249635	PAM-4	15180	0.147	0.010	0.003	
041315164-0004						
249604	PAM-5	15155	0.171	0.011	0.003	
041315164-0005						
249642	PAM-6	15438	0.177	0.011	0.003	
041315164-0006						
249643	PAM-7	15511	0.149	0.010	0.003	
041315164-0007						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (7)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/14/2013 09:14:29

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041315164

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature): Scott W Cummings
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 2B127 (201 - 300)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249629	5.0μ PVC	Cr VI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,191	6/3/13 16:50	PAM-1	
249618			15,334	17:00	PAM-2	
249619			15,180	17:05	PAM-3	
249635			~~15,180~~ 15,180	17:12	PAM-4	
249604			15,155	17:20	PAM-5	
249642			15,438	17:40	PAM-6	
249643			15,511	17:45	PAM-7	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 12 AM 10: 14

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	2013-06-03	[signature]	6/11/2013
		[signature] 9:15AM	6-12-2013

Comments:

* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

* SAMPLES WERE NOT COLLECTED IN PLATING, WELDING, OR PAINTING ENVIRONMENTS.

041315164

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315635
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/17/13 8:30 AM
Analysis Date:	6/17/2013
Collected:	6/13/2013

Test Report: PM2.5 Analysis of Particulate Matter Performed by EPA Reference Method 40 CFR, Chapter 1, Part 50, Appendix L

Sample	*Location*	*Volume (L)*	*Initial Weight (mg)*	*Final Weight (mg)*	*Sample Weight (mg)*	*Concentration (µg/m³)*	*Reporting Limit (µg/m³)*	*Notes*
GTA-5	PAM-1	22376	22.087	22.379	0.292	13.050	0.089	
041315635-0001								
GTA-6	PAM-2	16677	21.453	21.692	0.239	14.331	0.120	
041315635-0002								
GTA-7	PAM-4	15402	20.382	20.634	0.252	16.362	0.130	
041315635-0003								
GTA-8	PAM-6	15975	19.319	19.696	0.377	23.599	0.125	
041315635-0004								

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (4)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/18/2013 10:08:34

THIS IS THE LAST PAGE OF THE REPORT.

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

200 Route 130 North
Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041315635

041315635

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : 410-792-9446	**Fax :**		**Phone :** 410-792-9446	**Fax :**	
Project Name: 130467USA				**U.S. State where Samples Collected:** MD	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ FAX ☑ E-mail ☐ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47 mm
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐ _____	**Lot #:**

Sample ID	Media	Analyte / Method	Volume 22,376	Sample Date/Time	Location	Comments
GTA-5	47 mm	CrVI (OSHA 215) and Particulates (NIOSH 0500)	[illegible]	6/13/13 17:10	PAM-1	
GTA-6	↓	↓	16,677	17:45	PAM-2	
GTA-7	↓	↓	15,402	18:04	PAM-4	
GTA-8	↓	↓	15,975	18:28	PAM-6	

RECEIVED EMSL CINNAMINSON, NJ 13 JUN 17 AM 9:46

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tracie Ann	6/14/13	KD FX 8:30 AM	6-17-2013

Comments:
OK to analyze for both CrVI and particulates from the same filter. Samples were not collected from a welding, plating, or painting environment.

4

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/19/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/13/2013. The results are tabulated on the attached data pages for the following client designated project:

130467 USA

The reference number for these samples is EMSL Order #011302582. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302582
CustomerID:	GTA51
CustomerPO:	041315164
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/13/13 12:00 PM
Collected:	6/3/2013

Analytical Results

Client Sample Description 249629 PAM-1 ***Collected:*** 6/3/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00099	0.00066	µg/m³	6/14/2013	MM	6/17/2013	MM

Client Sample Description 249618 PAM-2 ***Collected:*** 6/3/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0025	0.00065	µg/m³	6/14/2013	MM	6/17/2013	MM

Client Sample Description 249619 PAM-3 ***Collected:*** 6/3/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0015	0.00066	µg/m³	6/14/2013	MM	6/17/2013	MM

Client Sample Description 249635 PAM-4 ***Collected:*** 6/3/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00066	µg/m³	6/14/2013	MM	6/17/2013	MM

Client Sample Description 249604 PAM-5 ***Collected:*** 6/3/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00066	µg/m³	6/14/2013	MM	6/18/2013	MM

Client Sample Description 249642 PAM-6 ***Collected:*** 6/3/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0021	0.00065	µg/m³	6/14/2013	MM	6/18/2013	MM

Client Sample Description 249643 PAM-7 ***Collected:*** 6/3/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0028	0.00065	µg/m³	6/14/2013	MM	6/18/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 01302582

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

01130258 2

Report To Contact Name: SAM STEVENSON			Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.		
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.			Attention To: SAM STEVENSON		
Street: 14280 PARK CENTER DRIVE			Street: 14280 PARK CENTER DRIVE		
City: LAUREL	State/Province: MD	Zip/Postal Code: 20707	City: LAUREL	State/Province: MD	Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395			Phone: (410) 792-9446 Fax: (410) 792-7395		
Project Name: 130467 USA			U.S. State where Samples Collected: MARYLAND		
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature): Scott W Cummings		
Please Provide results: ☐ Fax ☒ Email ☒ Mail			Email Results To: SSTEVENSON@GTAENG.COM		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (201 - 300)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
1	249629	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,191	6/3/13 16:50	PAM-1	
2	249618			15,334	17:00	PAM-2	
3	249619			15,180	17:05	PAM-3	
4	249635			~~15,180~~ 15,180	17:12	PAM-4	
5	249604			15,155	17:20	PAM-5	
6	249642			15,438	17:40	PAM-6	
7	249643			15,511	17:45	PAM-7	

RECEIVED EMSL CINNAMINSON, NJ 13 JUN 12 AM 10:14

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	2013-06-03		6/11/2013
		FX 9:15AM	6-12-2013
		Frank Allt 6/13/13 12:00pm	

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.
* SAMPLES WERE NOT COLLECTED IN PLATING, WELDING, OR PAINTING ENVIRONMENTS.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315468
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/14/13 10:10 AM
Analysis Date:	6/18/2013
Collected:	6/12/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249495	OSAM-1	14832	0.291	0.020	0.003	
041315468-0001						
249537	OSAM-2	14759	0.133	0.009	0.003	
041315468-0002						
249477	OSAM-3	14976	0.264	0.018	0.003	
041315468-0003						
249529	PAM-1	14760	0.231	0.016	0.003	
041315468-0004						
249500	PAM-2	14447	0.293	0.020	0.003	
041315468-0005						
249474	PAM-3	14921	0.286	0.019	0.003	
041315468-0006						
249484	PAM-4	15509	0.282	0.018	0.003	
041315468-0007						
249465	PAM-5	15147	0.251	0.017	0.003	
041315468-0008						
249466	PAM-6	15614	0.275	0.018	0.003	
041315468-0009						
249457	PAM-7	15444	0.315	0.020	0.003	
041315468-0010						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (10)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/19/2013 10:04:21

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041315468

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041315468

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (301 - 400)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249495	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,832	6/12/13 15:02	OSAM-1	
249537	5.0 µ PVC		14,759	6/12/13 15:20	OSAM-2	
249477	5.0 µ PVC		14,976	6/12/13 15:35	OSAM-3	
249529	5.0 µ PVC		14,760	6/12/13 15:53	PAM-1	
249500	5.0 µ PVC		14,447	6/12/13 16:22	PAM-2	
249474	5.0 µ PVC		14,921	6/12/13 16:47	PAM-3	
249484	5.0 µ PVC		15,509	6/12/13 16:54	PAM-4	
249465	5.0 µ PVC		15,147	6/12/13 17:25	PAM-5	
249466	5.0 µ PVC		15,614	6/12/13 17:35	PAM-6	
249457	5.0 µ PVC		15,444	6/12/13 17:50	PAM-7	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 14 PM 12:22

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6/13/13		6/13/13
	6/13/13		6.14.13

Comments: *Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.
Samples were not collected from a welding, plating or painting environment.

10

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315470
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/14/13 10:10 AM
Analysis Date:	6/18/2013
Collected:	6/11/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249517	OSAM-2	13698	0.071	0.005	0.004	
041315470-0001						
249501	OSAM-3	14000	0.087	0.006	0.004	
041315470-0002						
249487	PAM-1	14770	0.168	0.011	0.003	
041315470-0003						
249455	PAM-2	14759	0.151	0.010	0.003	
041315470-0004						
249496	PAM-3	14840	0.157	0.011	0.003	
041315470-0005						
249486	PAM-4	14581	0.159	0.011	0.003	
041315470-0006						
249463	PAM-5	14643	0.266	0.018	0.003	
041315470-0007						
249468	PAM-6	15722	0.193	0.012	0.003	
041315470-0008						
249467	PAM-7	15336	<0.05	<0.003	0.003	
041315470-0009						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (9)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/19/2013 10:39:22

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041315470

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041315470

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☐ Email ☐ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (301 - 400)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249517	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	13,698	6/11/13 15:13	OSAM-2	
249501	5.0 µ PVC		14,000	6/11/13 15:35	OSAM-3	
249487	5.0 µ PVC		14,770	6/11/13 15:53	PAM-1	
249455	5.0 µ PVC		14,759	6/11/13 16:10	PAM-2	
249496	5.0 µ PVC		14,840	6/11/13 16:17	PAM-3	
249486	5.0 µ PVC		14,581	6/11/13 16:24	PAM-4	
249463	5.0 µ PVC		14,643	6/11/13 16:40	PAM-5	
249468	5.0 µ PVC		15,722	6/11/13 16:48	PAM-6	
249467	5.0 µ PVC		15,336	6/11/13 17:02	PAM-7	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 14 PM 12:19

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tyler Marr	6/13/13	[signature]	6/13/13
[signature]	6/13/13	DMB-FX-1010A	6.14.13

Comments: *Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.
Samples were not collected from a welding, plating or painting environment.

9

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315632
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/17/13 8:30 AM
Analysis Date:	6/18/2013
Collected:	6/13/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249488	OSAM- 1	14822	0.361	0.024	0.003	
041315632-0001						
249494	OSAM- 2	14709	0.177	0.012	0.003	
041315632-0002						
249475	OSAM- 3	14565	0.333	0.023	0.003	
041315632-0003						
249464	PAM-1	15777	0.319	0.020	0.003	
041315632-0004						
249491	PAM-2	14773	0.341	0.023	0.003	
041315632-0005						
249497	PAM-3	15382	<0.05	<0.003	0.003	
041315632-0006						
249492	PAM-4	15327	0.253	0.017	0.003	
041315632-0007						
249476	PAM-5	15140	0.317	0.021	0.003	
041315632-0008						
249493	PAM-6	15527	0.386	0.025	0.003	
041315632-0009						
249485	PAM-7	15527	0.332	0.021	0.003	
041315632-0010						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (10)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/19/2013 09:56:01

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041315632

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041315632

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA			**U.S. State where Samples Collected:** Maryland		
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (301 - 400)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
249488	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,822	6/13/13	15:02	OSAM-1	
249494	5.0 µ PVC		14,709	6/13/13	15:15	OSAM-2	
249475	5.0 µ PVC		14,565	6/13/13	15:30	OSAM-3	
249464	5.0 µ PVC		15,777	6/13/13	17:10	PAM-1	
249491	5.0 µ PVC		14,773	6/13/13	17:45	PAM-2	
249497	5.0 µ PVC		15,382	6/13/13	18:00	PAM-3	
249492	5.0 µ PVC		15,327	6/13/13	18:04	PAM-4	
249476	5.0 µ PVC		15,140	6/13/13	18:24	PAM-5	
249493	5.0 µ PVC		15,527	6/13/13	18:28	PAM-6	
249485	5.0 µ PVC		15,527	6/13/13	18:43	PAM-7	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 17 AM 9:49

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tamara Pratt	6/14/13	KD FX 8:30 AM	6-17-2013

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

10

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315754
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/18/13 10:00 AM
Analysis Date:	6/18/2013
Collected:	6/15/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249483 *041315754-0001*	OSAM-2	14781	0.120	0.008	0.003	
249460 *041315754-0002*	OSAM-3	14645	<0.05	<0.003	0.003	
249458 *041315754-0003*	PAM-1	14515	0.140	0.010	0.003	
249478 *041315754-0004*	PAM-2	14575	0.161	0.011	0.003	
249472 *041315754-0005*	PAM-3	14221	0.127	0.009	0.004	
249469 *041315754-0006*	PAM-4	14565	0.061	0.004	0.003	
249470 *041315754-0007*	PAM-5	14514	0.113	0.008	0.003	
249490 *041315754-0008*	PAM-6	14697	0.095	0.006	0.003	
249462 *041315754-0009*	PAM-7	14697	0.086	0.006	0.003	
249454 *041315754-0010*	Media blank	14595	<0.05	<0.003	0.003	

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (10)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/19/2013 10:08:31

04131754

EMSL ANALYTICAL, INC.
LABORATORY | PRODUCTS | TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 6113 - 754

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (301 - 400)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
[redacted]	[redacted]	Cr VI OSHA 215 Total Particulates NIOSH 0500	[redacted]	[redacted]	[redacted]	[redacted]	
249483	5.0 µ PVC		14,781	6/14/13	15:17	OSAM-2	
249460	5.0 µ PVC		14,645	6/14/13	15:40	OSAM-3	
249458	5.0 µ PVC		14,515	6/14/13	17:00	PAM-1	
249478	5.0 µ PVC		14,575	6/14/13	17:20	PAM-2	
249472	5.0 µ PVC		14,221	6/14/13	17:35	PAM-3	
249469	5.0 µ PVC		14,565	6/14/13	17:45	PAM-4	
249470	5.0 µ PVC		14,514	6/14/13	18:00	PAM-5	
249490	5.0 µ PVC		14,697	6/14/13	18:08	PAM-6	
249462	5.0 µ PVC		14,595	6/14/13	18:20	PAM-7	

Note: Most NISOH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	**Date**	**Received By**	**Date**
[signature]	6/15/13	[signature]	6/17/13
[signature]	6/17/13	[signature] FX	6/18/13 10A

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media
Samples were not collected from a welding, plating or painting environment.

(10)

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only):
041315754

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041315754

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249454	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	n/a	n/a	n/a	Media Blank

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 18 AM 10:49

Comments:

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315755
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/18/13 10:00 AM
Analysis Date:	6/18/2013
Collected:	6/16/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249459	OSAM-1	14544	0.276	0.019	0.003	
041315755-0001						
249577	OSAM-2	14462	0.135	0.009	0.003	
041315755-0002						
249591	OSAM-3	14832	0.318	0.021	0.003	
041315755-0003						
249480	PAM-1	14688	0.255	0.017	0.003	
041315755-0004						
249593	PAM-2	14697	0.244	0.017	0.003	
041315755-0005						
249473	PAM-3	14768	0.275	0.019	0.003	
041315755-0006						
249498	PAM-4	14697	0.292	0.020	0.003	
041315755-0007						
249584	PAM-5	14626	0.286	0.020	0.003	
041315755-0008						
249585	PAM-6	14626	0.306	0.021	0.003	
041315755-0009						
249565	PAM-7	14626	0.292	0.020	0.003	
041315755-0010						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (10)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/19/2013 10:24:36

EMSL ANALYTICAL, INC.
LABORATORY · PRODUCTS · TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041315755

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041315755

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (301 - 500)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
249459	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,544	6/16/13	15:35	OSAM-1	
249577	5.0 µ PVC		14,462	6/16/13	15:48	OSAM-2	
249591	5.0 µ PVC		14,832	6/16/13	16:05	OSAM-3	
249480	5.0 µ PVC		14,688	6/16/13	16:40	PAM-1	
249593	5.0 µ PVC		14,697	6/16/13	16:46	PAM-2	
249473	5.0 µ PVC		14,768	6/16/13	16:57	PAM-3	
249498	5.0 µ PVC		14,697	6/16/13	17:02	PAM-4	
249584	5.0 µ PVC		14,626	6/16/13	17:20	PAM-5	
249585	5.0 µ PVC		14,626	6/16/13	17:25	PAM-6	
249565	5.0 µ PVC		14,626	6/16/13	17:40	PAM-7	

RECEIVED
EMSL
CINNAMINSON, NJ
JUN 18 AM 10:50

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6-17-13		6/17/13
	6/17/13	FX	6/18/13 10A

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

(10)

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315742
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/18/13 10:00 AM
Analysis Date:	6/18/2013
Collected:	6/15/2013

Test Report: PM2.5 Analysis of Particulate Matter Performed by EPA Reference Method 40 CFR, Chapter 1, Part 50, Appendix L

Sample	*Location*	*Volume (L)*	*Initial Weight (mg)*	*Final Weight (mg)*	*Sample Weight (mg)*	*Concentration (µg/m³)*	*Reporting Limit (µg/m³)*	*Notes*
GTA-13	PAM 1	14200	20.143	20.294	0.151	10.634	0.141	
041315742-0001								
GTA-14	PAM 2	14474	21.237	21.307	0.070	4.836	0.138	
041315742-0002								
GTA-15	PAM 4	14312	22.235	22.525	0.290	20.263	0.140	
041315742-0003								
GTA-16	PAM 6	14383	21.810	21.914	0.104	7.231	0.139	
041315742-0004								

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (4)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/19/2013 10:29:23

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041315742

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47mm, via PM2.5 Impact Sampler
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐	**Lot #:**

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
GTA-13	47 mm	Cr VI OSHA 215 Particulates (From PM2.5 Impact Sampler)	14,200	6-15-13	~~16:40~~ 16:40	PAM-1	
GTA-14	47 mm		14,474	6-15-13	17:06	PAM-2	
GTA-15	47 mm		14,312	6-15-13	~~17:20~~ 17:22	PAM-4	
GTA-16	47 mm		14,393	6-15-13	~~17:45~~ 17:45	PAM-6	

RECEIVED EMSL CINNAMINSON, NJ 13 JUN 18 AM 10:51

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6/15/13		6/17/13
	6/17/13	FX	6/18/13 10A

Comments: OK to run both methods from same sample media.
Samples were not collected from a welding, plating or painting environment.

(4)

041315742

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315751
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/18/13 10:00 AM
Analysis Date:	6/18/2013
Collected:	6/14/2013

Test Report: PM2.5 Analysis of Particulate Matter Performed by EPA Reference Method 40 CFR, Chapter 1, Part 50, Appendix L

Sample	*Location*	*Volume (L)*	*Initial Weight (mg)*	*Final Weight (mg)*	*Sample Weight (mg)*	*Concentration (µg/m³)*	*Reporting Limit (µg/m³)*	*Notes*
GTA-9	PAM-1	14300	19.385	19.769	0.384	26.853	0.140	
041315751-0001								
GTA-10	PAM-2	14575	20.984	21.118	0.134	9.194	0.137	
041315751-0002								
GTA-11	PAM-4	14423	21.212	21.275	0.063	4.368	0.139	
041315751-0003								
GTA-12	PAM-6	14626	19.615	19.713	0.098	6.700	0.137	Filter torn
041315751-0004								

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (4)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 06/19/2013 10:25:58 Replaces the Inital Report 06/19/2013 10:12:38. Reason Code: Data Entry-Results Changed for GTA-9

THIS IS THE LAST PAGE OF THE REPORT.

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041315751

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041315751

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47mm, via PM2.5 Impact Sampler
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐ _____	**Lot #:**

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
GTA-9	47 mm	Cr VI OSHA 215 Particulates (From PM2.5 Impact Sampler)	14,300	6-14-13	17:00	PAM-1	
GTA-10	47 mm		14,575	6-14-13	17:20	PAM-2	
GTA-11	47 mm		14,423	6-14-13	17:45	PAM-4	
GTA-12	47 mm		14,626	6-14-13	18:08	PAM-6	

RECEIVED
EMSL
CINNAMINSON, NJ
JUN 18 AM 10:47

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tracy Bachini	6/15/13	Kent Thoen	6/17/13
Kent Thoen	6/17/13	AK FX	6/18/13 10A

Comments: OK to run both methods from same sample media.
Samples were not collected from a welding, plating or painting environment.

4

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315877
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/19/13 10:40 AM
Analysis Date:	6/20/2013
Collected:	6/8/2013

Project: **130467 USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249521		15192	0.138	0.009	0.003	
041315877-0001						
249546		15006	0.125	0.008	0.003	
041315877-0002						
249506		14801	0.143	0.010	0.003	
041315877-0003						
249505		15027	0.144	0.010	0.003	
041315877-0004						
249538		14934	0.129	0.009	0.003	
041315877-0005						
249504		14903	0.161	0.011	0.003	
041315877-0006						
249508		15230	0.140	0.009	0.003	
041315877-0007						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (7)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/20/2013 14:36:09

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041315877

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: / Date of Shipment:	Purchase Order: / Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (301 - 400)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (FAM)	Comments
249521	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,192	6/8/13 16:45	1	Samples were not collected in plating, welding, or painting environments.
249546			15,006	16:50	2	
249506			14,801	16:55	3	
249505			15,027	17:00	4	
249538			14,934	17:06	5	
249504			14,903	17:13	6	
249508			15,230	17:20	7	

RECEIVED JUN 19 2013 AM 11:27 EMSL-CINNAMINSON, NJ

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Teresa Pelusio	6/18/13	[signature]	6/18/13
[signature]		VC PC	6-19-13 10:40

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/20/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/17/2013. The results are tabulated on the attached data pages for the following client designated project:

130467 USA

The reference number for these samples is EMSL Order #011302641. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302641
CustomerID:	GTA51
CustomerPO:	041315471
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/17/13 9:00 AM
Collected: 6/12/2013

Analytical Results

Client Sample Description GTA-1
PAM-1 ***Collected:*** 6/12/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0014	0.00069	µg/m³	6/19/2013	MM	6/20/2013	MM

Client Sample Description GTA-2
PAM-2 ***Collected:*** 6/12/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0021	0.00065	µg/m³	6/19/2013	MM	6/20/2013	MM

Client Sample Description GTA-3
PAM-4 ***Collected:*** 6/12/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00067	µg/m³	6/19/2013	MM	6/20/2013	MM

Client Sample Description GTA-4
PAM-6 ***Collected:*** 6/12/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00065	µg/m³	6/19/2013	MM	6/20/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302641

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302641

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : 410-792-9446 **Fax :**			**Phone :** 410-792-9446 **Fax :**		
Project Name: 130467 USA			**U.S. State where Samples Collected:**		
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**	**Sampled By (Signature):**		
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 47 mm
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #:
☐	☐	☐	☒	☐	☐	☐	Lot #:

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
1 GTA-1	↑	Cr VI OSHA 215	14400	6/12/13 15:53	PAM-1	
2 GTA-2	47mm	TOTAL PARTICULATES	15,319	16:22	PAM-2	
3 GTA-3	|	NIOSH (all	14,847	16:54	PAM-3	
4 GTA-4	↓	0500 samples)	15,390	↓ 17:35	PAM-6	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 14 PM 12:18

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6/13/13		6/13/13
	6/13/13		
		Travis Allnut	6/17/13

Comments: Approved to run both analyses from one filter.
Samples were not collected from a welding, plating, or painting environment.

4

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/20/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/17/2013. The results are tabulated on the attached data pages for the following client designated project:

130467 USA

The reference number for these samples is EMSL Order #011302645. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302645
CustomerID:	GTA51
CustomerPO:	041315635
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/17/13 5:30 PM
Collected: 6/13/2013

Project: **130467 USA**

Analytical Results

Client Sample Description GTA-5 PAM-1 ***Collected:*** 6/13/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00045	µg/m³	6/19/2013	MM	6/20/2013	MM

Client Sample Description GTA-6 PAM-2 ***Collected:*** 6/13/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0029	0.00060	µg/m³	6/19/2013	MM	6/20/2013	MM

Client Sample Description GTA-7 PAM-4 ***Collected:*** 6/13/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0029	0.00060	µg/m³	6/19/2013	MM	6/20/2013	MM

Client Sample Description GTA-8 PAM-6 ***Collected:*** 6/13/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0027	0.00065	µg/m³	6/19/2013	MM	6/20/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

200 Route 130 North
Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
FAX: (856) 786-5974

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302645

011302645

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : 410-792-9446	**Fax :**		**Phone :** 410-792-9446	**Fax :**	
Project Name: 130467USA			**U.S. State where Samples Collected:** MD		
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**	**Sampled By (Signature):**		
Please Provide results: ☐ FAX ☑ E-mail ☐ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 47 mm
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #:
☐	☐	☐	☒	☐	☐	☐	Lot #:

	Sample ID	Media	Analyte / Method	Volume 22,376	Sample Date/Time	Location	Comments
1	GTA-5	47 mm	CrVI (OSHA 215) and Particulates (NIOSH 0500)	[illegible]	6/13/13 17:10	PAM-1	
2	GTA-6	↓	↓	16,677	17:45	PAM-2	
3	GTA-7	↓	↓	15,402	18:04	PAM-4	
4	GTA-8	↓	↓	15,975	18:28	PAM-6	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 17 AM 9:46

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tenie Ann	6/14/13	Travis Allot 23°C	6/17/13 5:30pm

Comments:
OK to analyze for both CrVI and particulates from the same filter. Samples were not collected from a welding, plating, or painting environment.

4

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/21/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/19/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302677. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302677
CustomerID:	GTA51
CustomerPO:	041315470
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/19/13 9:00 AM
Collected:	6/11/2013

Analytical Results

Client Sample Description 249517 OSAM-2 ***Collected:*** 6/11/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00073	µg/m³	6/20/2013	MM	6/20/2013	MM

Client Sample Description 249501 OSAM-3 ***Collected:*** 6/11/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00091	0.00071	µg/m³	6/20/2013	MM	6/20/2013	MM

Client Sample Description 249487 PAM-1 ***Collected:*** 6/11/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0026	0.00068	µg/m³	6/20/2013	MM	6/20/2013	MM

Client Sample Description 249455 PAM-2 ***Collected:*** 6/11/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00076	0.00068	µg/m³	6/20/2013	MM	6/20/2013	MM

Client Sample Description 249496 PAM-3 ***Collected:*** 6/11/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00067	µg/m³	6/20/2013	MM	6/20/2013	MM

Client Sample Description 249486 PAM-4 ***Collected:*** 6/11/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0014	0.00069	µg/m³	6/20/2013	MM	6/20/2013	MM

Client Sample Description 249463 PAM-5 ***Collected:*** 6/11/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0014	0.00068	µg/m³	6/20/2013	MM	6/20/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302677
CustomerID:	GTA51
CustomerPO:	041315470
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/19/13 9:00 AM
Collected:	6/11/2013

Analytical Results

Client Sample Description 249468 PAM-6 ***Collected:*** 6/11/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00064	µg/m³	6/20/2013	MM	6/21/2013	MM

Client Sample Description 249467 PAM-7 ***Collected:*** 6/11/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0071	0.00065	µg/m³	6/20/2013	MM	6/21/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

Industrial Hygiene Chain of Custody

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

EMSL Order Number (Lab Use Only): 011302677

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302677

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☐ Email ☐ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐ _____

Media Type: 37mm, 3 piece Cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 28127 (301 - 400)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
①	249517	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	13,698	6/11/13 15:13	OSAM-2	
②	249501	5.0 µ PVC		14,000	6/11/13 15:35	OSAM-3	
③	249487	5.0 µ PVC		14,770	6/11/13 15:53	PAM-1	
④	249455	5.0 µ PVC		14,759	6/11/13 16:10	PAM-2	
⑤	249496	5.0 µ PVC		14,840	6/11/13 16:17	PAM-3	
⑥	249486	5.0 µ PVC		14,581	6/11/13 16:24	PAM-4	
⑦	249463	5.0 µ PVC		14,643	6/11/13 16:40	PAM-5	
⑧	249468	5.0 µ PVC		15,722	6/11/13 16:48	PAM-6	
⑨	249467	5.0 µ PVC		15,336	6/11/13 17:02	PAM-7	

RECEIVED EMSL CINNAMINSON, NJ 13 JUN 14 PM 12:19

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tyler Marr	6/13/13		6/13/13
	6/13/13	Ivavir Albert 23°C	6/19/13 9:00AM

Comments: *Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.
Samples were not collected from a welding, plating or painting environment.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/21/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/19/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302678. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302678
CustomerID:	GTA51
CustomerPO:	041315468
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/19/13 9:00 AM
Collected: 6/12/2013

Analytical Results

Client Sample Description 249495 OSAM-1 ***Collected:*** 6/12/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0021	0.00067	µg/m³	6/20/2013	MM	6/21/2013	MM

Client Sample Description 249537 OSAM-2 ***Collected:*** 6/12/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0015	0.00068	µg/m³	6/20/2013	MM	6/21/2013	MM

Client Sample Description 249477 OSAM-3 ***Collected:*** 6/12/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0020	0.00067	µg/m³	6/20/2013	MM	6/21/2013	MM

Client Sample Description 249529 PAM-1 ***Collected:*** 6/12/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0015	0.00068	µg/m³	6/20/2013	MM	6/21/2013	MM

Client Sample Description 249500 PAM-2 ***Collected:*** 6/12/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00069	µg/m³	6/20/2013	MM	6/21/2013	MM

Client Sample Description 249474 PAM-3 ***Collected:*** 6/12/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0053	0.00067	µg/m³	6/20/2013	MM	6/21/2013	MM

Client Sample Description 249484 PAM-4 ***Collected:*** 6/12/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0023	0.00065	µg/m³	6/20/2013	MM	6/21/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302678
CustomerID:	GTA51
CustomerPO:	041315468
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/19/13 9:00 AM
Collected: 6/12/2013

Analytical Results

Client Sample Description 249465 PAM-5 ***Collected:*** 6/12/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0023	0.00066	µg/m³	6/20/2013	MM	6/21/2013	MM

Client Sample Description 249466 PAM-6 ***Collected:*** 6/12/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0040	0.00064	µg/m³	6/20/2013	MM	6/21/2013	MM

Client Sample Description 249457 PAM-7 ***Collected:*** 6/12/2013 ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0052	0.00065	µg/m³	6/20/2013	MM	6/21/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 01130267B

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

01130267B

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece Cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 28127 (301 - 400)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
(1) 249495	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,832	6/12/13 15:02	OSAM-1	
(2) 249537	5.0 µ PVC		14,759	6/12/13 15:20	OSAM-2	
(3) 249477	5.0 µ PVC		14,976	6/12/13 15:35	OSAM-3	
(4) 249529	5.0 µ PVC		14,760	6/12/13 15:53	PAM-1	
(5) 249500	5.0 µ PVC		14,447	6/12/13 16:22	PAM-2	
(6) 249474	5.0 µ PVC		14,921	6/12/13 16:47	PAM-3	
(7) 249484	5.0 µ PVC		15,509	6/12/13 16:54	PAM-4	
(8) 249465	5.0 µ PVC		15,147	6/12/13 17:25	PAM-5	
(9) 249466	5.0 µ PVC		15,614	6/12/13 17:35	PAM-6	
(10) 249457	5.0 µ PVC		15,444	6/12/13 17:50	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6/13/13		6/13/13
	6/13/13		
		Travis Allot 23°C	6/19/13 9:00 AM

Comments: *Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.
Samples were not collected from a welding, plating or painting environment.

10

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315758
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467-USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/18/13 10:00 AM
Analysis Date:	6/21/2013
Collected:	6/15/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249456 *041315758-0001*	OSAM-1	15172	0.358	0.024	0.003	
249481 *041315758-0002*	OSAM-2	14867	0.228	0.015	0.003	
249489 *041315758-0003*	OSAM-3	14650	0.307	0.021	0.003	
249471 *041315758-0004*	PAM-1	14484	0.266	0.018	0.003	
249452 *041315758-0005*	PAM-2	14617	0.271	0.019	0.003	
249461 *041315758-0006*	PAM-3	13438	0.370	0.028	0.004	
249453 *041315758-0007*	PAM-4	14453	0.273	0.019	0.003	
249499 *041315758-0008*	PAM-5	14626	0.180	0.012	0.003	
249482 *041315758-0009*	PAM-6	14312	0.204	0.014	0.003	
249450 *041315758-0010*	PAM-7	14626	0.304	0.021	0.003	
249479 *041315758-0011*	PAM-1	0	<0.05	N/A	N\A	Field Blank

Analyst(s)

Shane Feret (11)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/21/2013 12:22:43

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315758
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467-USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/18/13 10:00 AM
Analysis Date:	6/21/2013
Collected:	6/15/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m^3)*	*Reporting Limit (mg/m^3)*	*Notes*

Notes: Discernable field blank submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (11)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/21/2013 12:22:43

041315758

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041315758

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 28127 (301 - 400)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249456	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	15,172	6/15/13 15:35	OSAM-1	RECEIVED EMSL CINNAMINSON, NJ 13 JUN 18 AM 10: 52
249481	5.0 µ PVC		14,867	6/15/13 15:49	OSAM-2	
249489	5.0 µ PVC		14,650	6/15/13 16:05	OSAM-3	
249471	5.0 µ PVC		14,484	6/15/13 16:40	PAM-1	
249452	5.0 µ PVC		14,617	6/15/13 17:06	PAM-2	
249461	5.0 µ PVC		13,438	6/15/13 17:17	PAM-3	
249453	5.0 µ PVC		14,453	6/15/13 17:22	PAM-4	
249499	5.0 µ PVC		14,626	6/15/13 17:40	PAM-5	
249482	5.0 µ PVC		14,312	6/15/13 17:45	PAM-6	
249450	5.0 µ PVC		14,626	6/15/13 19:00	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6-15-13		6/17/13
	6/17/13	FX	4/18/13 10A

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

11

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only):

041315758

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041315758

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249479	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	n/a	6/15/13 ~~15:02~~ 16:40	PAM-1	Filter Blank

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 18 AM 10:52

Comments:

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/24/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/19/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302673. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302673
CustomerID:	GTA51
CustomerPO:	041315632
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/19/13 9:45 AM
Collected:	6/13/2013

Analytical Results

Client Sample Description 249488 OSAM-1 ***Collected:*** 6/13/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0046	0.00068	µg/m³	6/19/2013	MM	6/21/2013	MM

Client Sample Description 249494 OSAM-2 ***Collected:*** 6/13/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	6/19/2013	MM	6/21/2013	MM

Client Sample Description 249475 OSAM-3 ***Collected:*** 6/13/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00069	µg/m³	6/19/2013	MM	6/21/2013	MM

Client Sample Description 249464 PAM-1 ***Collected:*** 6/13/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0016	0.00063	µg/m³	6/19/2013	MM	6/21/2013	MM

Client Sample Description 249491 PAM-2 ***Collected:*** 6/13/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0035	0.00068	µg/m³	6/19/2013	MM	6/21/2013	MM

Client Sample Description 249497 PAM-3 ***Collected:*** 6/13/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0031	0.00065	µg/m³	6/19/2013	MM	6/21/2013	MM

Client Sample Description 249492 PAM-4 ***Collected:*** 6/13/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00097	0.00065	µg/m³	6/19/2013	MM	6/21/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302673
CustomerID:	GTA51
CustomerPO:	041315632
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/19/13 9:45 AM
Collected:	6/13/2013

Analytical Results

Client Sample Description 249476 PAM-5 ***Collected:*** 6/13/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00066	µg/m³	6/19/2013	MM	6/21/2013	MM

Client Sample Description 249493 PAM-6 ***Collected:*** 6/13/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0016	0.00064	µg/m³	6/19/2013	MM	6/21/2013	MM

Client Sample Description 249485 PAM-7 ***Collected:*** 6/13/2013 ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0016	0.00064	µg/m³	6/19/2013	MM	6/21/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302673

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 28127 (301 - 400)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
249488	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,822	6/13/13	15:02	OSAM-1	
249494	5.0 µ PVC		14,709	6/13/13	15:15	OSAM-2	
249475	5.0 µ PVC		14,565	6/13/13	15:30	OSAM-3	
249464	5.0 µ PVC		15,777	6/13/13	17:10	PAM-1	
249491	5.0 µ PVC		14,773	6/13/13	17:45	PAM-2	
249497	5.0 µ PVC		15,382	6/13/13	18:00	PAM-3	
249492	5.0 µ PVC		15,327	6/13/13	18:04	PAM-4	
249476	5.0 µ PVC		15,140	6/13/13	18:24	PAM-5	
249493	5.0 µ PVC		15,527	6/13/13	18:28	PAM-6	
249485	5.0 µ PVC		15,527	6/13/13	18:43	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
[signature]	6/14/13	[signature]	6/19/13 0945

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

10

011302673

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/24/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/19/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302674. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302674
CustomerID:	GTA51
CustomerPO:	041315755
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/19/13 9:45 AM
Collected:	6/16/2013

Analytical Results

Client Sample Description 249459 OSAM-1 ***Collected:*** 6/16/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0033	0.00069	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249577 OSAM-2 ***Collected:*** 6/16/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0025	0.00069	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249591 OSAM-3 ***Collected:*** 6/16/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0025	0.00067	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249480 PAM-1 ***Collected:*** 6/16/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0033	0.00068	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249593 PAM-2 ***Collected:*** 6/16/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0037	0.00068	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249473 PAM-3 ***Collected:*** 6/16/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0039	0.00068	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249498 PAM-4 ***Collected:*** 6/16/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0030	0.00068	µg/m³	6/20/2013	MM	6/22/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302674
CustomerID:	GTA51
CustomerPO:	041315755
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/19/13 9:45 AM
Collected:	6/16/2013

Analytical Results

Client Sample Description 249584 PAM-5 ***Collected:*** 6/16/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0029	0.00068	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249585 PAM-6 ***Collected:*** 6/16/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0026	0.00068	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249565 PAM-7 ***Collected:*** 6/16/2013 ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0032	0.00068	µg/m³	6/20/2013	MM	6/22/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041315755

011302674

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 28127 (301 - 500)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
249459	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,544	6/16/13	15:35	OSAM-1	
249577	5.0 µ PVC		14,462	6/16/13	15:48	OSAM-2	
249591	5.0 µ PVC		14,832	6/16/13	16:05	OSAM-3	
249480	5.0 µ PVC		14,688	6/16/13	16:40	PAM-1	
249[illegible]593	5.0 µ PVC		14,697	6/16/13	16:46	PAM-2	
249473	5.0 µ PVC		14,768	6/16/13	16:57	PAM-3	
249498	5.0 µ PVC		14,697	6/16/13	17:02	PAM-4	
249584	5.0 µ PVC		14,626	6/16/13	17:20	PAM-5	
249585	5.0 µ PVC		14,626	6/16/13	17:25	PAM-6	
249565	5.0 µ PVC		14,626	6/16/13	17:40	PAM-7	

RECEIVED EMSL CINNAMINSON, NJ JUN 18 AM 10:50

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
[signature]	6-17-13	[signature]	6/17/13
[signature]	6/17/13	[signature] Fx	6/18/13 10A
			6/19/13 0945

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

(10)

011302674

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/24/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/19/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302680. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302680
CustomerID:	GTA51
CustomerPO:	041315754
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/19/13 9:00 AM
Collected:	6/14/2013

Analytical Results

Client Sample Description 249483 OSAM-2 ***Collected:*** 6/14/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0014	0.00068	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249460 OSAM-3 ***Collected:*** 6/14/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00075	0.00068	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249458 PAM-1 ***Collected:*** 6/14/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0016	0.00069	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249478 PAM-2 ***Collected:*** 6/14/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0032	0.00069	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249472 PAM-3 ***Collected:*** 6/14/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0026	0.00070	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249469 PAM-4 ***Collected:*** 6/14/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0016	0.00069	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249470 PAM-5 ***Collected:*** 6/14/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	6/20/2013	MM	6/22/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302680
CustomerID:	GTA51
CustomerPO:	041315754
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/19/13 9:00 AM
Collected: 6/14/2013

Analytical Results

Client Sample Description 249490 PAM-6 ***Collected:*** 6/14/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0025	0.00068	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249462 PAM-7 ***Collected:*** 6/14/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0040	0.00069	µg/m³	6/20/2013	MM	6/22/2013	MM

Client Sample Description 249454 Media Blank ***Collected:*** ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	6/20/2013	MM	6/22/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302680

~~041315754~~ TA

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302680

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 28127 (301 - 400)

	Sample ID	**Media**	**Analyte / Method**	**Volume**	**Sample Date/Time**		**Location**	**Comments**
	[redacted]	[redacted]		[redacted]	[redacted]		[redacted]	
1	249483	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,781	6/14/13	15:17	OSAM-2	
2	249460	5.0 µ PVC		14,645	6/14/13	15:40	OSAM-3	
3	249458	5.0 µ PVC		14,515	6/14/13	17:00	PAM-1	
4	249478	5.0 µ PVC		14,575	6/14/13	17:20	PAM-2	
5	249472	5.0 µ PVC		14,221	6/14/13	17:35	PAM-3	
6	249469	5.0 µ PVC		14,565	6/14/13	17:45	PAM-4	
7	249470	5.0 µ PVC		14,514	6/14/13	18:00	PAM-5	
8	249490	5.0 µ PVC		14,697	6/14/13	18:08	PAM-6	
9	249462	5.0 µ PVC		14,595	6/14/13	18:20	PAM-7	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 18 AM 10:49

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	**Date**	**Received By**	**Date**
[signature]	6/15/13	[signature]	6/17/13
[signature]	6/17/13	[signature] FX	6/18/13 10A
		[signature] 23°C	6/19/13 9:00AM

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

(10)

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302680

041315754 DA

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302680

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249454	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	n/a	n/a	n/a	Media Blank

RECEIVED
EMSL
CINNAMINSON, NJ
18 JUN 18 AM 10:49

Comments:

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315875
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/19/13 10:40 AM
Analysis Date:	6/21/2013
Collected:	6/17/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249574		14616	0.213	0.015	0.003	
041315875-0001						
249592		14452	0.221	0.015	0.003	
041315875-0002						
249572		14832	0.312	0.021	0.003	
041315875-0003						
249586		14616	0.238	0.016	0.003	
041315875-0004						
249580		14853	0.185	0.012	0.003	
041315875-0005						
249588		14801	0.200	0.014	0.003	
041315875-0006						
249598		14822	0.063	0.004	0.003	
041315875-0007						
249596		14781	0.214	0.014	0.003	
041315875-0008						
249553		14791	0.273	0.018	0.003	
041315875-0009						
249597		14698	0.158	0.011	0.003	
041315875-0010						
249583		0	<0.05	N/A	N\A	Field Blank
041315875-0011						

Analyst(s)

Shane Feret (11)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/24/2013 10:23:37

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315875
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/19/13 10:40 AM
Analysis Date:	6/21/2013
Collected:	6/17/2013

Project: **130467USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m^3)*	*Reporting Limit (mg/m^3)*	*Notes*

Notes: Discernable field blank submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (11)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/24/2013 10:23:37

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041315875

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (301 - 500)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
249574	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,616	6/17/13	15:35	OSAM-1	
249592	5.0 µ PVC		14,452	6/17/13	15:50	OSAM-2	
249572	5.0 µ PVC		14,832	6/17/13	16:05	OSAM-3	
249586	5.0 µ PVC		14,616	6/17/13	16:40	PAM-1	
249580	5.0 µ PVC		14,853	6/17/13	16:48	PAM-2	
249588	5.0 µ PVC		14,801	6/17/13	16:54	PAM-3	
249598	5.0 µ PVC		14,822	6/17/13	17:01	PAM-4	
249596	5.0 µ PVC		14,781	6/17/13	17:15	PAM-5	
249553	5.0 µ PVC		14,791	6/17/13	17:21	PAM-6	
249597	5.0 µ PVC		14,698	6/17/13	17:27	PAM-7	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 19 AM 11:31

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6-18-13		6/18/13
	6/18/13		6/19/13 10:40

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

11

041315875

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only):

041315875

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249583	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	n/a	6/17/13 16:40	[redacted]	Media Blank 1

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 19 AM 11:31

Comments:

041315875

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/24/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/19/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302682. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302682
CustomerID:	GTA51
CustomerPO:	041315742
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/19/13 9:00 AM
Collected: 6/15/2013

Analytical Results

Client Sample Description GTA-13 PAM-1 ***Collected:*** 6/15/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00070	µg/m³	6/21/2013	MM	6/21/2013	MM

Client Sample Description GTA-14 PAM-2 ***Collected:*** 6/15/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00069	µg/m³	6/21/2013	MM	6/21/2013	MM

Client Sample Description GTA-15 PAM-4 ***Collected:*** 6/15/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0016	0.00070	µg/m³	6/21/2013	MM	6/21/2013	MM

Client Sample Description GTA-16 PAM-6 ***Collected:*** 6/15/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00091	0.00070	µg/m³	6/21/2013	MM	6/21/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302682

041315442 TA

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47mm, via PM2.5 Impact Sampler
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐ _____	**Lot #:**

	Sample ID	**Media**	**Analyte / Method**	**Volume**	**Sample Date/Time**		**Location**	**Comments**
①	GTA-13	47 mm	Cr VI OSHA 215 Particulates (From PM2.5 Impact Sampler)	14,200	6-15-13	~~16:40~~ 16:40	PAM-1	RECEIVED EMSL CINNAMINSON, NJ 13 JUN 18 AM 10:51
②	GTA-14	47 mm		14,474	6-15-13	17:06	PAM-2	
③	GTA-15	47 mm		14,312	6-15-13	~~17:20~~ 17:22	PAM-4	
④	GTA-16	47 mm		14,393	6-15-13	~~17:45~~ 17:45	PAM-6	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	**Date**	**Received By**	**Date**
	6/15/13		6/17/13
	6/17/13	FX	6/18/13 10A
		23C	6/19/13 9:00AM

Comments: OK to run both methods from same sample media.
Samples were not collected from a welding, plating or painting environment.

(4)

011302682

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/24/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/19/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302685. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302685
CustomerID:	GTA51
CustomerPO:	041315751
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/19/13 9:00 AM
Collected: 6/14/2013

Analytical Results

Client Sample Description GTA-9
PAM-1 ***Collected:*** 6/14/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00070	µg/m³	6/21/2013	MM	6/21/2013	MM

Client Sample Description GTA-10
PAM-2 ***Collected:*** 6/14/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0020	0.00069	µg/m³	6/21/2013	MM	6/21/2013	MM

Client Sample Description GTA-11
PAM-4 ***Collected:*** 6/14/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00069	µg/m³	6/21/2013	MM	6/21/2013	MM

Client Sample Description GTA-12
PAM-6 ***Collected:*** 6/14/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00068	µg/m³	6/21/2013	MM	6/21/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302685

041315751 DA

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47mm, via PM2.5 Impact Sampler
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐	**Lot #:**

	Sample ID	**Media**	**Analyte / Method**	**Volume**	**Sample Date/Time**		**Location**	**Comments**
(1)	GTA-9	47 mm	Cr VI OSHA 215 Particulates (From PM2.5 Impact Sampler)	14,300	6-14-13	17:00	PAM-1	
(2)	GTA-10	47 mm		14,575	6-14-13	17:20	PAM-2	
(3)	GTA-11	47 mm		14,423	6-14-13	17:45	PAM-4	
(4)	GTA-12	47 mm		14,626	6-14-13	18:08	PAM-6	

RECEIVED EMSL CINNAMINSON, NJ JUN 18 AM 10:47

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	**Date**	**Received By**	**Date**
Tracy Perkins	6/15/13	Jarrod Hearn	6/17/13
Jarrod Hearn	6/17/13	AK FX	6/18/13 10A
		Travis Allen 23°C	6/19/13 9:00AM

Comments: OK to run both methods from same sample media.
Samples were not collected from a welding, plating or painting environment.

(4)

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041315871
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/19/13 10:40 AM
Analysis Date:	6/24/2013
Collected:	6/7/2013

Project: **130467 USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249523		12874	0.078	0.006	0.004	
041315871-0001						
249549		14288	0.371	0.026	0.003	
041315871-0002						
249502		14603	0.123	0.008	0.003	
041315871-0003						
249547		14350	0.242	0.017	0.003	
041315871-0004						
249528		14471	<0.05	<0.003	0.003	Initial weight error
041315871-0005						
249503		14717	0.106	0.007	0.003	
041315871-0006						
249518		14472	0.248	0.017	0.003	
041315871-0007						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (7)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 06/25/2013 10:37:21 Replaces the Inital Report 06/24/2013 15:41:58. Reason Code: QA\QC-Comment Change

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041315871

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: / Date of Shipment:	Purchase Order: / Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (301 - 400)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249523	5.0μ PVC	Cr VI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	12,874	6/7/13 16:45	1	
249549			14,288	16:54	2	(Samples were not collected welding, plating or painting environments.)
249502			14,603	16:58	3	
249547			14,350	17:02	4	
249528			14,971	17:10	5	
249503			14,717	17:20	6	
249518			14,472	17:30	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Teresa Perkins	6/18/13		6/18/13
			6-14-13 10:40

RECEIVED EMSL CINNAMINSON 13 JUN 19 AM 11:36

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

041315871

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316208
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/21/13 9:20 AM
Analysis Date:	6/25/2013
Collected:	5/26/2013

Project: **130467-USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249698	PAM-1	15480	0.090	0.006	0.003	
041316208-0001						
249655	PAM-2	15306	0.121	0.008	0.003	
041316208-0002						
249666	PAM-3	15584	0.156	0.010	0.003	
041316208-0003						
249684	PAM-4	15419	0.098	0.006	0.003	
041316208-0004						
249651	PAM-5	15285	0.089	0.006	0.003	
041316208-0005						
249653	PAM-6	15224	0.217	0.014	0.003	
041316208-0006						
249656	PAM-7	15028	0.140	0.009	0.003	
041316208-0007						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (7)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/25/2013 12:11:33

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041316208

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041316208

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: SSTEVENSON@GTAENG.COM

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (201 - 300)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249698	5.0μ PVC	Cr VI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,480	5/26/13 18:00	1	
249655			15,306	18:08	2	
249666			15,584	18:13	3	
249684			15,419	18:19	4	
249651			15,285	18:28	5	
249653			15,224	18:35	6	
249656			15,028	18:45	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Terrence Perkins	5/29/13	Scott W Cummings	5/29/13
Scott W Cummings	6/20/13	OMB-IH-920A	6-21-13

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

* SAMPLES WERE NOT COLLECTED FROM A PLATING, WELDING, OR PAINTING ENVIRONMENT.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/26/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/20/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302729. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302729
CustomerID:	GTA51
CustomerPO:	041315877
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/20/13 9:00 AM
Collected:	6/8/2013

Analytical Results

Client Sample Description 249521 1 ***Collected:*** 6/8/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0010	0.00066	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249546 2 ***Collected:*** 6/8/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00067	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249506 3 ***Collected:*** 6/8/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00085	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249505 4 ***Collected:*** 6/8/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00067	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249538 5 ***Collected:*** 6/8/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00077	0.00067	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249504 6 ***Collected:*** 6/8/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00067	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249508 7 ***Collected:*** 6/8/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00066	µg/m³	6/24/2013	WF	6/25/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

011302729

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302729

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: Date of Shipment:	Purchase Order: Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 2B127 (301 - 400)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
①	249521	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,192	6/8/13 16:45	1	Samples were not collected in plating, welding, or painting environments.
②	249546			15,006	16:50	2	
③	249506			14,801	16:55	3	
④	249505			15,027	17:00	4	
⑤	249538			14,934	17:06	5	
⑥	249504			14,903	17:13	6	
⑦	249509			15,230	17:20	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Terrance Perkins	6/18/13	Travis Allred	6/18/13 6:20/13 9:00AM

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE

1 of 1 pages

(7)

011302729

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707
Phone: (410) 792-9446
Fax: (410) 792-7395

6/26/2013

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/24/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302826. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302826
CustomerID:	GTA51
CustomerPO:	041315871
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/24/13 3:00 PM
Collected: 6/7/2013

Analytical Results

Client Sample Description 249523 1 ***Collected:*** 6/7/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00078	µg/m³	6/25/2013	MM	6/26/2013	MM

Client Sample Description 249549 2 ***Collected:*** 6/7/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0059	0.00070	µg/m³	6/25/2013	MM	6/26/2013	MM

Client Sample Description 249502 3 ***Collected:*** 6/7/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0010	0.00069	µg/m³	6/25/2013	MM	6/26/2013	MM

Client Sample Description 249547 4 ***Collected:*** 6/7/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0011	0.00070	µg/m³	6/25/2013	MM	6/26/2013	MM

Client Sample Description 249528 5 ***Collected:*** 6/7/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0033	0.00069	µg/m³	6/25/2013	MM	6/26/2013	MM

Client Sample Description 249503 6 ***Collected:*** 6/7/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	6/25/2013	MM	6/26/2013	MM

Client Sample Description 249518 7 ***Collected:*** 6/7/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0034	0.00069	µg/m³	6/25/2013	MM	6/26/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302826

011302826

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL	State/Province: MD	Zip/Postal Code: 20707	City: LAUREL	State/Province: MD	Zip/Postal Code: 20707
Phone: (410) 792-9446	Fax: (410) 792-7395	Phone: (410) 792-9446	Fax: (410) 792-7395
Project Name: 130467 USA			U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 2B127 (301 - 400)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (FAM)	Comments
1	249523	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	12,874	6/7/13 16:45	1	
2	249549			14,298	16:54	2	(Samples were not collected welding, plating or painting environments.)
3	249502			14,603	16:58	3	
4	249547			14,350	17:02	4	
5	249528			14,971	17:10	5	
6	249503			14,717	17:20	6	
7	249518			14,472	17:30	7	

13 JUN 19 AM 11:36 CINNAMINSON NJ

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tanya Perkins	6/18/13		6/18/13
			6-19-13 10:40
		Travis Allred 23°C	6/24/13 3:00pm

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316211
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/21/13 9:20 AM
Analysis Date:	6/25/2013
Collected:	6/19/2013

Project: **130467-USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249556	OSAM-1	14616	0.208	0.014	0.003	
041316211-0001						
249558	OSAM-2	14605	0.193	0.013	0.003	
041316211-0002						
249590	OSAM-3	15453	0.239	0.015	0.003	
041316211-0003						
249571	PAM- 1	15225	0.062	0.004	0.003	
041316211-0004						
249587	PAM- 2	15563	0.212	0.014	0.003	
041316211-0005						
249562	PAM- 3	15825	0.135	0.009	0.003	
041316211-0006						
249570	PAM- 4	15688	0.196	0.012	0.003	
041316211-0007						
249559	PAM- 5	15810	0.152	0.010	0.003	
041316211-0008						
249573	PAM- 6	15892	0.189	0.012	0.003	
041316211-0009						
249599	PAM- 7	15898	0.096	0.006	0.003	
041316211-0010						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (10)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/26/2013 10:11:53

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041316211

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041316211

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 28127 (301 - 500)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
249556	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,616	6/19/13	15:35	OSAM-1	
249558	5.0 µ PVC		14,605	6/19/13	16:00	OSAM-2	
249590	5.0 µ PVC		15,453	6/19/13	17:00	OSAM-3	
249571	5.0 µ PVC		15,225	6/19/13	17:40	PAM-1	
249587	5.0 µ PVC		15,563	6/19/13	18:00	PAM-2	
249562	5.0 µ PVC		15,825	6/19/13	18:25	PAM-3	
249570	5.0 µ PVC		15,688	6/19/13	18:40	PAM-4	
249559	5.0 µ PVC		15,810	6/19/13	19:05	PAM-5	
249573	5.0 µ PVC		15,892	6/19/13	19:20	PAM-6	
249599	5.0 µ PVC		15,898	6/19/13	19:35	PAM-7	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 21 AM 11:23

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6-20-13		6/20/13
	6/20/13	DMB-PA-920A	6-21-13

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

10

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316386
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/24/13 8:50 AM
Analysis Date:	6/25/2013
Collected:	6/20/2013

Test Report: PM2.5 Analysis of Particulate Matter Performed by EPA Reference Method 40 CFR, Chapter 1, Part 50, Appendix L

Sample	*Location*	*Volume (L)*	*Initial Weight (mg)*	*Final Weight (mg)*	*Sample Weight (mg)*	*Concentration (µg/m³)*	*Reporting Limit (µg/m³)*	*Notes*
GTA-17	PAM-1	15675	20.818	21.059	0.241	15.375	0.128	
041316386-0001								
GTA-18	PAM-2	15525	19.130	19.458	0.328	21.127	0.129	
041316386-0002								
GTA-19	PAM-4	16295	21.357	21.818	0.461	28.291	0.123	
041316386-0003								
GTA-20	PAM-6	15832	20.800	21.184	0.384	24.255	0.126	
041316386-0004								

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (4)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/26/2013 09:02:57

THIS IS THE LAST PAGE OF THE REPORT.

041316386

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041316386

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47mm, via PM2.5 Impact Sampler
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐ _____	**Lot #:**

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
GTA-17	47 mm	Cr VI OSHA 215 Particulates (From PM2.5 Impact Sampler)	15,675	6-20-13	18:40	PAM-1	
GTA-18	47 mm		15,525	6-20-13	19:00	PAM-2	
GTA-19	47 mm		16,295	6-20-13	20:10	PAM-4	
GTA-20	47 mm		15,832	6-20-13	20:30	PAM-6	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6/20/13		6/21/13
	6/21/13		6/21/13 8:50

Comments: OK to run both methods from same sample media.
Samples were not collected from a welding, plating or painting environment.

4

RECEIVED EMSL CINNAMINSON, NJ JUN 24 PM 12:30

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/27/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/21/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302783. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302783
CustomerID:	GTA51
CustomerPO:	041315875
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/21/13 5:00 PM
Collected:	6/17/2013

Analytical Results

Client Sample Description 249574 OSAM-1 ***Collected:*** 6/17/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249592 OSAM-2 ***Collected:*** 6/17/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00099	0.00069	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249572 OSAM-3 ***Collected:*** 6/17/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00067	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249586 PAM-1 ***Collected:*** 6/17/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00068	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249580 PAM-2 ***Collected:*** 6/17/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0053	0.00067	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249588 PAM-3 ***Collected:*** 6/17/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0015	0.00068	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249598 PAM-4 ***Collected:*** 6/17/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	6/24/2013	WF	6/25/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302783
CustomerID:	GTA51
CustomerPO:	041315875
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/21/13 5:00 PM
Collected:	6/17/2013

Analytical Results

Client Sample Description 249596 PAM-5 ***Collected:*** 6/17/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00068	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249553 PAM-6 ***Collected:*** 6/17/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00068	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249597 PAM-7 ***Collected:*** 6/17/2013 ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00068	µg/m³	6/24/2013	WF	6/25/2013	MM

Client Sample Description 249583 Media Blank 1 ***Collected:*** 6/17/2013 ***Lab ID:*** *0011*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	6/24/2013	WF	6/25/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302783

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302783

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece Cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 28127 (301 - 500)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
①	249574	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,616	6/17/13	15:35	OSAM-1	
②	249592	5.0 µ PVC		14,452	6/17/13	15:50	OSAM-2	
③	249572	5.0 µ PVC		14,832	6/17/13	16:05	OSAM-3	
④	249586	5.0 µ PVC		14,616	6/17/13	16:40	PAM-1	
⑤	249580	5.0 µ PVC		14,853	6/17/13	16:48	PAM-2	
⑥	249588	5.0 µ PVC		14,801	6/17/13	16:54	PAM-3	
⑦	249598	5.0 µ PVC		14,822	6/17/13	17:01	PAM-4	
⑧	249596	5.0 µ PVC		14,781	6/17/13	17:15	PAM-5	
⑨	249553	5.0 µ PVC		14,791	6/17/13	17:21	PAM-6	
⑩	249597	5.0 µ PVC		14,698	6/17/13	17:27	PAM-7	

RECEIVED EMSL CINNAMINSON, NJ 13 JUN 19 AM 11:31

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6-18-13		6/18/13
	6/18/13	VC TY	6/19/13 10:40
		Travis Allt 23°C	6/21/13 5:00pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

11

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only):

011302783

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302783

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249583	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	n/a	6/17/13 16:40	[redacted]	Media Blank 1

RECEIVED
EAST
CINNAMINSON, NJ
13 JUN 19 AM 11:31

Comments:

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316203
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467-USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/21/13 9:20 AM
Analysis Date:	6/26/2013
Collected:	6/18/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249578 *041316203-0001*	OSAM-1	14688	0.521	0.035	0.003	
249594 *041316203-0002*	OSAM-2	14584	0.147	0.010	0.003	
249575 *041316203-0003*	OSAM-3	14853	0.172	0.012	0.003	
249552 *041316203-0004*	PAM-1	14544	0.213	0.015	0.003	
249550 *041316203-0005*	PAM-2	14770	0.245	0.017	0.003	
249568 *041316203-0006*	PAM-3	14853	0.261	0.018	0.003	
249567 *041316203-0007*	PAM-4	14626	0.286	0.020	0.003	
249595 *041316203-0008*	PAM-5	14760	0.234	0.016	0.003	
249561 *041316203-0009*	PAM-6	14770	0.343	0.023	0.003	
249563 *041316203-0010*	PAM-7	14750	0.257	0.017	0.003	
249557 *041316203-0011*	PAM-1- FIELD BLANK	0	<0.05	N/A	N\A	Field Blank

Analyst(s)

Shane Feret (11)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/27/2013 12:22:37

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316203
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467-USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/21/13 9:20 AM
Analysis Date:	6/26/2013
Collected:	6/18/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m^3)*	*Reporting Limit (mg/m^3)*	*Notes*

Notes: Discernable field blank submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (11)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/27/2013 12:22:37

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041316203

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 28127 (301 - 500)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
249578	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,688	6/18/13	15:35	OSAM-1	
249594	5.0 µ PVC		14,584	6/18/13	15:50	OSAM-2	
249575	5.0 µ PVC		14,853	6/18/13	16:05	OSAM-3	
249552	5.0 µ PVC		14,544	6/18/13	16:40	PAM-1	
249550	5.0 µ PVC		14,770	6/18/13	16:48	PAM-2	
249568	5.0 µ PVC		14,853	6/18/13	16:54	PAM-3	
249567	5.0 µ PVC		14,626	6/18/13	17:01	PAM-4	
249595	5.0 µ PVC		14,760	6/18/13	17:15	PAM-5	
249561	5.0 µ PVC		14,770	6/18/13	17:21	PAM-6	
249563	5.0 µ PVC		14,750	6/18/13	17:27	PAM-7	

RECEIVED EMSL CINNAMINSON, NJ 13 JUN 21 AM 11:22

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tammy Terry	6-19-13		
	6/20/13		6/20/13
		DMB-FX-920A	6-21-13

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

11

041316203

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only):

041316203

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249557	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	n/a	6/18/13 16:40	PAM-1	Field Blank 1

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316219
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/21/13 9:20 AM
Analysis Date:	6/25/2013
Collected:	

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m^3)*	*Reporting Limit (mg/m^3)*	*Notes*
249694	PAM 1	14256	0.067	0.005	0.004	
041316219-0001						
249676	PAM 2	14268	0.146	0.010	0.004	
041316219-0002						
249697	PAM 3	14330	0.106	0.007	0.003	
041316219-0003						
249667	PAM 4	14360	0.124	0.009	0.003	
041316219-0004						
249664	PAM 5	15211	0.286	0.019	0.003	
041316219-0005						
249699	PAM 6	14852	0.095	0.006	0.003	
041316219-0006						
249665	PAM 7	14617	0.148	0.010	0.003	
041316219-0007						
249685	Field Blank	0	0.056	N/A	N\A	Field Blank
041316219-0008						

Notes: Discernable field blank submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (8)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/27/2013 12:09:23

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041316219

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL	State/Province: MD	Zip/Postal Code: 20707	City: LAUREL	State/Province: MD	Zip/Postal Code: 20707
Phone: (410) 792-9446	Fax: (410) 792-7395		Phone: (410) 792-9446	Fax: (410) 792-7395	
Project Name: 130467 USA			U.S. State where Samples Collected: MARYLAND		
Number of Samples in Shipment:	Date of Shipment:	Purchase Order:	Sampled By (Signature):		
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm, 3 PIECE CASSETTE
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: ZEFON 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	Lot #: 28127 (201 - 300)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
—	5.0μ PVC	Cr VI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	—	5/25/13 —	1 —	
249694			14,256	18:00	2 1	
249676			14,268	18:04	3 2	
249697			14,330	18:10	4 3	
249667			14,360	18:18	5 4	
249664			15,211	18:26	6 5	
249699			14,852	18:32	7 6	
249665			14,617	18:40	7	
249685			—	18:00	FIELD BLANK 1	

RECEIVED EMSL CINNAMINSON, NJ 13 JUN 21 AM 11:24

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Terrence Perkins	5/29/13	Scott W Cummings	5/29/13
Scott W Cummings	6/20/13	[illegible]	6-21-13

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

* SAMPLES WERE NOT COLLECTED FROM A PLATING, WELDING, OR PAINTING ENVIRONMENT.

8

041316219

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316248
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/21/13 9:20 AM
Analysis Date:	6/25/2013
Collected:	6/2/2013

Project: **130467 USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249649	Pam 1	14591	0.239	0.016	0.003	
041316248-0001						
249645	Pam 2	14422	0.179	0.012	0.003	
041316248-0002						
249626	Pam 3	14227	0.189	0.013	0.004	
041316248-0003						
249606	Pam 4	14378	0.239	0.017	0.003	
041316248-0004						
249603	Pam 5	14603	0.197	0.013	0.003	
041316248-0005						
249639	Pam 6	14763	0.221	0.015	0.003	
041316248-0006						
249641	Pam 7	14587	0.266	0.018	0.003	
041316248-0007						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (7)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/27/2013 12:11:29

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041316248

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (201 - 300)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249649	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	14.591	6/2/2013 16:06	PAM-1	
249645			14.422	6/2/2013 16:04	PAM-2	
249626			14.227	6/2/2013 16:08	PAM-3	
249606			14.378	6/2/2013 16:12	PAM-4	
249603			14.603	6/2/2013 16:18	PAM-5	
249639			14.763	6/2/2013 16:25	PAM-6	
249641			14.587	6/2/2013 16:31	PAM-7	

(7)

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Laura DeRare	6/3/2013	Scott W Cummings	6/3/13
Scott W Cummings	6/20/13	OMB-4X-920X	6-21-13

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

* SAMPLES WERE NOT COLLECTED FROM A PLATING, WELDING, OR PAINTING ENVIRONMENT.

041316248

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316333
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/22/13 10:00 AM
Analysis Date:	6/26/2013
Collected:	6/20/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249569	OSAM-1	15829	0.143	0.009	0.003	
041316333-0001						
249589	OSAM-2	15478	0.167	0.011	0.003	
041316333-0002						
249576	OSAM-3	15656	0.195	0.012	0.003	
041316333-0003						
249582	PAM-1	15300	0.208	0.014	0.003	
041316333-0004						
249555	PAM-2	14925	0.181	0.012	0.003	
041316333-0005						
249579	PAM-3	15991	0.109	0.007	0.003	
041316333-0006						
249581	PAM-4	15453	0.244	0.016	0.003	
041316333-0007						
249566	PAM-5	15453	0.294	0.019	0.003	
041316333-0008						
249551	PAM-6	15478	0.221	0.014	0.003	
041316333-0009						
249560	PAM-7	15453	0.213	0.014	0.003	
041316333-0010						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (10)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/27/2013 12:18:38

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041316333

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 28127 (401 - 450)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
249569	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	15,829	6/20/13	17:50	OSAM-1	
249589	5.0 µ PVC		15,478	6/20/13	17:10	OSAM-2	
249576	5.0 µ PVC		15,656	6/20/13	18:20	OSAM-3	
249582	5.0 µ PVC		15,300	6/20/13	18:40	PAM-1	
249555	5.0 µ PVC		14,925	6/20/13	19:00	PAM-2	
249579	5.0 µ PVC		15,991	6/20/13	20:00	PAM-3	
249581	5.0 µ PVC		15,453	6/20/13	20:10	PAM-4	
249566	5.0 µ PVC		15,453	6/20/13	20:20	PAM-5	
249551	5.0 µ PVC		15,478	6/20/13	20:30	PAM-6	
249560	5.0 µ PVC		15,453	6/20/13	20:50	PAM-7	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 22 AM 10: 13

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6-20-13		6/21/13
	6/21/13	Fx	6/22/13 10:00

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

10C

041316333

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316583
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/25/13 9:25 AM
Analysis Date:	6/27/2013
Collected:	6/21/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
93945		14413	0.188	0.013	0.003	
041316583-0001						
93982		15119	0.174	0.012	0.003	
041316583-0002						
93989		14484	0.148	0.010	0.003	
041316583-0003						
93974		14965	0.090	0.006	0.003	
041316583-0004						
93950		14994	0.134	0.009	0.003	
041316583-0005						
93968		14555	0.150	0.010	0.003	
041316583-0006						
93973		14413	0.244	0.017	0.003	
041316583-0007						
93966		14413	0.218	0.015	0.003	
041316583-0008						
93948		14555	0.320	0.022	0.003	
041316583-0009						
93958		14413	0.105	0.007	0.003	
041316583-0010						
93964		0	<0.05	N/A	N\A	Field Blank
041316583-0011						

Analyst(s)

Shane Feret (12)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/27/2013 15:53:23

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316583
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/25/13 9:25 AM
Analysis Date:	6/27/2013
Collected:	6/21/2013

Project: **130467USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
93978		0	<0.05	N/A	N\A	Field Blank
041316583-0012						

Notes: Discernable field blank submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (12)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/27/2013 15:53:23

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041316583

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 28127 (401 - 450)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
93945	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,413	6/21/13	17:30	OSAM-1	
93982	5.0 µ PVC		15,119	6/21/13	17:45	OSAM-2	
93989	5.0 µ PVC		14,484	6/21/13	18:00	OSAM-3	
93974	5.0 µ PVC		14,965	6/21/13	19:00	PAM-1	
93950	5.0 µ PVC		14,994	6/21/13	19:30	PAM-2	
93968	5.0 µ PVC		14,555	6/21/13	19:40	PAM-3	
93973	5.0 µ PVC		14,413	6/21/13	19:50	PAM-4	
93966	5.0 µ PVC		14,413	6/21/13	20:05	PAM-5	
93948	5.0 µ PVC		14,555	6/21/13	20:10	PAM-6	
93958	5.0 µ PVC		14,413	6/21/13	20:30	PAM-7	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 25 AM 10:53

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By		Date
Tamara Rathbun	6/24/13	AK	FX	6/25/13 9:25A

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

12

041316583

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only):
041316583

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
93964	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	n/a	6/21/13	n/a	Media Blank 1
93978	5.0 µ PVC		n/a	6/21/13	PAM-1	Field Blank 1

Comments:

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 25 AM 10:53

041316583

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316596
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467-USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/25/13 9:25 AM
Analysis Date:	6/27/2013
Collected:	6/22/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
93946	OSAM-1	14760	0.119	0.008	0.003	
041316596-0001						
93942	OSAM-2	14904	0.246	0.017	0.003	
041316596-0002						
93979	OSAM-3	14688	0.076	0.005	0.003	
041316596-0003						
93965	PAM-1	14555	0.119	0.008	0.003	
041316596-0004						
93953	PAM-2	14058	0.189	0.013	0.004	
041316596-0005						
93944	PAM-3	14535	0.195	0.013	0.003	
041316596-0006						
93943	PAM-4	14697	0.179	0.012	0.003	
041316596-0007						
93955	PAM-5	14271	0.209	0.015	0.004	
041316596-0008						
93976	PAM-6	14839	0.300	0.020	0.003	
041316596-0009						
93985	PAM-7	14555	0.308	0.021	0.003	
041316596-0010						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (10)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/27/2013 15:30:54

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041316596

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041316596

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 28127 (401 - 450)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
93946	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,760	6/22/13	17:30	OSAM-1	
93942	5.0 µ PVC		14,904	6/22/13	17:45	OSAM-2	
93979	5.0 µ PVC		14,688	6/22/13	18:00	OSAM-3	
93965	5.0 µ PVC		14,555	6/22/13	18:40	PAM-1	
93953	5.0 µ PVC		14,058	6/22/13	19:10	PAM-2	
93944	5.0 µ PVC		14,535	6/22/13	19:25	PAM-3	
93943	5.0 µ PVC		14,697	6/22/13	19:30	PAM-4	
93955	5.0 µ PVC		14,271	6/22/13	19:45	PAM-5	
93976	5.0 µ PVC		14,839	6/22/13	19:50	PAM-6	
93985	5.0 µ PVC		14,555	6/22/13	20:10	PAM-7	

EMSL
CINNAMINSON, NJ
13 JUN 25 AM 11:05

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
[signature]	6/24/13	[signature] FX	6/25/13 9:25A

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316537
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **1390467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/25/13 9:25 AM
Analysis Date:	6/26/2013
Collected:	6/22/2013

Test Report: PM2.5 Analysis of Particulate Matter Performed by EPA Reference Method 40 CFR, Chapter 1, Part 50, Appendix L

Sample	*Location*	*Volume (L)*	*Initial Weight (mg)*	*Final Weight (mg)*	*Sample Weight (mg)*	*Concentration (µg/m³)*	*Reporting Limit (µg/m³)*	*Notes*
GTA-25	PAM-1	14697	21.066	22.541	1.475	100.360	0.136	
041316537-0001								
GTA-26	PAM-2	15620	19.246	19.564	0.318	20.359	0.128	
041316537-0002								
GTA-27	PAM-3	15052	19.553	19.856	0.303	20.130	0.133	
041316537-0003								
GTA-28	PAM-4	14981	18.543	18.861	0.318	21.227	0.134	
041316537-0004								

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (4)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/27/2013 10:24:55

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041316537

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47mm, via PM2.5 Impact Sampler
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐	**Lot #:**

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
GTA-25	47 mm	Cr VI OSHA 215 Particulates (From PM2.5 Impact Sampler)	14,697	6-22-13	18:40	PAM-1	
GTA-26	47 mm		15,620	6-22-13	19:10	PAM-2	
GTA-27	47 mm		15,052	6-22-13	19:30	PAM-4	
GTA-28	47 mm		14,981	6-22-13	19:50	PAM-6	

RECEIVED EMSL CINNAMINSON, NJ 13 JUN 25 AM 11:00

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
James Rollins	6/24/13	AM FX	6/25/13 9:25A

Comments: OK to run both methods from same sample media.
Samples were not collected from a welding, plating or painting environment.

4

041316537

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316567
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/25/13 9:25 AM
Analysis Date:	6/26/2013
Collected:	6/21/2013

Test Report: PM2.5 Analysis of Particulate Matter Performed by EPA Reference Method 40 CFR, Chapter 1, Part 50, Appendix L

Sample	*Location*	*Volume (L)*	*Initial Weight (mg)*	*Final Weight (mg)*	*Sample Weight (mg)*	*Concentration (µg/m³)*	*Reporting Limit (µg/m³)*	*Notes*
GTA-21	PAM-1	14768	18.553	19.132	0.579	39.206	0.135	
041316567-0001								
GTA-22	PAM-2	15141	21.110	21.698	0.588	38.835	0.132	
041316567-0002								
GTA-23	PAM-4	15123	20.250	20.777	0.527	34.848	0.132	
041316567-0003								
GTA-24	PAM-6	14910	20.919	21.305	0.386	25.889	0.134	
041316567-0004								

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (4)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/27/2013 10:15:37

THIS IS THE LAST PAGE OF THE REPORT.

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041316567

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041316567

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47mm, via PM2.5 Impact Sampler
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐	**Lot #:**

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
GTA-21	47 mm	Cr VI OSHA 215 Particulates (From PM2.5 Impact Sampler)	14,768	6-21-13	19:00	PAM-1	
GTA-22	47 mm		15,141	6-21-13	19:30	PAM-2	
GTA-23	47 mm		15,123	6-21-13	19:50	PAM-4	
GTA-24	47 mm		14,910	6-21-13	20:10	PAM-6	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 25 AM 11:02

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
[signature]	6/24/13	AM FX	6/25/13 9:25A

Comments: OK to run both methods from same sample media.
Samples were not collected from a welding, plating or painting environment.

4

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316568
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/25/13 9:25 AM
Analysis Date:	6/26/2013
Collected:	6/23/2013

Test Report: PM2.5 Analysis of Particulate Matter Performed by EPA Reference Method 40 CFR, Chapter 1, Part 50, Appendix L

Sample	*Location*	*Volume (L)*	*Initial Weight (mg)*	*Final Weight (mg)*	*Sample Weight (mg)*	*Concentration (µg/m³)*	*Reporting Limit (µg/m³)*	*Notes*
GTA-29	PAM-1	14904	21.103	21.146	0.043	2.885	0.134	
041316568-0001								
GTA-30	PAM-2	14944	20.938	20.250	<0.002	<0.134	0.134	
041316568-0002								
GTA-31	PAM-4	14904	21.869	22.042	0.173	11.608	0.134	
041316568-0003								
GTA-32	PAM-6	14768	21.241	21.322	0.081	5.485	0.135	
041316568-0004								

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (4)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/27/2013 09:23:11

THIS IS THE LAST PAGE OF THE REPORT.

041316568

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041316568

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47mm, via PM2.5 Impact Sampler
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐ _____	**Lot #:**

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
GTA-29	47 mm	Cr VI OSHA 215 Particulates (From PM2.5 Impact Sampler)	14,904	6-23-13	18:30	PAM-1	
GTA-30	47 mm		14,944	6-23-13	18:50	PAM-2	
GTA-31	47 mm		14,904	6-23-13	19:10	PAM-4	
GTA-32	47 mm		14,768	6-23-13	19:30	PAM-6	

RECEIVED EMSL CINNAMINSON NJ 13 JUN 25 AM 11:04

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By		Date
Tuma Beck	6/24/13	AK	FX	6/25/13 9:25a

Comments: OK to run both methods from same sample media.
Samples were not collected from a welding, plating or painting environment.

4

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/28/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 5/16/2013. The results are tabulated on the attached data pages for the following client designated project:

130467 USA

The reference number for these samples is EMSL Order #011302079. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

Revised Report- Samples -0043 through -0049 were resubmitted by the client for analysis. - Original Report 5/22/13

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302079
CustomerID:	GTA51
CustomerPO:	041312334
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/16/13 4:00 PM
Collected:	5/13/2013

Analytical Results

Client Sample Description 249341 Pam-1 ***Collected:*** ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00065	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249310 Pam-2 ***Collected:*** ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00065	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249331 Pam-3 ***Collected:*** ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00066	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249330 Pam-4 ***Collected:*** ***Lab ID:*** *0011*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00067	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249244 Pam-5 ***Collected:*** ***Lab ID:*** *0012*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00082	0.00065	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249222 Pam-6 ***Collected:*** ***Lab ID:*** *0013*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00065	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249246 Pam-7 ***Collected:*** ***Lab ID:*** *0014*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00065	µg/m³	5/20/2013	MM	5/20/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302079
CustomerID:	GTA51
CustomerPO:	041312334
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 05/16/13 4:00 PM
Collected: 5/13/2013

Project: **130467 USA**

Analytical Results

Client Sample Description 249338 Field Blank 1 ***Collected:*** ***Lab ID:*** *0015*

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249227 Pam-1 ***Collected:*** ***Lab ID:*** *0016*

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
ID-215	Hexavalent Chromium	0.0020	0.00067	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249213 Pam-2 ***Collected:*** ***Lab ID:*** *0017*

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249226 Pam-3 ***Collected:*** ***Lab ID:*** *0018*

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	5/20/2013	MM	5/20/2013	MM

Client Sample Description 249228 Pam-4 ***Collected:*** ***Lab ID:*** *0019*

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249236 Pam-5 ***Collected:*** ***Lab ID:*** *0020*

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
ID-215	Hexavalent Chromium	ND	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249230 Pam-6 ***Collected:*** ***Lab ID:*** *0021*

Method	Parameter	Result	RL	Units	Prep Date	Analyst	Analysis Date	Analyst
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	5/20/2013	MM	5/21/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302079
CustomerID:	GTA51
CustomerPO:	041312334
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/16/13 4:00 PM
Collected:	5/13/2013

Analytical Results

Client Sample Description 249207 Pam-7 ***Collected:*** ***Lab ID:*** *0022*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00068	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249220 Pam-1 ***Collected:*** ***Lab ID:*** *0029*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249223 Pam-2 ***Collected:*** ***Lab ID:*** *0030*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0015	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249234 Pam-3 ***Collected:*** ***Lab ID:*** *0031*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249247 Pam-4 ***Collected:*** ***Lab ID:*** *0032*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249206 Pam-5 ***Collected:*** ***Lab ID:*** *0033*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249224 Pam-6 ***Collected:*** ***Lab ID:*** *0034*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0039	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302079
CustomerID:	GTA51
CustomerPO:	041312334
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/16/13 4:00 PM
Collected:	5/13/2013

Analytical Results

Client Sample Description 249218 Pam-7 ***Collected:*** ***Lab ID:*** *0035*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00080	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249231 Pam-1 ***Collected:*** ***Lab ID:*** *0036*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249245 Pam-2 ***Collected:*** ***Lab ID:*** *0037*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0047	0.00071	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249229 Pam-3 ***Collected:*** ***Lab ID:*** *0038*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0036	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249233 Pam-4 ***Collected:*** ***Lab ID:*** *0039*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249205 Pam-5 ***Collected:*** ***Lab ID:*** *0040*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0021	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249214 Pam-6 ***Collected:*** ***Lab ID:*** *0041*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0033	0.00069	µg/m³	5/20/2013	MM	5/21/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302079
CustomerID:	GTA51
CustomerPO:	041312334
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/16/13 4:00 PM
Collected:	5/13/2013

Analytical Results

Client Sample Description 249216 Pam-7 ***Collected:*** ***Lab ID:*** *0042*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00070	µg/m³	5/20/2013	MM	5/21/2013	MM

Client Sample Description 249225 Pam-1 ***Collected:*** 5/13/2013 ***Lab ID:*** *0043*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0036	0.00069	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249241 Pam-2 ***Collected:*** 5/13/2013 ***Lab ID:*** *0044*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0051	0.00070	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249201 Pam-3 ***Collected:*** 5/13/2013 ***Lab ID:*** *0045*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0051	0.00069	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249235 Pam-4 ***Collected:*** 5/13/2013 ***Lab ID:*** *0046*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0042	0.00069	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249210 Pam-5 ***Collected:*** 5/13/2013 ***Lab ID:*** *0047*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0031	0.00069	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249204 Pam-6 ***Collected:*** 5/13/2013 ***Lab ID:*** *0048*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0048	0.00069	µg/m³	6/26/2013	MM	6/27/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302079
CustomerID:	GTA51
CustomerPO:	041312334
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467 USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	05/16/13 4:00 PM
Collected:	5/13/2013

Analytical Results

Client Sample Description 249200 Pam-7 ***Collected:*** 5/13/2013 ***Lab ID:*** *0049*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0021	0.00069	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249248 Media Blank 1 ***Collected:*** ***Lab ID:*** *0050*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	5/20/2013	MM	5/21/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON		Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.	
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.		Attention To: SAM STEVENSON	
Street: 14280 PARK CENTER DRIVE		Street: 14280 PARK CENTER DRIVE	
City: LAUREL / State/Province: MD / Zip/Postal Code: 20707		City: LAUREL / State/Province: MD / Zip/Postal Code: 20707	
Phone: (410) 792-9446 Fax: (410) 792-7395		Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA		U.S. State where Samples Collected: MARYLAND	
Number of Samples in Shipment: 7	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): TP
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 2B127 (1 - 100)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
1	249301	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,172	5/6/13 16:00	1	
2	249308			15,198	" 16:08	2	
3	249349			15,308	" 16:20	3	
4	249312			14,888	" 16:25	4	
5	249325			15,026	" 16:33	5	
6	249307			15,080	" 16:40	6	
7	249324			15,109	" 16:49	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Jennifer Perkins	5/6/13	Scott W Cummings	5/8/13
Scott W Cummings	5/14/13	VE FX	5/15/13 920
			5/16/13 9:00p

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

4 per client return samples w/out analysis
AG 5/17

011302079

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 0807
Phone: (800) 220-367
Fax: (856) 858-350

Report To Contact Name: Sam Stevenson		Bill To Company: Geo-Technology Associates, Inc	
Company Name: Geo-Technology Associates, Inc.		Attention To: Sam Stevenson	
Street: 14280 Park Center Drive		Street: 14280 Park Center Drive	
City: Laurel	State/Province: MD	Zip/Postal Code: 20707	City: Laurel	State/Province: MD	Zip/Postal Code: 207
Phone: (410) 792-9446 Fax: (410) 792-7395			Phone: (410) 792-9446 Fax: (410) 792-7395	
Project Name: 130467 USA			U.S. State where Samples Collected: Marylan
Number of Samples in Shipment: 7	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): TP
Please Provide results: ☐ Fax ☒ Email ☒ Mail			Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece Casse
Manufacturer/Part #: Zefon 7P53
Lot #: 28127 (1 - 100, 101 - 200)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
(8) 249341	5.0µ PVC	CrVI OSHA 215 /	15,317	5/7/13 16:05	1	Lot 28127 (1-100)
(9) 249310		Total Particulates	15,443	16:18	2	
(10) 249331		NIOSH 0500	15,100	16:25	3	
(11) 249330			14,904	16:33	4	
(12) 249244			15,287	16:42	5	Lot 28127 (101-200)
(13) 249222			15,443	16:50	6	
(14) 249246			15,443	17:00	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	5/8/13	Scott W Cummings	5/8/13
Scott W Cummings	5/14/13		5/16/13 4:00p

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassett

011302079

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

Report To Contact Name: Sam Stevenson		Bill To Company: Geo-Technology Associates, Inc.	
Company Name: Geo-Technology Associates, Inc.		Attention To: Sam Stevenson	
Street: 14280 Park Center Drive		Street: 14280 Park Center Drive	
City: Laurel	State/Province: MD	Zip/Postal Code: 20707	City: Laurel	State/Province: MD	Zip/Postal Code: 2070
Phone: (410) 792-9446	Fax: (410) 792-7395		Phone: (410) 792-9446	Fax: (410) 792-7395
Project Name: 130467 USA			U.S. State where Samples Collected: Maryland
Number of Samples in Shipment: 8	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): TP
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							Media Type: 37mm, 3 piece cassette
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	Manufacturer/Part #: Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	Lot #: 28127 (101 - 200)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
15 249338	5.0µ PVC	CrVI OSHA 215 /	0	5/9/13 16:30	~~(EB)~~ Field Bank 1	
16 249227		Total Particulates	14,977	16:30	1	
17 249213		NIOSH 0500	14,670	16:45	2	
18 249226			14,650	16:50	3	
19 249224			14,620	16:55	4	
20 249236			14,590	17:00	5	
21 249230			14,696	17:05	6	
22 249207			14,645	17:10	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Terri Pelz	5/9/13	Scott W Cumming	5/8/13
Scott W Cumming	5/14/13		5/16/13 4:00pm

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette

011302079

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

Report To Contact Name: Sam Stevenson	Bill To Company: Geo-Technology Associates, Inc.
Company Name: Geo-Technology Associates, Inc.	Attention To: Sam Stevenson
Street: 14280 Park Center Drive	Street: 14280 Park Center Drive
City: Laurel State/Province: MD Zip/Postal Code: 20707	City: Laurel State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: Maryland
Number of Samples in Shipment: 6 Date of Shipment: 5/14/13	Purchase Order: Sampled By (Signature): TP
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 28127 (101 - 200)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
*	249411 SOC	5.0 µ PVC	Cr VI OSHA 215 / Total Particulates NIOSH 0500	15,173 SOC	5/10/13 16:05	SOC	Run time interruption - Vol Un
23	249209			14,646	16:10	2	
24	249221			14,749	16:20	3	
25	249232			14,749	16:25	4	
26	249240			14,615	16:30	5	
27	249243			15,127	17:10	6	
28	249242			15,232	17:15	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Travis Pyles	5/13/13	Scott W Cummings	5/13/13
Scott W Cummings	5/14/13		5/16/13 4:00p

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.

011302079

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

Report To Contact Name: Sam Stevenson		Bill To Company: Geo-Technology Associates, Inc.	
Company Name: Geo-Technology Associates, Inc.		Attention To: Sam Stevenson	
Street: 14280 Park Center Drive		Street: 14280 Park Center Drive	
City: Laurel	State/Province: MD	City: Laurel	State/Province: MD
Zip/Postal Code: 20707		Zip/Postal Code: 20707	
Phone: (410) 792-9446	Fax: (410) 792-7395	Phone: (410) 792-9446	Fax: (410) 792-7395
Project Name: 130467 USA		U.S. State where Samples Collected: Maryland	
Number of Samples in Shipment: 7	Date of Shipment: 5/14/13	Purchase Order:	Sampled By (Signature): T.P.
Please Provide results: ☐ Fax ☒ Email ☒ Mail		Email Results To: ssteverson@gtaeng.com	

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 28127 (101 - 200)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
29 249220	5.0μ PVC	Cr VI OSHA 215 / Total Particulates NIOSH 0500	14,522	5/11/13 16:10	1	
30 249223			14,500	16:20	2	
31 249234			14,450	16:25	3	
32 249247			14,450	16:30	4	
33 249206			14,490	16:39	5	
34 249224			14,200	16:50	6	
35 249218			14,220	17:00	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	5/13/13 5/14/13	Scott W Cummings	5/13/13 5/16/13 4:00pm

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.

011302079

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (800) 220-3675
Fax: (856) 858-3502

Report To Contact Name: Sam Stevenson			Bill To Company: Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			Attention To: Sam Stevenson		
Street: 14280 Park Center Drive			Street: 14280 Park Center Drive		
City: Laurel	State/Province: MD	Zip/Postal Code: 20707	City: Laurel	State/Province: MD	Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395			Phone: (410) 792-9446 Fax: (410) 792-7395		
Project Name: 130467 USA			U.S. State where Samples Collected: Maryland		
Number of Samples in Shipment: 7	Date of Shipment: 5/14/13		Purchase Order:	Sampled By (Signature):	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			Email Results To: ssteverson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐ _____

Media Type: 37mm, 3 piece cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 2B127 (101 - 200)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
36	249231	5.0µ PVC	CrVI OSHA 215 / Total Particulates NIOSH 0500	~~1400~~ 14,331	5/12/13 16:56	PAM-1	
37	249245			~~1400~~ 14,169	5/12/13 16:04	PAM-2	
38	249229			~~1400~~ 14,280	5/12/13 16:13	PAM-3	
39	249233			~~1400~~ 14,310	5/12/13 16:21	PAM-4	
40	249205			~~1400~~ 14,320	5/12/13 16:31	PAM-5	
41	249214			~~1400~~ 14,400	5/12/13 16:50	PAM-6	
42	249216			~~1400~~ 14,380	5/12/13 16:58	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Shiehan Chou	5/13/2013		5/13/13
Scott W Cimmino	5/14/2013		5/16/13 4:00p

Comments:
* Client approval granted to run OSHA 215 and NIOSH 0500 from same sample cassette.

011302079

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302079

EMSL ANALYTICAL, INC
200 ROUTE 130 NORTH
CINNAMINSON, NJ 0807
PHONE: (800) 220-367
FAX: (856) 858-350

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 2070
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAN
Number of Samples in Shipment: 8 Date of Shipment: 5/14/13	Purchase Order: Sampled By (Signature): Scott W Cumming
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: SSteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSET
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (101 - 200)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
43	249225	5.0μ PVC	Cr VI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	14,584	5/13/13 16:00	PAM-1	
44	249241			14,395	16:18	PAM-2	
45	249201			14,447	16:25	PAM-3	
46	249235			14,428	16:31	PAM-4	
47	249210			14,418	16:40	PAM-5	
48	249204			14,477	17:05	PAM-6	
49	249200			14,507	17:16	PAM-7	
50	249248			—	—	MEDIA BLANK	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cumming	5/14/13		5/16/13 4:00p

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

011302079

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/28/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/25/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302840. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302840
CustomerID:	GTA51
CustomerPO:	041316208
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/25/13 11:00 AM
Collected:	5/26/2013

Analytical Results

Client Sample Description 249698 1 ***Collected:*** 5/26/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00065	µg/m³	6/26/2013	MM	6/26/2013	MM

Client Sample Description 249655 2 ***Collected:*** 5/26/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0028	0.00065	µg/m³	6/26/2013	MM	6/26/2013	MM

Client Sample Description 249666 3 ***Collected:*** 5/26/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0024	0.00064	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249684 4 ***Collected:*** 5/26/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0028	0.00065	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249651 5 ***Collected:*** 5/26/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0054	0.00065	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249653 6 ***Collected:*** 5/26/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0021	0.00066	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249656 7 ***Collected:*** 5/26/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00067	µg/m³	6/26/2013	MM	6/27/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302840

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302840

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL / State/Province: MD / Zip/Postal Code: 20707	City: LAUREL / State/Province: MD / Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	U.S. State where Samples Collected: MARYLAND
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Sampled By (Signature):
	Email Results To: SSteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (201 - 300)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
①	249698	5.0μ PVC	Cr VI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	15,480	5/26/13 18:00	1	
②	249655			15,306	18:08	2	
③	249666			15,594	18:13	3	
④	249684			15,419	18:19	4	
⑤	249651			15,285	18:28	5	
⑥	249653			15,224	18:35	6	
⑦	249656			15,026	18:45	7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Ramsey	5/29/13	Scott W Ramsey	5/29/13
Scott W Ramsey	6/20/13	Travis Allen 23°C	6/25/13 11:00AM

Comments:

* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

* SAMPLES WERE NOT COLLECTED FROM A PLATING, WELDING, OR PAINTING ENVIRONMENT.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/28/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/25/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302841. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302841
CustomerID:	GTA51
CustomerPO:	041316221
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/25/13 11:00 AM
Collected: 5/14/2013

Analytical Results

Client Sample Description 249203 PAM-1 ***Collected:*** 5/14/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00070	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249215 PAM-2 ***Collected:*** 5/14/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00071	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249249 PAM-3 ***Collected:*** 5/14/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00071	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249219 PAM-4 ***Collected:*** 5/14/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00070	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249212 PAM-5 ***Collected:*** 5/14/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00070	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249237 PAM-6 ***Collected:*** 5/14/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0016	0.00070	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description 249202 PAM-7 ***Collected:*** 5/14/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0017	0.00071	µg/m³	6/26/2013	MM	6/27/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 01130284 1

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 2B127 (101 - 200)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
1	249203	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	14,801	5/14/13 15:50	PAM-1	
2	249215			14,261	15:57	PAM-2	
3	249249			14,038	16:03	PAM-3	
4	249219			14,342	16:11	PAM-4	
5	249212			14,332	16:19	PAM-5	
6	249237			14,211	16:32	PAM-6	
7	249202			14,030	16:39	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W. Cumming	6/20/13	23°C	6/25/13 11:00AM

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

* SAMPLES WERE NOT COLLECTED FROM A PLATING, WELDING OR PAINTING ENVIRONMENT. 7

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 6/28/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/25/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302860. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302860
CustomerID:	GTA51
CustomerPO:	041316211
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/25/13 5:00 PM
Collected: 6/19/2013

Analytical Results

Client Sample Description 249556 OSAM-1 ***Collected:*** 6/19/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00068	µg/m³	6/27/2013	MM	6/27/2013	MM

Client Sample Description 249558 OSAM-2 ***Collected:*** 6/19/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0020	0.00069	µg/m³	6/27/2013	MM	6/27/2013	MM

Client Sample Description 249590 OSAM-3 ***Collected:*** 6/19/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00065	µg/m³	6/27/2013	MM	6/27/2013	MM

Client Sample Description 249571 PAM-1 ***Collected:*** 6/19/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0010	0.00066	µg/m³	6/27/2013	MM	6/27/2013	MM

Client Sample Description 249587 PAM-2 ***Collected:*** 6/19/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00064	µg/m³	6/27/2013	MM	6/27/2013	MM

Client Sample Description 249562 PAM-3 ***Collected:*** 6/19/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0025	0.00063	µg/m³	6/27/2013	MM	6/27/2013	MM

Client Sample Description 249570 PAM-4 ***Collected:*** 6/19/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0014	0.00064	µg/m³	6/27/2013	MM	6/27/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302860
CustomerID:	GTA51
CustomerPO:	041316211
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/25/13 5:00 PM
Collected: 6/19/2013

Analytical Results

Client Sample Description 249559 PAM-5 ***Collected:*** 6/19/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0030	0.00063	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249573 PAM-6 ***Collected:*** 6/19/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0020	0.00063	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249599 PAM-7 ***Collected:*** 6/19/2013 ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00063	µg/m³	6/27/2013	MM	6/28/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 01130286O

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302860

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA			**U.S. State where Samples Collected:** Maryland		
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**	**Sampled By (Signature):**		
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 28127 (301 - 500)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
1	249556	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,616	6/19/13	15:35	OSAM-1	
2	249558	5.0 µ PVC		14,605	6/19/13	16:00	OSAM-2	
3	249590	5.0 µ PVC		15,453	6/19/13	17:00	OSAM-3	
4	249571	5.0 µ PVC		15,225	6/19/13	17:40	PAM-1	
5	249587	5.0 µ PVC		15,563	6/19/13	18:00	PAM-2	
6	249562	5.0 µ PVC		15,825	6/19/13	18:25	PAM-3	
7	249570	5.0 µ PVC		15,688	6/19/13	18:40	PAM-4	
8	249559	5.0 µ PVC		15,810	6/19/13	19:05	PAM-5	
9	249573	5.0 µ PVC		15,892	6/19/13	19:20	PAM-6	
10	249599	5.0 µ PVC		15,898	6/19/13	19:35	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
[signature]	6-20-13	[signature]	6/20/13
[signature]	6/20/13	Fedrix Allen 23°C	6/25/13 5:00pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

10

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707
Phone: (410) 792-9446
Fax: (410) 792-7395

6/28/2013

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/25/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302859. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302859
CustomerID:	GTA51
CustomerPO:	041316386
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/25/13 5:00 PM
Collected:	6/20/2013

Analytical Results

Client Sample Description GTA-17 PAM-1 ***Collected:*** 6/20/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0024	0.00064	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description GTA-18 PAM-2 ***Collected:*** 6/20/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0017	0.00064	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description GTA-19 PAM-4 ***Collected:*** 6/20/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0020	0.00061	µg/m³	6/26/2013	MM	6/27/2013	MM

Client Sample Description GTA-20 PAM-6 ***Collected:*** 6/20/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00063	µg/m³	6/26/2013	MM	6/27/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302859

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302859

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47mm, via PM2.5 Impact Sampler
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐	**Lot #:**

	Sample ID	**Media**	**Analyte / Method**	**Volume**	**Sample Date/Time**		**Location**	**Comments**
(1)	GTA-17	47 mm	Cr VI OSHA 215 Particulates (From PM2.5 Impact Sampler)	15,675	6-20-13	18:40	PAM-1	
(2)	GTA-18	47 mm		15,525	6-20-13	19:00	PAM-2	
(3)	GTA-19	47 mm		16,295	6-20-13	20:10	PAM-4	
(4)	GTA-20	47 mm		15,832	6-20-13	20:30	PAM-6	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	**Date**	**Received By**	**Date**
	6/20/13		6/21/13
	6/21/13	FX	6/24/13 8:50
		Travis Albert 23°C	6/25/13 5:00pm

Comments: OK to run both methods from same sample media.
Samples were not collected from a welding, plating or painting environment.

RECEIVED
CINNAMINSON, NJ
2013 JUN 25 PM 12:30

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/1/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/26/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302879. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302879
CustomerID:	GTA51
CustomerPO:	041316203
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/26/13 11:00 AM
Collected: 6/18/2013

Project: **130467USA**

Analytical Results

Client Sample Description 249578 OSAM-1 ***Collected:*** 6/18/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0017	0.00068	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249594 OSAM-2 ***Collected:*** 6/18/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00071	0.00069	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249575 OSAM-3 ***Collected:*** 6/18/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00067	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249552 PAM-1 ***Collected:*** 6/18/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00069	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249550 PAM-2 ***Collected:*** 6/18/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00068	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249568 PAM-3 ***Collected:*** 6/18/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00067	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249567 PAM-4 ***Collected:*** 6/18/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0016	0.00068	µg/m³	6/27/2013	MM	6/28/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302879
CustomerID:	GTA51
CustomerPO:	041316203
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/26/13 11:00 AM
Collected: 6/18/2013

Analytical Results

Client Sample Description 249595 PAM-5 ***Collected:*** 6/18/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0024	0.00068	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249561 PAM-6 ***Collected:*** 6/18/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0024	0.00068	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249563 PAM-7 ***Collected:*** 6/18/2013 ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0014	0.00068	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249557 PAM-1, Field Blank 1 ***Collected:*** 6/18/2013 ***Lab ID:*** *0011*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	6/27/2013	MM	6/28/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302879

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302879

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (301 - 500)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
①	249578	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,688	6/18/13	15:35	OSAM-1	
②	249594	5.0 µ PVC		14,584	6/18/13	15:50	OSAM-2	
③	249575	5.0 µ PVC		14,853	6/18/13	16:05	OSAM-3	
④	249552	5.0 µ PVC		14,544	6/18/13	16:40	PAM-1	
⑤	249550	5.0 µ PVC		14,770	6/18/13	16:48	PAM-2	
⑥	249568	5.0 µ PVC		14,853	6/18/13	16:54	PAM-3	
⑦	249567	5.0 µ PVC		14,626	6/18/13	17:01	PAM-4	
⑧	249595	5.0 µ PVC		14,760	6/18/13	17:15	PAM-5	
⑨	249561	5.0 µ PVC		14,770	6/18/13	17:21	PAM-6	
⑩	249563	5.0 µ PVC		14,750	6/18/13	17:27	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tejuana Terry	6-19-13		6/20/13
	6/20/13	Tivris Albert 23°C	6/26/13 11:00AM

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only):
011302879

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302879

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
249557	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	n/a	6/18/13 16:40	PAM-1	Field Blank 1

Comments:

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/1/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/26/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302880. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302880
CustomerID:	GTA51
CustomerPO:	041316219
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/26/13 11:00 AM
Collected: 5/25/2013

Project: **130467USA**

Analytical Results

Client Sample Description 249694 1 ***Collected:*** 5/25/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0012	0.00070	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249676 2 ***Collected:*** 5/25/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0042	0.00070	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249697 3 ***Collected:*** 5/25/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0015	0.00070	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249667 4 ***Collected:*** 5/25/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0025	0.00070	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249664 5 ***Collected:*** 5/25/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0022	0.00066	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249699 6 ***Collected:*** 5/25/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0042	0.00067	µg/m³	6/27/2013	MM	7/1/2013	MM

Client Sample Description 249665 7 ***Collected:*** 5/25/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0077	0.00068	µg/m³	6/27/2013	MM	7/1/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302880
CustomerID:	GTA51
CustomerPO:	041316219
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/26/13 11:00 AM
Collected:	5/25/2013

Project: **130467USA**

Analytical Results

Client Sample Description 249685
Field Blank 1

Collected: 5/25/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	6/27/2013	MM	7/1/2013	MM

Definitions:
ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302880

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302880

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	U.S. State where Samples Collected: MARYLAND
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Sampled By (Signature):
	Email Results To: SStevenson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 2B127 (201 - 300)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500		5/25/13		
① 249694			14,256	18:00	2 1	
② 249676			14,268	18:04	3 2	
③ 249697			14,330	18:10	4 3	
④ 249667			14,360	18:18	5 4	
⑤ 249664			15,211	18:26	6 5	
⑥ 249699			14,852	18:32	7 6	
⑦ 249665			14,617	18:40	7	
⑧ 249685				18:00	FIELD BLANK 1	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Terrence Perkins	5/29/13	Scott W Cummings	5/29/13
Scott W Cummings	6/26/13	Travis Cullen 23C	6/26/13 11:00AM

Comments:

* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

* SAMPLES WERE NOT COLLECTED FROM A PLATING, WELDING OR PAINTING ENVIRONMENT

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/1/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/26/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302889. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302889
CustomerID:	GTA51
CustomerPO:	041316248
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/26/13 6:30 PM
Collected:	6/2/2013

Analytical Results

Client Sample Description 249649 PAM-1 ***Collected:*** 6/2/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0028	0.00069	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249645 PAM-2 ***Collected:*** 6/2/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0014	0.00069	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249626 PAM-3 ***Collected:*** 6/2/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0038	0.00070	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249606 PAM-4 ***Collected:*** 6/2/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0020	0.00070	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249603 PAM-5 ***Collected:*** 6/2/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00069	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249639 PAM-6 ***Collected:*** 6/2/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0036	0.00068	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249641 PAM-7 ***Collected:*** 6/2/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0029	0.00069	µg/m³	6/27/2013	MM	6/28/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302889

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302889

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	U.S. State where Samples Collected: MARYLAND
Number of Samples in Shipment: / Date of Shipment:	Purchase Order: / Sampled By (Signature):
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Email Results To: ssteverson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (201 - 300)

	Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
①	249649	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	14.591	6/2/2013 16:00	PAM-1	
②	249645			14.422	6/2/2013 16:04	PAM-2	
③	249626			14.227	6/2/2013 16:08	PAM-3	
④	249606			14.378	6/2/2013 16:12	PAM-4	
⑤	249603			14.603	6/2/2013 16:18	PAM-5	
⑥	249639			14.763	6/2/2013 16:25	PAM-6	
⑦	249641			14.587	6/2/2013 16:31	PAM-7	

7

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By		Date
Sara DeRose	6/3/2013	Scott W Cummings		6/3/13
Scott W Cummings	6/20/13	Travis Allot	23°C	6/26/13 6:30pm

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

& SAMPLES WERE NOT COLLECTED FROM A PLATING, WELDING, OR PAINTING ENVIRONMENT.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/1/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/26/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302890. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302890
CustomerID:	GTA51
CustomerPO:	041316333
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/26/13 6:30 PM
Collected:	6/20/2013

Analytical Results

Client Sample Description 249569 OSAM-1 ***Collected:*** 6/20/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00085	0.00063	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249589 OSAM-2 ***Collected:*** 6/20/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0017	0.00065	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249576 OSAM-3 ***Collected:*** 6/20/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00076	0.00064	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249582 PAM-1 ***Collected:*** 6/20/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00065	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249555 PAM-2 ***Collected:*** 6/20/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0016	0.00067	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249579 PAM-3 ***Collected:*** 6/20/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00098	0.00063	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249581 PAM-4 ***Collected:*** 6/20/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00065	µg/m³	6/27/2013	MM	6/28/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302890
CustomerID:	GTA51
CustomerPO:	041316333
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/26/13 6:30 PM
Collected:	6/20/2013

Analytical Results

Client Sample Description 249566 PAM-5 ***Collected:*** 6/20/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00089	0.00065	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249551 PAM-6 ***Collected:*** 6/20/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00092	0.00065	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description 249560 PAM-7 ***Collected:*** 6/20/2013 ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0016	0.00065	µg/m³	6/27/2013	MM	6/28/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302890

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302890

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece Cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 28127 (401 - 450)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
1	249569	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	15,829	6/20/13	17:50	OSAM-1	
2	249589	5.0 µ PVC		15,478	6/20/13	17:10	OSAM-2	
3	249576	5.0 µ PVC		15,656	6/20/13	18:20	OSAM-3	
4	249582	5.0 µ PVC		15,300	6/20/13	18:40	PAM-1	
5	249555	5.0 µ PVC		14,925	6/20/13	19:00	PAM-2	
6	249579	5.0 µ PVC		15,991	6/20/13	20:00	PAM-3	
7	249581	5.0 µ PVC		15,453	6/20/13	20:10	PAM-4	
8	249566	5.0 µ PVC		15,453	6/20/13	20:20	PAM-5	
9	249551	5.0 µ PVC		15,478	6/20/13	20:30	PAM-6	
10	249560	5.0 µ PVC		15,453	6/20/13	20:50	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6-20-13		6/21/13
	6/21/13	Fx	6/22/13 10:00
		23°C	6/26/13 @30pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

10C

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316221
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/21/13 9:20 AM
Analysis Date:	6/25/2013
Collected:	

Project: **130467 USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249203	Pam 1	14801	0.137	0.009	0.003	
041316221-0001						
249215	Pam 2	14261	0.199	0.014	0.004	
041316221-0002						
249249	Pam 3	14038	0.168	0.012	0.004	
041316221-0003						
249219	Pam 4	14342	0.106	0.007	0.003	
041316221-0004						
249212	Pam 5	14332	0.114	0.008	0.003	
041316221-0005						
249237	Pam 6	14211	0.151	0.011	0.004	
041316221-0006						
249202	Pam 7	14030	0.147	0.010	0.004	
041316221-0007						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (7)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 07/01/2013 12:39:43

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041316221

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041316221

Report To Contact Name: SAM STEVENSON	Bill To Company: GEO-TECHNOLOGY ASSOCIATES, INC.
Company Name: GEO-TECHNOLOGY ASSOCIATES, INC.	Attention To: SAM STEVENSON
Street: 14280 PARK CENTER DRIVE	Street: 14280 PARK CENTER DRIVE
City: LAUREL State/Province: MD Zip/Postal Code: 20707	City: LAUREL State/Province: MD Zip/Postal Code: 20707
Phone: (410) 792-9446 Fax: (410) 792-7395	Phone: (410) 792-9446 Fax: (410) 792-7395
Project Name: 130467 USA	
Number of Samples in Shipment: / Date of Shipment: / Purchase Order:	U.S. State where Samples Collected: MARYLAND
Please Provide results: ☐ Fax ☒ Email ☒ Mail	Sampled By (Signature):
	Email Results To: SSTEVENSON@GTAENG.COM

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 PIECE CASSETTE
Manufacturer/Part #: ZEFON 7P53P
Lot #: 28127 (10Ø - 2ØØ)

Sample ID	Media	Analyte / Method	Volume (L)	Sample Date/Time	Location (PAM)	Comments
249203	5.0μ PVC	CrVI OSHA 215 / TOTAL PARTICULATES NIOSH 0500	14,801	5/14/13 15:50	PAM-1	
249215			14,261	15:57	PAM-2	
249249			14,038	16:03	PAM-3	
249219			14,342	16:11	PAM-4	
249212			14,332	16:19	PAM-5	
249237			14,211	16:32	PAM-6	
249202			14,030	16:39	PAM-7	

RECEIVED EMSL CINNAMINSON, NJ 13 JUN 21 AM 11:25

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	6/20/13	DMB-H-920A	6-21-13

Comments:
* CLIENT APPROVAL GRANTED TO RUN OSHA 215 AND NIOSH 0500 FROM SAME SAMPLE CASSETTE.

* SAMPLES WERE NOT COLLECTED FROM A PLATING, WELDING OR PAINTING ENVIRONMENT. 7

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316333
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/22/13 10:00 AM
Analysis Date:	6/26/2013
Collected:	6/20/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
249569	OSAM-1	15829	0.143	0.009	0.003	
041316333-0001						
249589	OSAM-2	15478	0.167	0.011	0.003	
041316333-0002						
249576	OSAM-3	15656	0.195	0.012	0.003	
041316333-0003						
249582	PAM-1	15300	0.208	0.014	0.003	
041316333-0004						
249555	PAM-2	14925	0.181	0.012	0.003	
041316333-0005						
249579	PAM-3	15991	0.109	0.007	0.003	
041316333-0006						
249581	PAM-4	15453	0.244	0.016	0.003	
041316333-0007						
249566	PAM-5	15453	0.294	0.019	0.003	
041316333-0008						
249551	PAM-6	15478	0.221	0.014	0.003	
041316333-0009						
249560	PAM-7	15453	0.213	0.014	0.003	
041316333-0010						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (10)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/27/2013 12:18:38

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041316333

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 28127 (401 - 450)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
249569	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	15,829	6/20/13	17:50	OSAM-1	
249589	5.0 µ PVC		15,478	6/20/13	17:10	OSAM-2	
249576	5.0 µ PVC		15,656	6/20/13	18:20	OSAM-3	
249582	5.0 µ PVC		15,300	6/20/13	18:40	PAM-1	
249555	5.0 µ PVC		14,925	6/20/13	19:00	PAM-2	
249579	5.0 µ PVC		15,991	6/20/13	20:00	PAM-3	
249581	5.0 µ PVC		15,453	6/20/13	20:10	PAM-4	
249566	5.0 µ PVC		15,453	6/20/13	20:20	PAM-5	
249551	5.0 µ PVC		15,478	6/20/13	20:30	PAM-6	
249560	5.0 µ PVC		15,453	6/20/13	20:50	PAM-7	

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUN 22 AM 10: 13

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6-20-13		6/21/13
	6/21/13	Fx	6/22/13 10:00

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

10C

041316333

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041316566
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/25/13 9:25 AM
Analysis Date:	6/28/2013
Collected:	6/23/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m^3)*	*Reporting Limit (mg/m^3)*	*Notes*
93980	OSAM-1	14760	0.130	0.009	0.003	
041316566-0001						
93987	OSAM-2	14904	0.226	0.015	0.003	
041316566-0002						
93941	OSAM-3	14935	<0.05	<0.003	0.003	
041316566-0003						
93988	PAM-1	14801	0.087	0.006	0.003	
041316566-0004						
93969	PAM-2	14872	0.106	0.007	0.003	
041316566-0005						
93954	PAM-3	14729	0.209	0.014	0.003	
041316566-0006						
93986	PAM-4	14697	0.093	0.006	0.003	
041316566-0007						
93961	PAM-5	14342	0.145	0.010	0.003	
041316566-0008						
93951	PAM-6	14697	0.182	0.012	0.003	
041316566-0009						
93947	PAM-7	14626	0.242	0.017	0.003	
041316566-0010						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (10)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 06/30/2013 14:24:26

041316566

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041316566

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (401 - 450)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
93980	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,760	6/23/13	17:30	OSAM-1	
93987	5.0 µ PVC		14,904	6/23/13	17:45	OSAM-2	
93941	5.0 µ PVC		14,935	6/23/13	18:10	OSAM-3	
93988	5.0 µ PVC		14,801	6/23/13	18:30	PAM-1	
93969	5.0 µ PVC		14,872	6/23/13	18:50	PAM-2	
93954	5.0 µ PVC		14,729	6/23/13	19:05	PAM-3	
93986	5.0 µ PVC		14,697	6/23/13	19:10	PAM-4	
93961	5.0 µ PVC		14,342	6/23/13	19:25	PAM-5	
93951	5.0 µ PVC		14,697	6/23/13	19:30	PAM-6	
93947	5.0 µ PVC		14,626	6/23/13	19:50	PAM-7	

RECEIVED EMSL CINNAMINSON NJ JUN 25 AM 11:01

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By		Date
Tiana Ryan	6/24/13	AK	FX	6/25/13 9:25A

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/1/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/26/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302876. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302876
CustomerID:	GTA51
CustomerPO:	041316537
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/26/13 2:00 PM
Collected: 6/22/2013

Analytical Results

Client Sample Description GTA-25
PAM-1 ***Collected:*** 6/22/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00068	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description GTA-26
PAM-2 ***Collected:*** 6/22/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0015	0.00064	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description GTA-27
PAM-4 ***Collected:*** 6/22/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0016	0.00066	µg/m³	6/27/2013	MM	6/28/2013	MM

Client Sample Description GTA-28
PAM-6 ***Collected:*** 6/22/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0015	0.00067	µg/m³	6/27/2013	MM	6/28/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302876

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302876

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47mm, via PM2.5 Impact Sampler
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐	**Lot #:**

	Sample ID	**Media**	**Analyte / Method**	**Volume**	**Sample Date/Time**		**Location**	**Comments**
1	GTA-25	47 mm	Cr VI OSHA 215 Particulates (From PM2.5 Impact Sampler)	14,697	6-22-13	18:40	PAM-1	
2	GTA-26	47 mm		15,620	6-22-13	19:10	PAM-2	
3	GTA-27	47 mm		15,052	6-22-13	19:30	PAM-4	
4	GTA-28	47 mm		14,981	6-22-13	19:50	PAM-6	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	**Date**	**Received By**	**Date**
Tonya Parker	6/24/13	Ivan Allt 23°C	6/26/13 2:00pm

Comments: OK to run both methods from same sample media.
Samples were not collected from a welding, plating or painting environment.

4

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/1/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/26/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302877. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302877
CustomerID:	GTA51
CustomerPO:	041316567
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/26/13 2:00 PM
Collected: 6/21/2013

Analytical Results

Client Sample Description GTA-21 PAM-1 ***Collected:*** 6/21/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0020	0.00068	µg/m³	6/27/2013	MM	6/29/2013	MM

Client Sample Description GTA-22 PAM-2 ***Collected:*** 6/21/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0047	0.00066	µg/m³	6/27/2013	MM	6/29/2013	MM

Client Sample Description GTA-23 PAM-3 ***Collected:*** 6/21/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0027	0.00066	µg/m³	6/27/2013	MM	6/29/2013	MM

Client Sample Description GTA-24 PAM-4 ***Collected:*** 6/21/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00067	µg/m³	6/27/2013	MM	6/29/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302877

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302877

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47mm, via PM2.5 Impact Sampler
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐	**Lot #:**

	Sample ID	**Media**	**Analyte / Method**	**Volume**	**Sample Date/Time**		**Location**	**Comments**
1	GTA-21	47 mm	Cr VI OSHA 215 Particulates (From PM2.5 Impact Sampler)	14,768	6-21-13	19:00	PAM-1	
2	GTA-22	47 mm		15,141	6-21-13	19:30	PAM-2	
3	GTA-23	47 mm		15,123	6-21-13	19:50	PAM-4	
4	GTA-24	47 mm		14,910	6-21-13	20:10	PAM-6	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	**Date**	**Received By**	**Date**
[signature]	6/24/13	[signature] 23°C	6/26/13 2:00pm

Comments: OK to run both methods from same sample media.
Samples were not collected from a welding, plating or painting environment.

4

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/1/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/26/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302878. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302878
CustomerID:	GTA51
CustomerPO:	041316568
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/26/13 2:00 PM
Collected: 6/23/2013

Analytical Results

Client Sample Description GTA-29
PAM-1 ***Collected:*** 6/23/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00067	µg/m³	6/27/2013	MM	6/29/2013	MM

Client Sample Description GTA-30
PAM-2 ***Collected:*** 6/23/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0023	0.00067	µg/m³	6/27/2013	MM	6/29/2013	MM

Client Sample Description GTA-31
PAM-4 ***Collected:*** 6/23/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00067	µg/m³	6/27/2013	MM	6/29/2013	MM

Client Sample Description GTA-32
PAM-6 ***Collected:*** 6/23/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0014	0.00068	µg/m³	6/27/2013	MM	6/29/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302878

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 47mm, via PM2.5 Impact Sampler
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:**
☐	☐	☐	☒	☐	☐	☐	**Lot #:**

	Sample ID	**Media**	**Analyte / Method**	**Volume**	**Sample Date/Time**		**Location**	**Comments**
①	GTA-29	47 mm	Cr VI OSHA 215 Particulates (From PM2.5 Impact Sampler)	14,904	6-23-13	18:30	PAM-1	
②	GTA-30	47 mm		14,944	6-23-13	18:50	PAM-2	
③	GTA-31	47 mm		14,904	6-23-13	19:10	PAM-4	
④	GTA-32	47 mm		14,768	6-23-13	19:30	PAM-6	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	**Date**	**Received By**	**Date**
Tuma Bahr	6/24/13	Travis Allen 23°C	6/26/13 2:00pm

Comments: OK to run both methods from same sample media.
Samples were not collected from a welding, plating or painting environment.

④

011302878

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/2/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/27/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302902. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302902
CustomerID:	GTA51
CustomerPO:	041316583
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/27/13 12:00 PM
Collected: 6/21/2013

Analytical Results

Client Sample Description 93945 OSAM-1 ***Collected:*** 6/21/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0054	0.00069	µg/m³	6/28/2013	MM	7/1/2013	MM

Client Sample Description 93982 OSAM-2 ***Collected:*** 6/21/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0070	0.00066	µg/m³	6/28/2013	MM	7/1/2013	MM

Client Sample Description 93989 OSAM-3 ***Collected:*** 6/21/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0036	0.00069	µg/m³	6/28/2013	MM	7/1/2013	MM

Client Sample Description 93974 PAM-1 ***Collected:*** 6/21/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0043	0.00067	µg/m³	6/28/2013	MM	7/1/2013	MM

Client Sample Description 93950 PAM-2 ***Collected:*** 6/21/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0043	0.00067	µg/m³	6/28/2013	MM	7/1/2013	MM

Client Sample Description 93968 PAM-3 ***Collected:*** 6/21/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0059	0.00069	µg/m³	6/28/2013	MM	7/1/2013	MM

Client Sample Description 93973 PAM-4 ***Collected:*** 6/21/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0054	0.00069	µg/m³	6/28/2013	MM	7/1/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302902
CustomerID:	GTA51
CustomerPO:	041316583
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/27/13 12:00 PM
Collected: 6/21/2013

Project: **130467USA**

Analytical Results

Client Sample Description 93966 PAM-5 ***Collected:*** 6/21/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0081	0.00069	µg/m³	6/28/2013	MM	7/1/2013	MM

Client Sample Description 93948 PAM-6 ***Collected:*** 6/21/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0052	0.00069	µg/m³	6/28/2013	MM	7/1/2013	MM

Client Sample Description 93958 PAM-7 ***Collected:*** 6/21/2013 ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0028	0.00069	µg/m³	6/28/2013	MM	7/1/2013	MM

Client Sample Description 93964 Media Blank 1 ***Collected:*** 6/21/2013 ***Lab ID:*** *0011*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	6/28/2013	MM	7/1/2013	MM

Client Sample Description 93978 Field Blank 1 ***Collected:*** 6/21/2013 ***Lab ID:*** *0012*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.010	µg/filter	6/28/2013	MM	7/2/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302902

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302902

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (401 - 450)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
1	93945	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,413	6/21/13	17:30	OSAM-1	RECEIVED EMSL CINNAMINSON, NJ 13 JUN 25 AM 10:53
2	93982	5.0 µ PVC		15,119	6/21/13	17:45	OSAM-2	
3	93989	5.0 µ PVC		14,484	6/21/13	18:00	OSAM-3	
4	93974	5.0 µ PVC		14,965	6/21/13	19:00	PAM-1	
5	93950	5.0 µ PVC		14,994	6/21/13	19:30	PAM-2	
6	93968	5.0 µ PVC		14,555	6/21/13	19:40	PAM-3	
7	93973	5.0 µ PVC		14,413	6/21/13	19:50	PAM-4	
8	93966	5.0 µ PVC		14,413	6/21/13	20:05	PAM-5	
9	93948	5.0 µ PVC		14,555	6/21/13	20:10	PAM-6	
10	93958	5.0 µ PVC		14,413	6/21/13	20:30	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tamara Perkins	6/24/13	AK FX Travis Allot 23°C	6/25/13 9:25A 6/27/13 12:00pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

12

EMSL ANALYTICAL, INC.
LABORATORY•PRODUCTS•TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302902

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302902

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time	Location	Comments
11	93964	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	n/a	6/21/13	n/a	Media Blank 1
12	93978	5.0 µ PVC		n/a	6/21/13	PAM-1	Field Blank 1

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/2/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/27/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302903. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302903
CustomerID:	GTA51
CustomerPO:	041316596
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/27/13 12:00 PM
Collected: 6/22/2013

Project: **130467USA**

Analytical Results

Client Sample Description 93946 OSAM-1 ***Collected:*** 6/22/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0038	0.00068	µg/m³	6/28/2013	MM	7/2/2013	MM

Client Sample Description 93942 OSAM-2 ***Collected:*** 6/22/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0059	0.00067	µg/m³	6/28/2013	MM	7/2/2013	MM

Client Sample Description 93979 OSAM-3 ***Collected:*** 6/22/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0057	0.00068	µg/m³	6/28/2013	MM	7/2/2013	MM

Client Sample Description 93965 PAM-1 ***Collected:*** 6/22/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0040	0.00069	µg/m³	6/28/2013	MM	7/2/2013	MM

Client Sample Description 93953 PAM-2 ***Collected:*** 6/22/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0036	0.00071	µg/m³	6/28/2013	MM	7/2/2013	MM

Client Sample Description 93944 PAM-3 ***Collected:*** 6/22/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0044	0.00069	µg/m³	6/28/2013	MM	7/2/2013	MM

Client Sample Description 93943 PAM-4 ***Collected:*** 6/22/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0040	0.00068	µg/m³	6/28/2013	MM	7/2/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302903
CustomerID:	GTA51
CustomerPO:	041316596
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/27/13 12:00 PM
Collected: 6/22/2013

Analytical Results

Client Sample Description 93955 PAM-5 ***Collected:*** 6/22/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0032	0.00070	µg/m³	6/28/2013	MM	7/2/2013	MM

Client Sample Description 93976 PAM-6 ***Collected:*** 6/22/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0041	0.00067	µg/m³	6/28/2013	MM	7/2/2013	MM

Client Sample Description 93985 PAM-7 ***Collected:*** 6/22/2013 ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0027	0.00069	µg/m³	6/28/2013	MM	7/2/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011302903

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302903

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (401 - 450)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
1	93946	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,760	6/22/13	17:30	OSAM-1	
2	93942	5.0 µ PVC		14,904	6/22/13	17:45	OSAM-2	
3	93979	5.0 µ PVC		14,688	6/22/13	18:00	OSAM-3	
4	93965	5.0 µ PVC		14,555	6/22/13	18:40	PAM-1	
5	93953	5.0 µ PVC		14,058	6/22/13	19:10	PAM-2	
6	93944	5.0 µ PVC		14,535	6/22/13	19:25	PAM-3	
7	93943	5.0 µ PVC		14,697	6/22/13	19:30	PAM-4	
8	93955	5.0 µ PVC		14,271	6/22/13	19:45	PAM-5	
9	93976	5.0 µ PVC		14,839	6/22/13	19:50	PAM-6	
10	93985	5.0 µ PVC		14,555	6/22/13	20:10	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Trace Ryan	6/24/13	AK FX	6/25/13 9:25A
		Brian Ault 23°C	6/27/13 12:00pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/2/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 6/28/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011302949. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302949
CustomerID:	GTA51
CustomerPO:	041316566
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	06/28/13 4:00 PM
Collected:	6/23/2013

Analytical Results

Client Sample Description 93980 OSAM-1 ***Collected:*** 6/23/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0018	0.00068	µg/m³	7/1/2013	MM	7/2/2013	MM

Client Sample Description 93987 OSAM-2 ***Collected:*** 6/23/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.023	0.00067	µg/m³	7/1/2013	MM	7/2/2013	MM

Client Sample Description 93941 OSAM-3 ***Collected:*** 6/23/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	ND	0.00067	µg/m³	7/1/2013	MM	7/2/2013	MM

Client Sample Description 93988 PAM-1 ***Collected:*** 6/23/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0045	0.00068	µg/m³	7/1/2013	MM	7/2/2013	MM

Client Sample Description 93969 PAM-2 ***Collected:*** 6/23/2013 ***Lab ID:*** *0005*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00067	µg/m³	7/1/2013	MM	7/2/2013	MM

Client Sample Description 93954 PAM-3 ***Collected:*** 6/23/2013 ***Lab ID:*** *0006*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00068	µg/m³	7/1/2013	MM	7/2/2013	MM

Client Sample Description 93986 PAM-4 ***Collected:*** 6/23/2013 ***Lab ID:*** *0007*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0013	0.00068	µg/m³	7/1/2013	MM	7/2/2013	MM

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011302949
CustomerID:	GTA51
CustomerPO:	041316566
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 06/28/13 4:00 PM
Collected: 6/23/2013

Analytical Results

Client Sample Description 93961 PAM-5 ***Collected:*** 6/23/2013 ***Lab ID:*** *0008*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.00095	0.00070	µg/m³	7/1/2013	MM	7/2/2013	MM

Client Sample Description 93951 PAM-6 ***Collected:*** 6/23/2013 ***Lab ID:*** *0009*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00068	µg/m³	7/1/2013	MM	7/2/2013	MM

Client Sample Description 93947 PAM-7 ***Collected:*** 6/23/2013 ***Lab ID:*** *0010*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0027	0.00068	µg/m³	7/1/2013	MM	7/2/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011302949

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011302949

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (401 - 450)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
1	93980	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,760	6/23/13	17:30	OSAM-1	
2	93987	5.0 µ PVC		14,904	6/23/13	17:45	OSAM-2	
3	93941	5.0 µ PVC		14,935	6/23/13	18:10	OSAM-3	
4	93988	5.0 µ PVC		14,801	6/23/13	18:30	PAM-1	
5	93969	5.0 µ PVC		14,872	6/23/13	18:50	PAM-2	
6	93954	5.0 µ PVC		14,729	6/23/13	19:05	PAM-3	
7	93986	5.0 µ PVC		14,697	6/23/13	19:10	PAM-4	
8	93961	5.0 µ PVC		14,342	6/23/13	19:25	PAM-5	
9	93951	5.0 µ PVC		14,697	6/23/13	19:30	PAM-6	
10	93947	5.0 µ PVC		14,626	6/23/13	19:50	PAM-7	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tawn Rupp	6/24/13	Travis Allen 23°C	6/28/13 4:00pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

10

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/16/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 7/9/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011303114. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011303114
CustomerID:	GTA51
CustomerPO:	041317949
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 07/09/13 4:30 PM

Project: **130467USA**

Analytical Results

Client Sample Description 94023 OSAM-1 ***Collected:*** 7/2/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0023	0.00065	µg/m³	7/15/2013	MM	7/15/2013	MM

Client Sample Description 94021 OSAM-2 ***Collected:*** 7/2/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0026	0.00068	µg/m³	7/15/2013	MM	7/15/2013	MM

Client Sample Description 94026 OSAM-3 ***Collected:*** 7/2/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0041	0.00067	µg/m³	7/15/2013	MM	7/15/2013	MM

Client Sample Description 94013 OSAM-4 ***Collected:*** 7/2/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0031	0.00068	µg/m³	7/15/2013	MM	7/15/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011303114

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 26112 (50 – 100)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
(1) 94023	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	15,466	7/2/13	20:00	OSAM-1	
(2) 94021	5.0 µ PVC		14,770	7/2/13	19:42	OSAM-2	
94026	5.0 µ PVC		14,941	7/2/13	19:00	OSAM-3	
94013	5.0 µ PVC		14,800	7/2/13	19:30	OSAM-4	
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tamara Rahn	7/3/13	Scott Cummings	7/8/13
		Travis Allen 24°C	7/9/13 4:30pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

011303114

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/16/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 7/12/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011303224. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011303224
CustomerID:	GTA51
CustomerPO:	041318319
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 07/12/13 4:15 PM

Project: **130467USA**

Analytical Results

Client Sample Description 93997 OSAM-1 ***Collected:*** 7/8/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0024	0.00067	µg/m³	7/15/2013	MM	7/16/2013	MM

Client Sample Description 94024 OSAM-2 ***Collected:*** 7/8/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0020	0.00067	µg/m³	7/15/2013	MM	7/16/2013	MM

Client Sample Description 94007 OSAM-3 ***Collected:*** 7/8/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0015	0.00067	µg/m³	7/15/2013	MM	7/16/2013	MM

Client Sample Description 94004 OSAM-4 ***Collected:*** 7/8/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0030	0.00066	µg/m³	7/15/2013	MM	7/16/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

011303224

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011303224

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 26112 (50 – 100)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
①	93997	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,847	7/8/13		OSAM-1	
②	94024	5.0 µ PVC		14,994	7/8/13		OSAM-2	
③	94007	5.0 µ PVC		14,921	7/8/13		OSAM-3	
④	94004	5.0 µ PVC		15,068	7/8/13		OSAM-4	

RECEIVED EMSL CINNAMINSON, NJ 13 JUL 12 AM 11:03

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tanner Pitt	7/9/13	Scott Hummy Tyconi Client 24°C	7/11/13 7/12/13 4:15pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/16/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 7/9/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011303111. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011303111
CustomerID:	GTA51
CustomerPO:	041317931
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 07/09/13 4:00 PM

Project: **130467USA**

Analytical Results

Client Sample Description 94039 OSAM-1 ***Collected:*** 7/3/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0029	0.00068	µg/m³	7/12/2013	MM	7/15/2013	MM

Client Sample Description 94032 OSAM-2 ***Collected:*** 7/3/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0021	0.00068	µg/m³	7/12/2013	MM	7/15/2013	MM

Client Sample Description 94010 OSAM-4 ***Collected:*** 7/3/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0095	0.00067	µg/m³	7/12/2013	MM	7/15/2013	MM

Definitions:
ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 071303111

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 26112 (50 – 100)

	Sample ID	**Media**	**Analyte / Method**	**Volume**	**Sample Date/Time**		**Location**	**Comments**
(1)	94039	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,768	7/3/13	19:40	OSAM-1	
(2)	94032	5.0 µ PVC		14,617	7/3/13	19;28	OSAM-2	
	~~94000~~	~~5.0 µ PVC~~		~~14,320~~	~~7/3/13~~	~~18:52~~	~~OSAM-3~~ SWC	
(3)	94010	5.0 µ PVC		14,944	7/3/13	19:20	OSAM-4	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

	Date	**Received By**
Tatiana Kibler	7/8/13	Scott Cunningham
		Travis Allen 7/9/13 4:00pm 24°C

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/16/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 7/9/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011303112. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011303112
CustomerID:	GTA51
CustomerPO:	041317930
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 07/09/13 4:00 PM

Project: **130467USA**

Analytical Results

Client Sample Description 94005 OSAM-1 ***Collected:*** 7/4/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0060	0.00066	µg/m³	7/12/2013	MM	7/15/2013	MM

Client Sample Description 94037 OSAM-2 ***Collected:*** 7/4/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0049	0.00066	µg/m³	7/12/2013	MM	7/15/2013	MM

Client Sample Description 94011 OSAM-3 ***Collected:*** 7/4/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0077	0.00071	µg/m³	7/12/2013	MM	7/15/2013	MM

Client Sample Description 94017 OSAM-4 ***Collected:*** 7/4/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0040	0.00066	µg/m³	7/12/2013	MM	7/15/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011303112

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 26112 (50 – 100)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
①	94005	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	15,140	7/4/13	20:39	OSAM-1	
②	94037	5.0 µ PVC		15,120	7/4/13	20:25	OSAM-2	
③	94011	5.0 µ PVC		14,081	7/4/13	19:42	OSAM-3	
④	94017	5.0 µ PVC		15,103	7/4/13	20:08	OSAM-4	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Relinquished By	Date	Received By	Date
Tucker Barbin	7/8/13	Scott Cummings	7/8/13
		Travis Albert 24°C	7/9/13 4:00pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

4

011303112

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/16/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 7/9/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011303113. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011303113
CustomerID:	GTA51
CustomerPO:	041317928
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 07/09/13 4:00 PM

Project: **130467USA**

Analytical Results

Client Sample Description 93995 OSAM-1 ***Collected:*** 7/5/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0054	0.00069	µg/m³	7/12/2013	MM	7/16/2013	MM

Client Sample Description 94029 OSAM-2 ***Collected:*** 7/5/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0036	0.00069	µg/m³	7/12/2013	MM	7/16/2013	MM

Client Sample Description 94016 OSAM-3 ***Collected:*** 7/5/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0035	0.00067	µg/m³	7/12/2013	MM	7/16/2013	MM

Client Sample Description 94015 OSAM-4 ***Collected:*** 7/5/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0089	0.00068	µg/m³	7/12/2013	MM	7/16/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 071303113

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 26112 (50 – 100)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
①	93995	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,484	7/5/13	20:19	OSAM-1	
②	94029	5.0 µ PVC		14,484	7/5/13	20:05	OSAM-2	
③	94016	5.0 µ PVC		14,839	7/5/13	19:22	OSAM-3	
④	94015	5.0 µ PVC		14,626	7/5/13	19:48	OSAM-4	

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tammie Perlin	7/8/13	Kathleen Simmons	7/8/13
		Frank Ault 24°C	7/9/13 4:00pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/16/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 7/12/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011303225. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011303225
CustomerID:	GTA51
CustomerPO:	041318321
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 07/12/13 4:15 PM

Project: **130467USA**

Analytical Results

Client Sample Description 94027 OSAM-1 ***Collected:*** 7/7/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0024	0.00069	µg/m³	7/15/2013	MM	7/16/2013	MM

Client Sample Description 94025 OSAM-2 ***Collected:*** 7/7/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0030	0.00069	µg/m³	7/15/2013	MM	7/16/2013	MM

Client Sample Description 94020 OSAM-3 ***Collected:*** 7/7/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0030	0.00068	µg/m³	7/15/2013	MM	7/16/2013	MM

Client Sample Description 94006 OSAM-4 ***Collected:*** 7/7/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0048	0.00068	µg/m³	7/15/2013	MM	7/16/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011303225

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

011303225

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 26112 (50 – 100)

	Sample ID	**Media**	**Analyte / Method**	**Volume**	**Sample Date/Time**		**Location**	**Comments**
1	94027	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,484	7/7/13	19:45	OSAM-1	
2	94025	5.0 µ PVC		14,484	7/7/13	19:30	OSAM-2	
3	94020	5.0 µ PVC		14,626	7/7/13	19:00	OSAM-3	
4	94006	5.0 µ PVC		14,676	7/7/13	19:15	OSAM-4	

13 JUL 12 AM 11:03 CINNAMINSON, NJ

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	**Date**	**Received By**	**Date**
Travis Ruhl	7/9/13	Travis Ruhl 24°C	7/11/13
			7/12/13 4:15pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

4

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/16/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 7/12/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011303226. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011303226
CustomerID:	GTA51
CustomerPO:	041318312
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 07/12/13 4:15 PM

Project: **130467USA**

Analytical Results

Client Sample Description 93996 OSAM-1 ***Collected:*** 7/9/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0021	0.00071	µg/m³	7/15/2013	MM	7/16/2013	MM

Client Sample Description 94022 OSAM-2 ***Collected:*** 7/9/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0036	0.00072	µg/m³	7/15/2013	MM	7/16/2013	MM

Client Sample Description 94028 OSAM-3 ***Collected:*** 7/9/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0051	0.00068	µg/m³	7/15/2013	MM	7/16/2013	MM

Client Sample Description 93998 OSAM-4 ***Collected:*** 7/9/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0031	0.00068	µg/m³	7/15/2013	MM	7/16/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

011303226

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 011303226

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece Cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 26112 (50 – 100)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
①	93996	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,009	7/9/13	18:42	OSAM-1	
②	94022	5.0 µ PVC		13,938	7/9/13	19:00	OSAM-2	
③	94028	5.0 µ PVC		14,780	7/9/13	19:18	OSAM-3	
④	93998	5.0 µ PVC		14,799	7/9/13	20:03	OSAM-4	

RECEIVED EMSL CINNAMINSON, NJ 13 JUL 12 AM 11:02

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tanner Pinn	7/9/13	Scott Wilson / Jvanriddell 24°C	7/11/13 7/12/13 4:15pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone: (856) 303-2500 Fax: (856) 858-4571 Email: jsmith@emsl.com

Attn: **Sam Stevenson** 7/16/2013
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 7/12/2013. The results are tabulated on the attached data pages for the following client designated project:

130467USA

The reference number for these samples is EMSL Order #011303227. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Reviewed and Approved By:

Julie Smith - Laboratory Director

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org

Accreditation #100194 NELAC Certification: NJ 03036, NY 10872

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the AIHA, unless specifically indicated. The final results are not field blank corrected. The laboratory is not responsible for final results calculated using air volumes that have been provided by non-laboratory personnel. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 858-4571
http://www.emsl.com jsmith@emsl.com

EMSL Order:	011303227
CustomerID:	GTA51
CustomerPO:	041318316
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone: (410) 792-9446
Fax: (410) 792-7395
Received: 07/12/13 4:15 PM

Project: **130467USA**

Analytical Results

Client Sample Description 94038 OSAM-1 ***Collected:*** 7/6/2013 ***Lab ID:*** *0001*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0028	0.00069	µg/m³	7/15/2013	MM	7/16/2013	MM

Client Sample Description 94030 OSAM-2 ***Collected:*** 7/6/2013 ***Lab ID:*** *0002*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0019	0.00069	µg/m³	7/15/2013	MM	7/16/2013	MM

Client Sample Description 94014 OSAM-3 ***Collected:*** 7/6/2013 ***Lab ID:*** *0003*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0037	0.00069	µg/m³	7/15/2013	MM	7/16/2013	MM

Client Sample Description 93993 OSAM-4 ***Collected:*** 7/6/2013 ***Lab ID:*** *0004*

Method	*Parameter*	*Result*	*RL*	*Units*	*Prep Date*	*Analyst*	*Analysis Date*	*Analyst*
ID-215	Hexavalent Chromium	0.0050	0.00068	µg/m³	7/15/2013	MM	7/16/2013	MM

Definitions:

ND - indicates that the analyte was not detected at the reporting limit
RL - Reporting Limit

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 011303227

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province: MD**	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 26112 (50 – 100)

	Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
①	94038	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,545	7/6/13	20:05	OSAM-1	
②	94030	5.0 µ PVC		14,606	7/6/13	19:50	OSAM-2	
③	94014	5.0 µ PVC		14,596	7/6/13	19:20	OSAM-3	
④	93993	5.0 µ PVC		14,790	7/6/13	19:37	OSAM-4	

RECEIVED EMSL CINNAMINSON, NJ JUL 12 AM 11:02

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tommy Rich	7/9/13	Scott Evans Allen 24°C	7/11/13 7/12/13 4:15pm

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

011303227

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041317212
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	07/01/13 8:40 AM
Analysis Date:	7/1/2013
Collected:	6/25/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
93963	OSAM-1	15527	0.254	0.016	0.003	
041317212-0001						
93949	OSAM-3	15750	0.232	0.015	0.003	
041317212-0002						
93960	OSAM-4	16150	0.249	0.015	0.003	
041317212-0003						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (3)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 07/02/2013 10:48:42

EMSL ANALYTICAL, INC.
LABORATORY · PRODUCTS · TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041317212

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
Phone: (856) 858-4800
Fax: (856) 858-4571

041317212

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (401 - 450)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
93963	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	15,527	6/25/13	20:00	OSAM-1	
93949	5.0 µ PVC		15,750	6/25/13	19:00	OSAM-3	
93960	5.0 µ PVC		16,150	6/25/13	19:39	OSAM-4	
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
	6/28/13		6/25/13
	6/28/13		
		RD FL 8:40 AM	7-1-2013

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

3

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041317210
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	07/01/13 8:40 AM
Analysis Date:	7/1/2013
Collected:	6/27/2013

Project: **130467USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
93984	OSAM-1	14931	0.222	0.015	0.003	
041317210-0001						
93970	OSAM-3	14542	0.197	0.014	0.003	
041317210-0002						
93952	OSAM-4	14413	0.206	0.014	0.003	
041317210-0003						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (3)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 07/02/2013 10:24:35

041317210

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041317210

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (401 - 450)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
93984	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,931	6/27/13	19:42	OSAM-1	
93970	5.0 µ PVC		14,542	6/27/13	18:30	OSAM-3	
93952	5.0 µ PVC		14,413	6/27/13	19:00	OSAM-4	
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						

RECEIVED EMSL CINNAMINSON, NJ 13 JUL -1 AM 9:42

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tsquanza Perkins	6/28/13		6/28/13
	6/28/13		
		FL 8:40 AM	7-1-2013

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

3

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041317201
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Project: **130467USA**

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	07/01/13 8:40 AM
Analysis Date:	7/1/2013
Collected:	6/26/2013

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
93977	OSAM-1	14889	0.069	0.005	0.003	
041317201-0001						
93962	OSAM-3	14612	0.252	0.017	0.003	
041317201-0002						
93940	OSAM-4	14494	0.341	0.024	0.003	
041317201-0003						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (3)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 07/02/2013 10:27:46

041317201

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041317201

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 28127 (401 - 450)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
93977	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,889	6/26/13	20:00	OSAM-1	
93962	5.0 µ PVC		14,612	6/26/13	18:25	OSAM-3	
939[illegible]40	5.0 µ PVC		14,494	6/26/13	19:20	OSAM-4	
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						
	5.0 µ PVC						

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUL -1 AM 9:40

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
[signature]	6/28/13	[signature]	6/28/13
[signature]	6/28/13	[signature] 8:40 AM	7-1-2013

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

(3)

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041317507
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	07/03/13 9:25 AM
Analysis Date:	7/3/2013
Collected:	6/28/2013

Project: **130467USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m^3)*	*Reporting Limit (mg/m^3)*	*Notes*
93956	OSAM-1	14942	0.279	0.019	0.003	
041317507-0001						
93972	OSAM-2	14139	0.156	0.011	0.004	
041317507-0002						
93959	OSAM-3	14626	0.318	0.022	0.003	
041317507-0003						
93975	OSAM-4	14372	0.196	0.014	0.003	
041317507-0004						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (4)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 07/05/2013 10:35:38

041317507

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene
Chain of Custody

EMSL Order Number (Lab Use Only): 041317507

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐ _____	**Lot #:** 26112 (50 – 100)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
93956	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,942	6/28/13	19:25	OSAM-1	
93972	5.0 µ PVC		14,139	6/28/13	19:11	OSAM-2	
93959	5.0 µ PVC		14,626	6/28/13	18:10	OSAM-3	
93975	5.0 µ PVC		14,372	6/28/13	18:36	OSAM-4	
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						

RECEIVED
EMSL
CINNAMINSON, NJ
13 JUL -3 AM 10:19

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Kenny Ruth	7/2/13	Scott H Cummings	7/2/13
Scott H Cummings	7/2/13	UC FF	7-3-13 9:25

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

4

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041317503
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	07/03/13 9:25 AM
Analysis Date:	7/3/2013
Collected:	6/29/2013

Project: **130467USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
93999	OSAM-1	14981	0.181	0.012	0.003	
041317503-0001						
94019	OSAM-2	15023	0.100	0.007	0.003	
041317503-0002						
94035	OSAM-3	14801	0.120	0.008	0.003	
041317503-0003						
94036	OSAM-4	14555	0.102	0.007	0.003	
041317503-0004						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (4)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 07/05/2013 10:40:16

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041319503

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

041317503

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**	**Purchase Order:**		**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail		**Email Results To:** sstevenson@gtaeng.com			

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.						
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece Cassette
Manufacturer/Part #: Zefon 7P53P
Lot #: 26112 (50 – 100)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
93999	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	14,981	6/29/13	19:05	OSAM-1	
94019	5.0 µ PVC		15,023	6/29/13	18:55	OSAM-2	
94035	5.0 µ PVC		14,801	6/29/13	18:00	OSAM-3	
94036	5.0 µ PVC		14,555	6/29/13	18:30	OSAM-4	
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						

RECEIVED EMSL CINNAMINSON, NJ 13 JUL -3 AM 10:26

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	**Date**	**Received By**	**Date**
Scott	7/2/13		7/2/13
Scott	7/2/13		7/3/13 925

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

4

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041317502
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	07/03/13 9:14 AM
Analysis Date:	7/3/2013
Collected:	7/1/2013

Project: **130467USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
94009	OSAM-1	14839	0.094	0.006	0.003	
041317502-0003						
94001	OSAM-2	14342	0.150	0.010	0.003	
041317502-0004						
93992	OSAM-3	14555	0.117	0.008	0.003	
041317502-0005						
94002	OSAM-4	14342	0.230	0.016	0.003	
041317502-0006						
94000	OSAM-1	0	<0.05	N/A	N\A	Field Blank
041317502-0001						
94012	OSAM-1	0	<0.05	N/A	N\A	Field Blank
041317502-0002						

Notes: Discernable field blank submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (6)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Report Amended: 07/05/2013 12:59:20 Replaces the Inital Report 07/05/2013 10:43:39. Reason Code: Data Entry-Blanks Samples Added

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041317502

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson	**Bill To Company:** Geo-Technology Associates, Inc.
Company Name: Geo-Technology Associates, Inc.	**Attention To:** Sam Stevenson
Street: 14280 Park Center Drive	**Street:** 14280 Park Center Drive
City: Laurel **State/Province:** MD **Zip/Postal Code:** 20707	**City:** Laurel **State/Province:** MD **Zip/Postal Code:** 20707
Phone : (410) 792-9446 **Fax :** (410) 792-7395	**Phone :** (410) 792-9446 **Fax :** (410) 792-7395
Project Name: 130467USA	**U.S. State where Samples Collected:** Maryland
Number of Samples in Shipment: **Date of Shipment:** **Purchase Order:**	**Sampled By (Signature):**
Please Provide results: ☐ Fax ☒ Email ☒ Mail	**Email Results To:** sstevenson@gtaeng.com

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.

2 Week	1 Week	4 Day	3 Day	2 Day	1 Day	Other (Call Lab)
☐	☒	☐	☐	☐	☐	☐

Media Type: 37mm, 3 piece Cassette
Manufacturer/Part #: Zefon ZP53P
Lot #: 26112 (50 – 100)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
94000	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	Media Blank	7/1/13	-	OSAM-1	
94012	5.0 µ PVC		Field Blank	7/1/13	19:20	OSAM-1	
94009	5.0 µ PVC		14,839	7/1/13	19:20	OSAM-1	
94001	5.0 µ PVC		14,342	7/1/13	19:05	OSAM-2	
93992	5.0 µ PVC		14,555	7/1/13	18:28	OSAM-3	
94002	5.0 µ PVC		14,342	7/1/13	18:50	OSAM-4	
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						

RECEIVED CINNAMINSON, NJ 3 JUL 3 AM 10: 25

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Tanya Penn	6/2/13	Scott W Cummings	7/2/13
Scott W Cummings	7/2/13		7-3-13

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

6

041317502

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.emsl.com cinnasblab@EMSL.com

EMSL Order:	041317498
CustomerID:	GTA51
CustomerPO:	
ProjectID:	

Attn: **Sam Stevenson**
Geo-Technology Associates, Inc.
14280 Park Center Drive
Suite A
Laurel, MD 20707

Phone:	(410) 792-9446
Fax:	(410) 792-7395
Received:	07/03/13 9:25 AM
Analysis Date:	7/3/2013
Collected:	6/30/2013

Project: **130467USA**

Test Report: Total Dust Analysis (Gravimetric) of Air Samples via NIOSH 0500, Issue 2, 8/15/94

Sample	*Location*	*Volume (L)*	*Sample Weight (mg)*	*Concentration (mg/m³)*	*Reporting Limit (mg/m³)*	*Notes*
93990	OSMA-1	15350	0.175	0.011	0.003	
041317498-0001						
94003	OSMA-2	14831	0.282	0.019	0.003	
041317498-0002						
94033	OSMA-3	15223	0.316	0.021	0.003	
041317498-0003						
94031	OSMA-4	15350	0.271	0.018	0.003	
041317498-0004						

Notes: Discernable field blank not submitted with samples.
Results are not field blank corrected.

Analyst(s)

Shane Feret (4)

Stephen Siegel, CIH, Laboratory Manager
or other approved signatory

The laboratory is not responsible for data reported in mg/m3, which is dependent on volume collected by non-laboratory personnel. This report relates only to the samples reported above. This report may not be reproduced, except in full, without written approval by EMSL. Samples received in good condition unless otherwise noted.
Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--IHLAP Accredited #100194

Initial report from 07/05/2013 10:32:46

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Industrial Hygiene Chain of Custody

EMSL Order Number (Lab Use Only): 041317498

EMSL ANALYTICAL, INC.
200 ROUTE 130 NORTH
CINNAMINSON, NJ 08077
PHONE: (800) 220-3675
FAX: (856) 858-3502

Report To Contact Name: Sam Stevenson			**Bill To Company:** Geo-Technology Associates, Inc.		
Company Name: Geo-Technology Associates, Inc.			**Attention To:** Sam Stevenson		
Street: 14280 Park Center Drive			**Street:** 14280 Park Center Drive		
City: Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707	**City:** Laurel	**State/Province:** MD	**Zip/Postal Code:** 20707
Phone : (410) 792-9446	**Fax :** (410) 792-7395		**Phone :** (410) 792-9446	**Fax :** (410) 792-7395	
Project Name: 130467USA				**U.S. State where Samples Collected:** Maryland	
Number of Samples in Shipment:	**Date of Shipment:**		**Purchase Order:**	**Sampled By (Signature):**	
Please Provide results: ☐ Fax ☒ Email ☒ Mail			**Email Results To:** sstevenson@gtaeng.com		

Turnaround Time – Please Check: Please Note Standard TAT is 2 Week.							**Media Type:** 37mm, 3 piece Cassette
2 Week	**1 Week**	**4 Day**	**3 Day**	**2 Day**	**1 Day**	**Other (Call Lab)**	**Manufacturer/Part #:** Zefon 7P53P
☐	☒	☐	☐	☐	☐	☐	**Lot #:** 26112 (50 – 100)

Sample ID	Media	Analyte / Method	Volume	Sample Date/Time		Location	Comments
~~93999~~ 93990	5.0 µ PVC	Cr VI OSHA 215 Total Particulates NIOSH 0500	15,350	6/30/13	19:40	OSAM-1	
~~94019~~ 94003	5.0 µ PVC		14,831	6/30/13	19:25	OSAM-2	
~~94035~~ 94033	5.0 µ PVC		15,223	6/30/13	18:48	OSAM-3	
~~94036~~ 94031	5.0 µ PVC		14,961	6/30/13	19:10	OSAM-4	
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						
	~~5.0 µ PVC~~						

13 JUL -3 AM 6:13 EMSL CINNAMINSON

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	Date	Received By	Date
Scott W Cummings	7/2/13 7/2/13		7/3/13 7-3-13 9:25

Comments: OK to run OSHA 215 and NIOSH 0500 from same sample media.
Samples were not collected from a welding, plating or painting environment.

4

041317498

Appendix B
Figures and Summary Tables

LIST OF FIGURES

1 *Site Location Map*

2 *Perimeter Construction Monitoring Locations*

3 *Air Monitoring (AM) and Particle Size Analyzer (PSA) Locations*

4a *Wind Direction (24 Apr – 23 Jun 2013)*

4b *Wind Speed (24 Apr – 23 Jun 2013)*

5 *PSA (DustTrak™ DRX 8534) versus RAM (DustTrak™ DR4000)*

6 *Total Particulates (NIOSH 0500) versus PSA (DustTrak™ DRX 8534)*

7 *Particle Size Distribution (DustTrak™ DRX 8534) – Percent Frequency*

8 *Mass [µg/M³] Frequency Distribution – (DustTrak™ DRX 8534)*

9 *Action Level Scenario - Particle Size Distribution (DustTrak™ DRX 8534) - Percent Frequency*

Figure 1
Site Location Map

Figure 2
Perimeter Construction Monitoring Locations
Harbor Point
Baltimore, Maryland

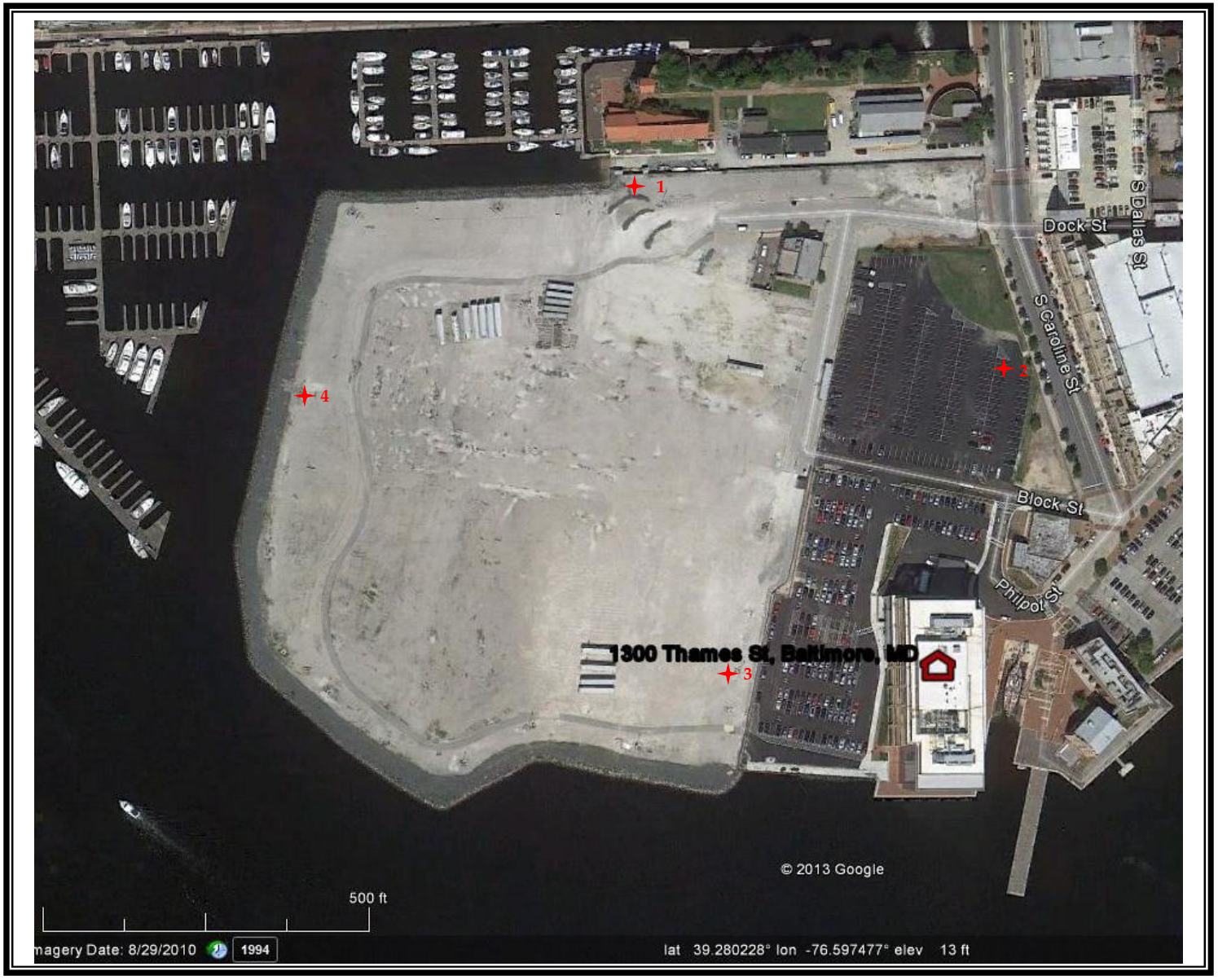


Figure 3
Air Monitoring (AM) and Particle Size Analyzer (PSA) Locations
Harbor Point
Baltimore, Maryland

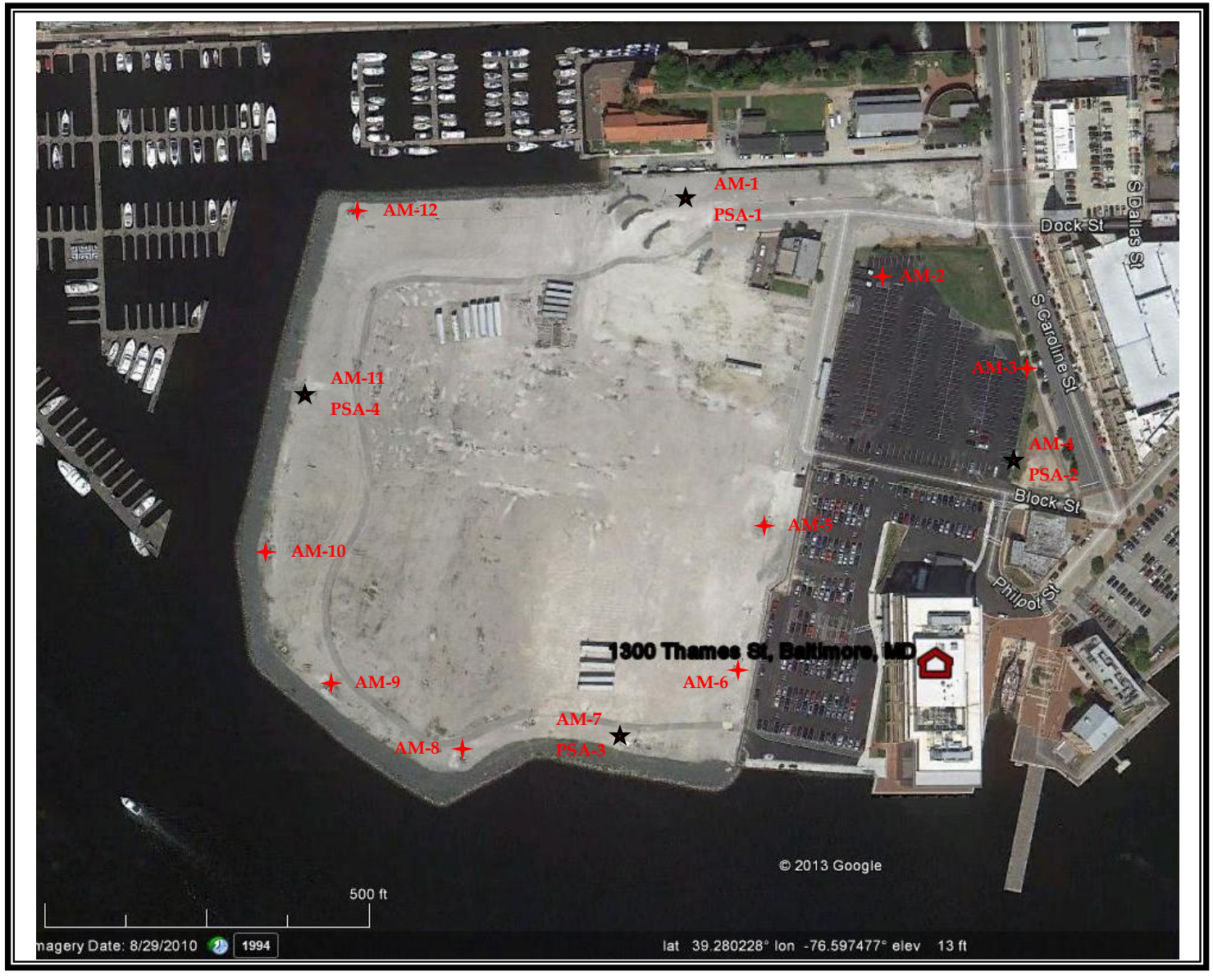


Figure 4a. Wind Direction (24-Apr - 23 Jun 2013)

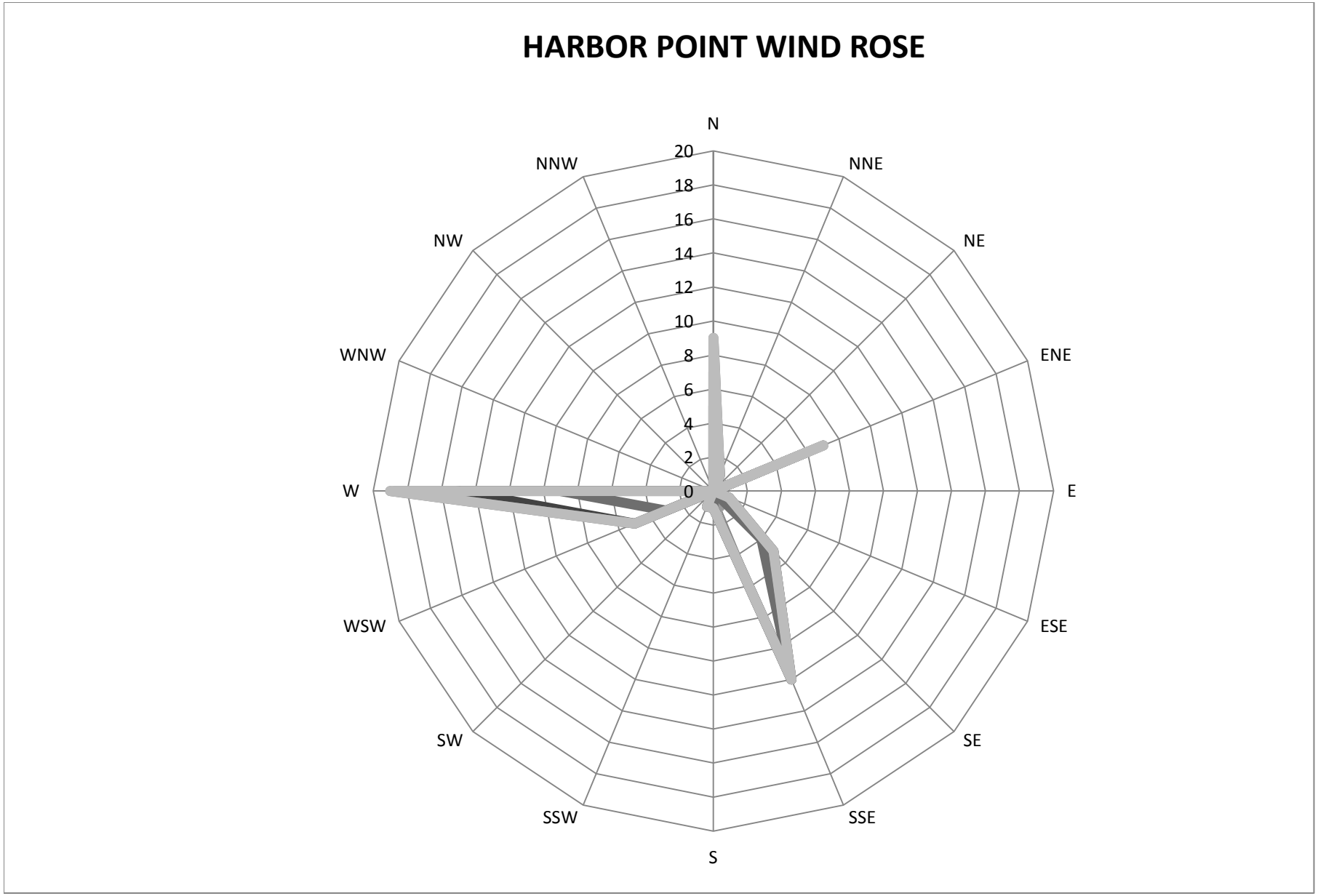


Figure 4b. Wind Speed (24-Apr - 23-Jun 2013)

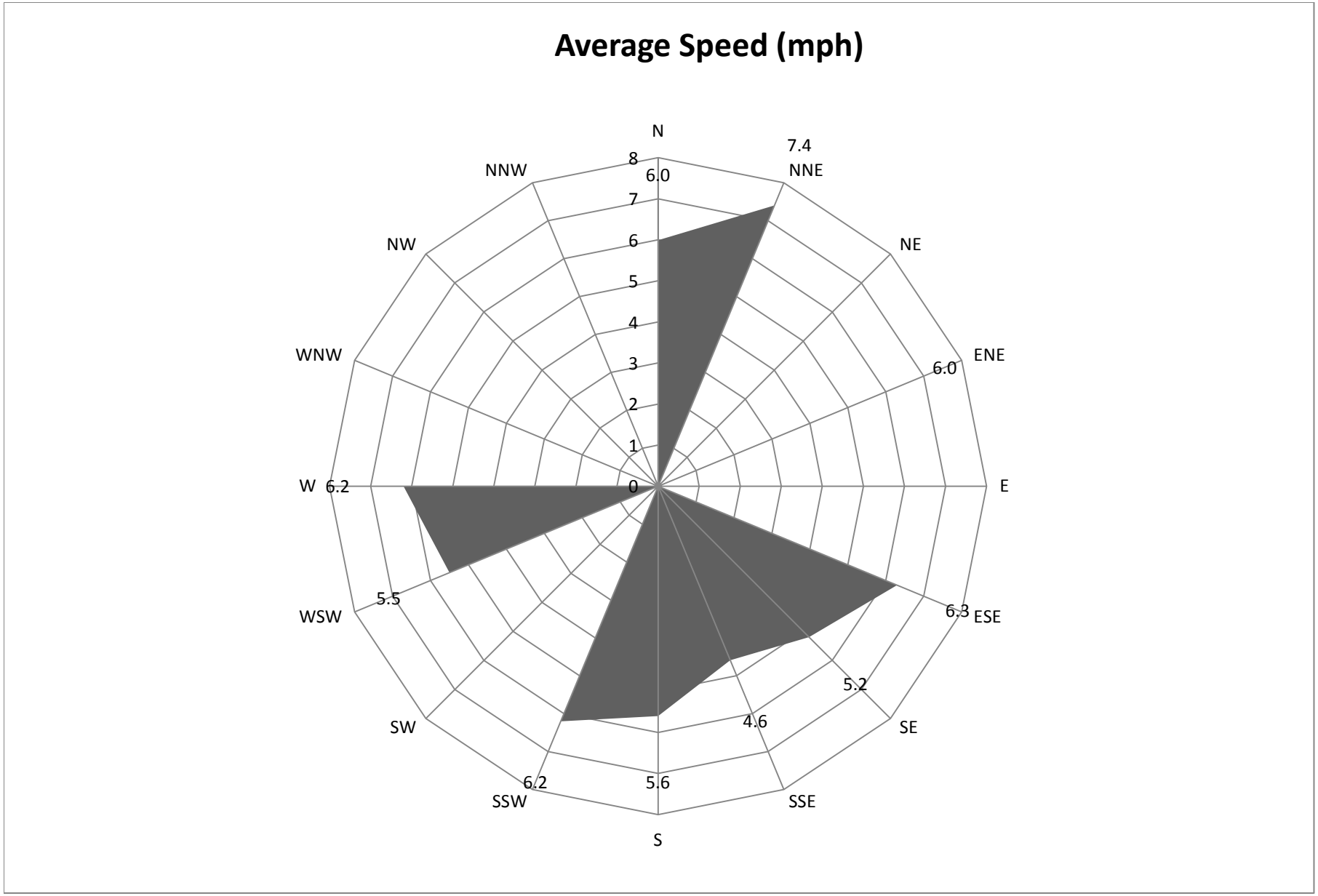


FIGURE 5. PSA (DustTrak™ DRX 8534) versus RAM (DustTrak™ DR4000)

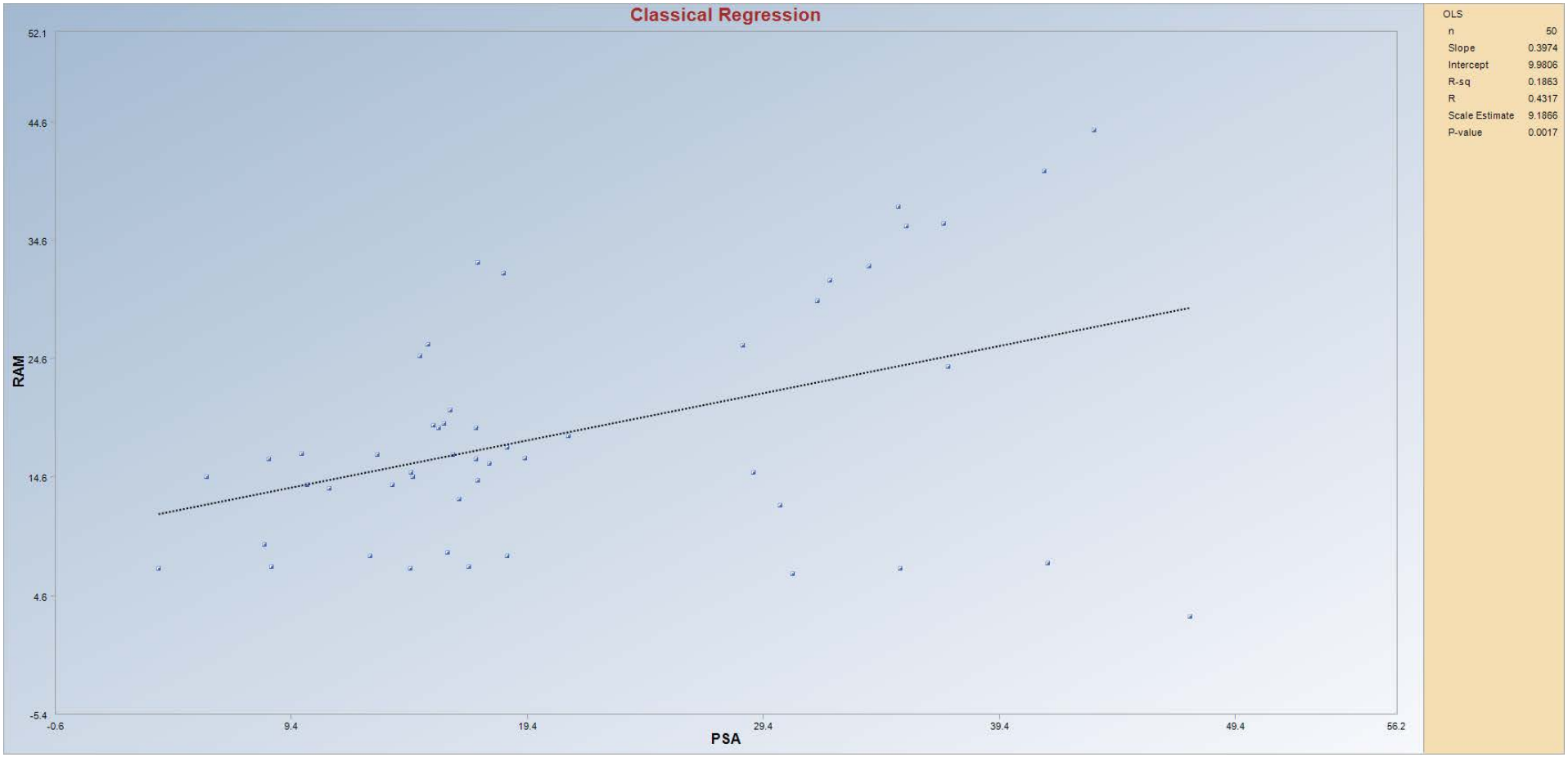


FIGURE 6. Total Particulates (NIOSH 0500) versus PSA (DustTrak™ DRX 8534)

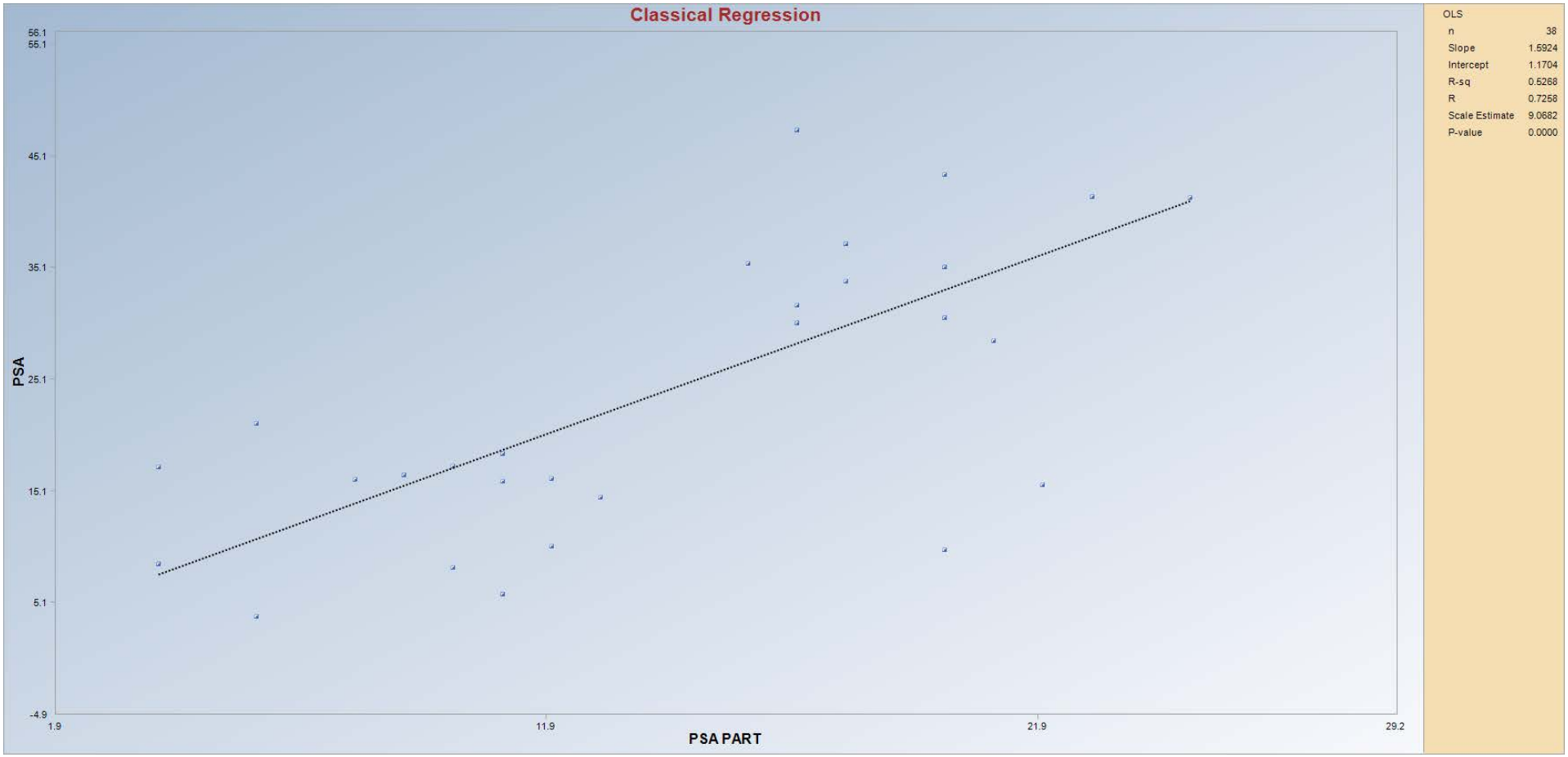
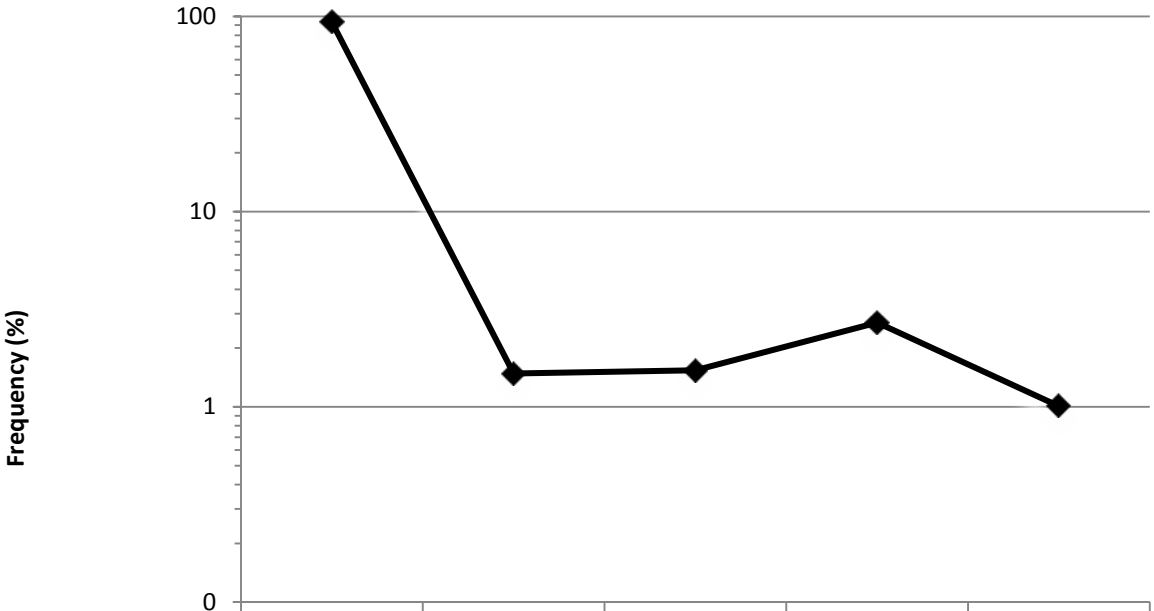
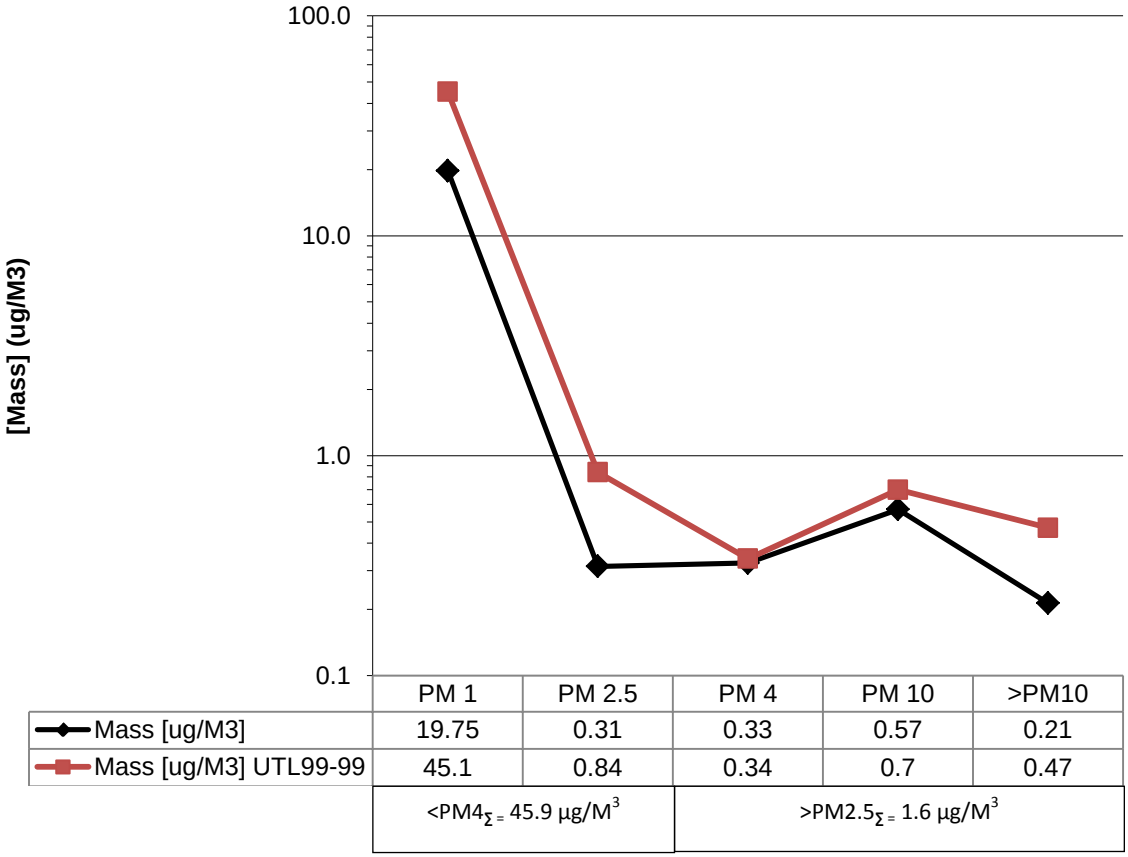


FIGURE 7. Particle Size Distribution (DustTrak™ DRX 8534) – Percent Frequency



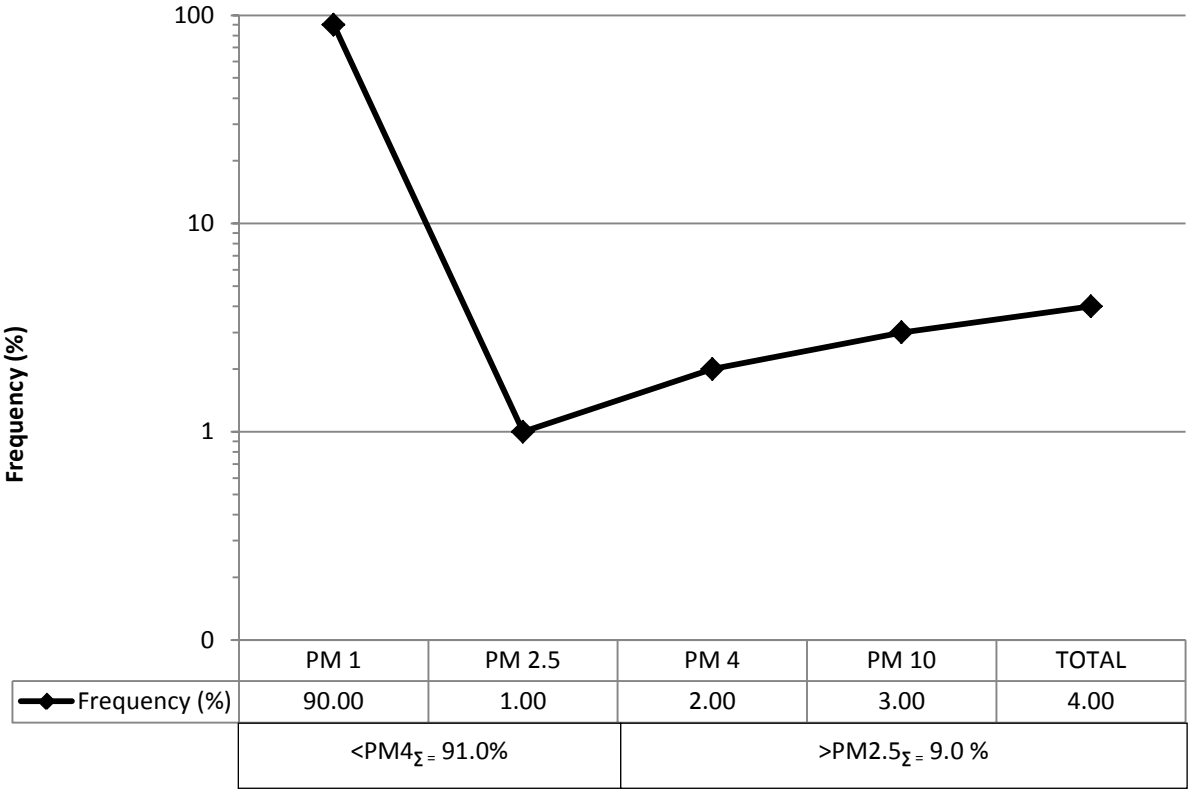
	PM 1	PM 2.5	PM 4	PM 10	TOTAL
Frequency (%)	93.28	1.48	1.54	2.69	1.01
	$<PM4_{\Sigma =}$ 94.8 %		$>PM2.5_{\Sigma =}$ 5.2 %		

FIGURE 8. Mass [µg/M^3] Frequency Distribution - (DustTrak™ DRX 8534)



	PM 1	PM 2.5	PM 4	PM 10	>PM10
Mass [ug/M3]	19.75	0.31	0.33	0.57	0.21
Mass [ug/M3] UTL99-99	45.1	0.84	0.34	0.7	0.47
	<$PM4_{\Sigma}$ = 45.9 µg/M^3		>$PM2.5_{\Sigma}$ = 1.6 µg/M^3		

FIGURE 9. Action Level Scenario - Particle Size Distribution (DustTrak™ DRX 8534) - Percent Frequency



	PM 1	PM 2.5	PM 4	PM 10	TOTAL
Frequency (%)	90.00	1.00	2.00	3.00	4.00
	$<PM4_{\Sigma =}$ 91.0%		$>PM2.5_{\Sigma =}$ 9.0 %		

LIST OF TABLES

1 *Pre-Construction Air Monitoring – ProUCL4.1 Dataset*

2a *RAM – BTV 97.5%*

2b *RAM – BTV 99%*

2c *RAM – BTV 95%*

2d *RAM – UCLs*

3a *Total Particulate – BTV 97.5%*

3b *Total Particulate – BTV 99%*

3c *Total Particulate – BTV 95%*

3d *Total Particulate – UCLs*

4a *Hexavalent Chromium – BTV 97.5%*

4b *Hexavalent Chromium – BTV 99%*

4c *Hexavalent Chromium – BTV 95%*

4d *Hexavalent Chromium – UCLs*

5a *Upwind CrVI versus Downwind CrVI – Set 1*

5b *Upwind CrVI versus Downwind CrVI – Set 2*

6a *Dry Low Wind CrVI (Background) versus Dry High wind (AoC)*

6b *Rain CrVI (Background) versus Dry Light Wind (AoC)*

6c *Rain CrVI (Background) versus Dry Heavy Wind (AoC)*

7 *Particle Size Distribution ProUCL4.1 Dataset*

8a *Particle Size Analyses (PSA) BTVs 99%*

8b *Particle Size Analyses (PSA) BTVs 97.5%*

8c *Particle Size Analyses (PSA) BTVs 95%*

8d *Particle Size Analyses (PSA) UCLs*

9 *Total Particulate Concentrations (NIOSH 0500) versus PM2.5 Concentrations (NIOSH 0500)*

10 *Total CrVI Concentrations (OSHA ID 215) versus PM2.5 Concentrations (OSHA ID 215)*

Table 1. Pre-Construction Air Monitoring - ProUCL4.1 Dataset

DATE	RAM-1	PART-1	D_PART-1	CrVI-1	D_CrVI-1	RAM-2	PART-2	D_PART-2	CrVI-2	D_CrVI-2	RAM-3	PART-3	D_PART-3	CrVI-3	D_CrVI-3	WS (mph)	WD	RH (%)	Rainfall (in)	Matrix
24-Apr	30.5	11	1	0.7	0						16.8	11	1	0.7	0	4.4	SE	69	0	A1
25-Apr	16.4	17	1	2.2	1						9.1	8	1	0.73	1	7.4	N	54	0.004	B1
26-Apr	14.8	14	1	1.3	1						8.1	11	1	3.3	1	5.5	W	39	0	A2
27-Apr	14.8	11	1	3.7	1						8.2	8	1	6.0	1	4.4	N	35	0	A3
28-Apr	15.9	13	1	2.4	1						9.2	12	1	3.6	1	4.1	SSE	44	0	A4
29-Apr	13.4	8	1	0.83	1						7.3	135	1	0.7	0	6.2	SSW	62	0.089	A5
30-Apr	8.5	7	1	0.72	1						4.1	5	1	0.7	0	6.8	ENE	92	0.004	D1
1-May	10.6	5	1	0.72	1						5.6	12	1	0.7	0	5.4	SE	56	0	A6
2-May	9.0	8	1	0.78	1						4.3	8	1	1.1	1	5.6	SE	59	0	A7
3-May	11.6	23	1	1.2	1						5.8	3	0	0.7	0	5.6	SSE	56	0	A8
4-May	12.9	16	1	1.3	1						6.2	9	1	0.7	0	6	SE	61	0	A9
5-May	20.3	16	1	0.7	0						10.1	12	1	0.7	0	6.3	ESE	59	0	A10
6-May	24.7	14	1								12.6	16	1			6.0	ENE	71	0.003	D2
7-May	14.4	6	1	1.2	1						6.8	8	1	1.3	1	9.2	ENE	89	0.667	C1
8-May	19.0	10	1	2.0	1						9.6	13	1	0.68	0	6.2	ENE	85	0.208	C2
9-May	24.6										12.2					5.2	W	78	0.160	C 16
10-May	21.2										10.5					4.1	W	63	0	A11
11-May	12.4	12	1	1.8	1						10.6	21	1	0.8	1	5.8	W	76	0.360	C3
12-May	10.7	8	1	1.2	1						7.2	10	1	2.2	1	8.3	W	61	0.130	C4
13-May	14.0	8	1	3.6	1						3.6	7	1	2.1	1	9.8	W	36	0	B2
14-May	7.8	9	1	0.7	0						5.1	10	1	1.7	1	7.1	N	35	0	B3
15-May	13.1										9.6					4.7	SSE	56	0.049	A12
16-May	21.1										12.9					5.7	W	59	0.027	A13
17-May	18.7										11.4					6.3	W	47	0	A14
18-May	8.2										6.0					5.2	SSE	55	0.001	A15
19-May	12.5										7.7					4.3	SSE	90	0	D3
20-May	34.8										19.5					3.9	ENE	85	0	D4
21-May	28.6										16.6					4.2	WSW	80	0	D5
22-May	55.7										27.5					4.9	SSE	78	0	D6
23-May	24.8	7	1	1.5	1	9.5	13	1	3.1	1						5.6	S	75	0.152	C5
24-May	11.0	3	0	2.4	1	2.8	8	11	5.2	1						5.5	N	71	0.968	C6
25-May	6.6	5	1	1.2	1	0.5	10	1	7.7	1						8.9	N	58	0	B4
26-May	5.8	6	1	2.2	1	0.4	9	1	1.9	1						7.4	NNE	47	0	B5
27-May	7.0					1.0										4.1	N	44	0	A16
28-May	16.8					6.9										2.8	N	67.4	0.07	A17
29-May	29.2					14.8	29	1	2.2	1						4.7	W	75	0.141	C7
30-May	30.7					14.3										4.1	W	71	0	D7
31-May	33.9					17.8										5.0	WSW	61	0	A18
1-Jun	21.4					14.8										6.0	WSW	55	0	A19
2-Jun	16.2	16	1	2.8	1	12.3	18	1	2.9	1						7.3	WSW	58	0	B6
3-Jun	17.1	6	1	0.99	1	9.9	10	1	2.8	1						5.6	W	83	0.65	C8
4-Jun	9.0					5.5										5.6	N	48	0.02	A20
5-Jun	8.4					4.6										4.6	SE	45	0	A21
6-Jun	12.1					8.5										5.3	SSE	58	0	A22
7-Jun	12.0	6	1	0.78	0	8.5	17	1	3.4	1						4.9	ENE	89	1.989	C9
8-Jun	15.7	9	1	1	1	11.0	9	1	1.3	1						6.0	W	80	0.18	C10
9-Jun	24.7					18.9										3.6	SSE	61	0.001	A23
10-Jun	29.1					25										4.2	SSE	84	0.668	C11
11-Jun	19.1	11	1	2.6	1	11.6	3	0	7.1	1						8.3	W	82	0.741	C12
12-Jun	35.8	16	1	1.5	1	24	20	1	5.2	1						7.6	W	65	0	B7
13-Jun	43.9	20	1	1.6	1	32.2	21	1	1.6	1						6.4	W	70	0.682	C13
14-Jun	8.9	10	1	1.6	1	3	6	1	4	1						8.1	N	66	0.459	C14
15-Jun	16.2	18	1	1.5	1	7.3	21	1	1.3	1						6.1	W	49	0	A24
16-Jun	29.5	17	1	3.3	1	13.4	20	1	3.2	1						6.1	W	52	0	A25
17-Jun	17.1	16	1	1.2	1	6.4	11	1	1.8	1						8.1	W	57	0	B8
18-Jun	36.0	4	1	1.2	1	16.2	6	1	1.4	1						4.7	W	73	0.215	C15
19-Jun	18.7	4	1	1	1	7.4	6	1	0.63	0						4.7	ENE	73	0.070	A26
20-Jun	16.1	14	1	1.8	1	6.3	14	1	1.6	1						4.5	SSE	60	0	A27
21-Jun	18.1	6	1	4.3	1	8.7	7	1	2.8	1						4.6	SSE	49	0	A28
22-Jun	20.3	8	1	4	1	8	21	1	2.7	1						5	WSW	64	0	A29
23-Jun	19	6	1	4.5	1	7.5	17	1	2.7	1						4.3	SSE	73	0.018	D8

Weather Sampling Matrix Codes: A=Dry/Light Wind, B=Dry/Heavy Wind, C=Rain Day, D=Out of Classification

Table 1. Pre-Construction Air Monitoring - ProUCL4.1 Dataset

DATE	RAM-4	PART-4	D_PART-4	CrVI-4	D_CrVI-4	RAM-5	PART-5	D_PART-5	CrVI-5	D_CrVI-5	RAM-6	PART-6	D_PART-6	CrVI-6	D_CrVI-6	WS (mph)	WD	RH (%)	Rainfall (in)	Matrix
24-Apr						32.3	12	1	0.7	0						4.4	SE	69	0	A1
25-Apr						19.6	13	1	0.71	1						7.4	N	54	0.004	B1
26-Apr						19.2	10	1	1.8	1						5.5	W	39	0	A2
27-Apr						16.9	11	1	4.2	1						4.4	N	35	0	A3
28-Apr						18.6	13	1	5.5	1						4.1	SSE	44	0	A4
29-Apr						15.8	18	1	1.7	1						6.2	SSW	62	0.089	A5
30-Apr						9.7	6	1	1.1	1						6.8	ENE	92	0.004	D1
1-May						11.6	14	1	1.5	1						5.4	SE	56	0	A6
2-May	8.3	12	1	1.6	1						6.7	37	1	0.88	1	5.6	SE	59	0	A7
3-May	11.9	8	1	0.6	0						10.6	23	1	1.5	1	5.6	SSE	56	0	A8
4-May	12.7	13	1	0.6	0						11.2	11	1	0.7	0	6	SE	61	0	A9
5-May	20.2	16	1	0.6	0						17.2	14	1	0.7	0	6.3	ESE	59	0	A10
6-May	25.2	36	1								22.3	16	1			6.0	ENE	71	0.003	D2
7-May	13.8	12	1	0.65	0						11.8	8	1	0.82	1	9.2	ENE	89	0.667	C1
8-May	18.0	10	1	0.68	0						16.2	14	1	0.69	0	6.2	ENE	85	0.208	C2
9-May	25.4										22.7					5.2	W	78	0.160	C 16
10-May						18.5	31	1								4.1	W	63	0	A11
11-May						22.6	39	1	3.9	1						5.8	W	76	0.360	C3
12-May						13.2	20	1	3.3	1						8.3	W	61	0.130	C4
13-May						6.9	193	1	4.8	1						9.8	W	36	0	B2
14-May						9.8	11	1	1.6	1						7.1	N	35	0	B3
15-May						16.1										4.7	SSE	56	0.049	A12
16-May						22.7										5.7	W	59	0.027	A13
17-May						19.7										6.3	W	47	0	A14
18-May						10.9										5.2	SSE	55	0.001	A15
19-May						13.1										4.3	SSE	90	0	D3
20-May						32.5										3.9	ENE	85	0	D4
21-May						31.0										4.2	WSW	80	0	D5
22-May						56.2										4.9	SSE	78	0	D6
23-May	28.0	22	1	3.5	1						47.6	13	1	2.3	1	5.6	S	75	0.152	C5
24-May	10.8	8	1	2.8	1						45.0	6	1	2.1	1	5.5	N	71	0.968	C6
25-May	7.3	6	1	4.2	1						42.9	19	1	2.2	1	8.9	N	58	0	B4
26-May	5.7	14	1	2.1	1						46.0	6	1	5.4	1	7.4	NNE	47	0	B5
27-May	8.6										88.2					4.1	N	44	0	A16
28-May	20.7										0.6					2.8	N	67.4	0.07	A17
29-May	35.7	26	1	3.9	1						0.7	20	1	2.4	1	4.7	W	75	0.141	C7
30-May	31.1										0.7					4.1	W	71	0	D7
31-May	33.3										1.4					5.0	WSW	61	0	A18
1-Jun	22.8										2.3					6.0	WSW	55	0	A19
2-Jun	18.3	15	1	3.6	1						1.7	13	1	1.9	1	7.3	WSW	58	0	B6
3-Jun	14.2	11	1	2.1	1						1.8	11	1	0.66	0	5.6	W	83	0.65	C8
4-Jun	11.7										1.8					5.6	N	48	0.02	A20
5-Jun	10.3										1.7					4.6	SE	45	0	A21
6-Jun	12.7										6.2					5.3	SSE	58	0	A22
7-Jun	11.5	7	1	0.68	0						7.5	3	0	3.3	1	4.9	ENE	89	1.989	C9
8-Jun	14.8	11	1	0.67	0						14.1	9	1	0.77	1	6.0	W	80	0.18	C10
9-Jun	23.7										22.8					3.6	SSE	61	0.001	A23
10-Jun	28.2										26.3					4.2	SSE	84	0.668	C11
11-Jun	16.5	12	1	1.2	1						16.4	18	1	1.4	1	8.3	W	82	0.741	C12
12-Jun	32.4	18	1	4	1						28.1	17	1	2.3	1	7.6	W	65	0	B7
13-Jun	40.4	25	1	1.6	1						34.3	21	1	2.2	1	6.4	W	70	0.682	C13
14-Jun	6.9	6	1	2.5	1						7.3	8	1	0.69	0	8.1	N	66	0.459	C14
15-Jun	15.0	14	1	2.7	1						14.5	12	1	0.68	0	6.1	W	49	0	A24
16-Jun	25.7	21	1	2.6	1						23.9	20	1	2.9	1	6.1	W	52	0	A25
17-Jun	13.9	18	1	1.9	1						15.0	14	1	1.3	1	8.1	W	57	0	B8
18-Jun	31.2	12	1	2.4	1						26.6	10	1	2.4	1	4.7	W	73	0.215	C15
19-Jun	13.9	12	1	2	1						13.6	10	1	3	1	4.7	ENE	73	0.070	A26
20-Jun	13.6	14	1	0.92	1						13.8	19	1	0.89	1	4.5	SSE	60	0	A27
21-Jun	18.7	22	1	5.2	1						16.4	15	1	8.1	1	4.6	SSE	49	0	A28
22-Jun	16.5	20	1	4.1	1						16.2	15	1	3.2	1	5	WSW	64	0	A29
23-Jun	16.1	12	1	1.9	1						14.9	10	1	0.95	1	4.3	SSE	73	0.018	D8

Weather Sampling Matrix Codes: A=Dry/Light Wind, B=Dry/Heavy Wind, C=Rain Day, D=Out of Classification

Table 1. Pre-Construction Air Monitoring - ProUCL4.1 Dataset

DATE	RAM-7	PART-7	D_PART-7	CrVI-7	D_CrVI-7	RAM-8	PART-8	D_PART-8	CrVI-8	D_CrVI-8	RAM-9	PART-9	D_PART-9	CrVI-9	D_CrVI-9	WS (mph)	WD	RH (%)	Rainfall (in)	Matrix
24-Apr	28.5	11	1	0.7	0	29.7	13	1	0.95	1						4.4	SE	69	0	A1
25-Apr	17.6	13	1	0.7	0	19.3	14	1	1.4	1						7.4	N	54	0.004	B1
26-Apr	14.8	13	1	1.7	1	15.8	10	1	1.1	1						5.5	W	39	0	A2
27-Apr	13.9	12	1	3.8	1	15.7	11	1	4.3	1						4.4	N	35	0	A3
28-Apr	16.4	9	1	1.1	1	18.5	11	1	1.9	1						4.1	SSE	44	0	A4
29-Apr	13.6	28	1	3.7	1	14.9	14	1	1.4	1						6.2	SSW	62	0.089	A5
30-Apr	8.9	12	1	2.5	1	11.0	98	1	0.7	0						6.8	ENE	92	0.004	D1
1-May	9.4	14	1	1.1	1	11.5	11	1	1.7	1						5.4	SE	56	0	A6
2-May						9.0	7	1	1.0	1	6.5	12	1	0.7	0	5.6	SE	59	0	A7
3-May						14.6	24	1	1.2	1	10.6	24	1	2.0	1	5.6	SSE	56	0	A8
4-May						15.4	10	1	1.4	1	10.6	15	1	0.7	0	6	SE	61	0	A9
5-May						21.3	13	1	0.74	1	15.7	15	1	0.7	0	6.3	ESE	59	0	A10
6-May						24.7	15	1			19.4	12	1			6.0	ENE	71	0.003	D2
7-May						14.1	7	1	0.67	0	11.2	8	1	0.66	0	9.2	ENE	89	0.667	C1
8-May						19.2	16	1	0.68	0	15.6	3	0	0.68	0	6.2	ENE	85	0.208	C2
9-May						26.5					21.6					5.2	W	78	0.160	C 16
10-May	17.1	22	1			21.3	19	1								4.1	W	63	0	A11
11-May	18.9	16	1	1.8	1	21.5	3	0	2.2	1						5.8	W	76	0.360	C3
12-May	13.7	9	1	2.1	1	15.9	9	1	0.7	0						8.3	W	61	0.130	C4
13-May	7.2	10	1	3.1	1	9.0	7	1	4.2	1						9.8	W	36	0	B2
14-May	9.4	8	1	0.7	0	6.2	7	1	0.7	0						7.1	N	35	0	B3
15-May	16.7					14.9										4.7	SSE	56	0.049	A12
16-May	21.3					17.9										5.7	W	59	0.027	A13
17-May	18.2					16.1										6.3	W	47	0	A14
18-May	10.8					9.2										5.2	SSE	55	0.001	A15
19-May	13.1					10.1										4.3	SSE	90	0	D3
20-May	31.6					28.0										3.9	ENE	85	0	D4
21-May	26.5					22.9										4.2	WSW	80	0	D5
22-May	49.4					46.5										4.9	SSE	78	0	D6
23-May						22.0	13	1	1.6	1	22.4	10	1	2.1	1	5.6	S	75	0.152	C5
24-May						12.6	7	1	3.9	1	10.1	5	1	3	1	5.5	N	71	0.968	C6
25-May						0.0	9	1	2.5	1	6.7	7	1	1.5	1	8.9	N	58	0	B4
26-May						0.0	6	1	2.8	1	5.8	10	1	2.4	1	7.4	NNE	47	0	B5
27-May						0.0										4.1	N	44	0	A16
28-May						0.1										2.8	N	67.4	0.07	A17
29-May						1.7	21	1	3	1	29.8	23	1	2.2	1	4.7	W	75	0.141	C7
30-May						1.4					27.2					4.1	W	71	0	D7
31-May						3.2					27.5					5.0	WSW	61	0	A18
1-Jun						7.7					16					6.0	WSW	55	0	A19
2-Jun						4.6	17	1	2	1	13.5	13	1	3.8	1	7.3	WSW	58	0	B6
3-Jun						7.3	10	1	1.2	1	11.6	21	1	1.5	1	5.6	W	83	0.65	C8
4-Jun						5.7					6.5					5.6	N	48	0.02	A20
5-Jun						3.5					6.1					4.6	SE	45	0	A21
6-Jun						9.4					10.4					5.3	SSE	58	0	A22
7-Jun						8.6	17	1	1.1	1	11.1	8	1	1	1	4.9	ENE	89	1.989	C9
8-Jun						9.0	10	1	1.9	1	12.6	10	1	2.2	1	6.0	W	80	0.18	C10
9-Jun						13.5					20.1					3.6	SSE	61	0.001	A23
10-Jun						18.2					25.2					4.2	SSE	84	0.668	C11
11-Jun		11	1	1.4	1						13.5	11	1	1.2	1	8.3	W	82	0.741	C12
12-Jun	31.8	18	1	2.3	1						26.9	19	1	5.3	1	7.6	W	65	0	B7
13-Jun	23.9	17	1	0.97	1						33.2	3	0	3.1	1	6.4	W	70	0.682	C13
14-Jun	2.8	4	1	1.6	1						5.0	9	1	2.6	1	8.1	N	66	0.459	C14
15-Jun	7.0	19	1	1.4	1						11.9	28	1	2.2	1	6.1	W	49	0	A24
16-Jun	14.3	20	1	3	1						21.3	19	1	3.9	1	6.1	W	52	0	A25
17-Jun	6.4	4	1	0.68	0						11.3	14	1	1.5	1	8.1	W	57	0	B8
18-Jun	15.7	12	1	1.6	1						24.1	9	1	1.2	1	4.7	W	73	0.215	C15
19-Jun	6.9	12	1	1.4	1						11.2	9	1	2.5	1	4.7	ENE	73	0.070	A26
20-Jun	7	16	1	0.65	0						11	7	1	0.98	1	4.5	SSE	60	0	A27
21-Jun	8.2	17	1	5.4	1						11.9	10	1	5.9	1	4.6	SSE	49	0	A28
22-Jun	7.9	12	1	4	1						12.4	13	1	4.4	1	5	WSW	64	0	A29
23-Jun	6.9	6	1	1.3	1						10.9	14	1	1.3	1	4.3	SSE	73	0.018	D8

Weather Sampling Matrix Codes: A=Dry/Light Wind, B=Dry/Heavy Wind, C=Rain Day, D=Out of Classification

Table 1. Pre-Construction Air Monitoring - ProUCL4.1 Dataset

DATE	RAM-10	PART-10	D_PART-10	CrVI-10	D_CrVI-10	RAM-11	PART-11	D-PART-11	CrVI-11	D_CrVI-11	RAM-12	PART-12	D_PART-12	CrVI-12	D_CrVI-12	WS (mph)	WD	RH (%)	Rainfall (in)	Matrix
24-Apr	25.6	14	1	0.7	0						17.1	230	1	0.7	0	4.4	SE	69	0	A1
25-Apr	15.6	14	1	1.3	1						19.1	14	1	2	1	7.4	N	54	0.004	B1
26-Apr	12.7	8	1	0.7	0						19.8	12	1	1.3	1	5.5	W	39	0	A2
27-Apr	12.9	12	1	3.8	1						23.2	9	1	2.8	1	4.4	N	35	0	A3
28-Apr	14.9	15	1	5.1	1						22.9	13	1	3.8	1	4.1	SSE	44	0	A4
29-Apr	11.4	11	1	2.0	1						24.2	3	0	1.1	1	6.2	SSW	62	0.089	A5
30-Apr	8.1	11	1	3.7	1						20.2	7	1	1.0	1	6.8	ENE	92	0.004	D1
1-May	8.6	10	1	1.7	1						21.2	11	1	1.3	1	5.4	SE	56	0	A6
2-May						21.2	10	1	0.7	0						5.6	SE	59	0	A7
3-May						24.7	25	1	1.4	1						5.6	SSE	56	0	A8
4-May						25.0	8	1	0.7	0						6	SE	61	0	A9
5-May						31.9	15	1	0.7	0						6.3	ESE	59	0	A10
6-May						35.7	17	1								6.0	ENE	71	0.003	D2
7-May						27.1	7	1	0.65	0						9.2	ENE	89	0.667	C1
8-May						27.1	10	1	0.68	0						6.2	ENE	85	0.208	C2
9-May						37.5										5.2	W	78	0.160	C 16
10-May	16.9	21	1								23.6	17	1			4.1	W	63	0	A11
11-May	16.3	3	0	1.2	1						29.6	9	1	1.5	1	5.8	W	76	0.360	C3
12-May	11.7	8	1	3.6	1						31.8	7	1	4.7	1	8.3	W	61	0.130	C4
13-May	5.9	8	1	5.1	1						37.9	8	1	5.1	1	9.8	W	36	0	B2
14-May	7.9	12	1	1.3	1						36.6			2.2	1	7.1	N	35	0	B3
15-May	15.6										11.3					4.7	SSE	56	0.049	A12
16-May	20.4										17.7					5.7	W	59	0.027	A13
17-May	18.0										15.2					6.3	W	47	0	A14
18-May	10.2										6.1					5.2	SSE	55	0.001	A15
19-May	12.4										10.1					4.3	SSE	90	0	D3
20-May	30.6										30.4					3.9	ENE	85	0	D4
21-May	25.4										24.0					4.2	WSW	80	0	D5
22-May	44.6										45.8					4.9	SSE	78	0	D6
23-May						20.5	9	1	1.3	1						5.6	S	75	0.152	C5
24-May						7.5	3	0	2.4	1						5.5	N	71	0.968	C6
25-May						4.2	10	1	4.2	1						8.9	N	58	0	B4
26-May						3.3	8	1	2.8	1						7.4	NNE	47	0	B5
27-May						5.2										4.1	N	44	0	A16
28-May						14.9										2.8	N	67.4	0.07	A17
29-May						30.0	20	1	2.1	1						4.7	W	75	0.141	C7
30-May						27.5										4.1	W	71	0	D7
31-May						28.4										5.0	WSW	61	0	A18
1-Jun						18.2										6.0	WSW	55	0	A19
2-Jun						15.4	12	1	1.4	1						7.3	WSW	58	0	B6
3-Jun						14.0	7	1	2.5	1						5.6	W	83	0.65	C8
4-Jun						9.1										5.6	N	48	0.02	A20
5-Jun						7.9										4.6	SE	45	0	A21
6-Jun						11.9										5.3	SSE	58	0	A22
7-Jun						12.8	26	1	5.9	1						4.9	ENE	89	1.989	C9
8-Jun						15.0	8	1	2.2	1						6.0	W	80	0.18	C10
9-Jun						24.1										3.6	SSE	61	0.001	A23
10-Jun						29.3										4.2	SSE	84	0.668	C11
11-Jun						16.5	10	1	7.6	1						8.3	W	82	0.741	C12
12-Jun						32.7	20	1	1.9	1						7.6	W	65	0	B7
13-Jun						37.4	23	1	3.5	1						6.4	W	70	0.682	C13
14-Jun						7.3	11	1	3.2	1						8.1	N	66	0.459	C14
15-Jun						14.6	19	1	1.8	1						6.1	W	49	0	A24
16-Jun						25.8	17	1	3.7	1						6.1	W	52	0	A25
17-Jun						12.2	12	1	5.3	1						8.1	W	57	0	B8
18-Jun						24.8	14	1	1.9	1						4.7	W	73	0.215	C15
19-Jun						15	14	1	1.8	1						4.7	ENE	73	0.070	A26
20-Jun						12.7	12	1	1.6	1						4.5	SSE	60	0	A27
21-Jun						14.6	9	1	4.3	1						4.6	SSE	49	0	A28
22-Jun						0.5	13	1	3.6	1						5	WSW	64	0	A29
23-Jun						7.7	7	1	1.9	1						4.3	SSE	73	0.018	D8

Weather Sampling Matrix Codes: A=Dry/Light Wind, B=Dry/Heavy Wind, C=Rain Day, D=Out of Classification

Table 2a. RAM - BTV	97.5%
	Nonparametric Background Statistics for Full Data Sets
User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ProUCL PCAM Data_2013-06-26.xls.wst
Full Precision	ON
Confidence Coefficient	97.5%
Coverage	97.5%
Number of Bootstrap Operations	2000

ALL RAM

Some Non-Parametric Statistics	
Number of Valid Observations	405.00000
Number of Distinct Observations	246
Minimum	0
Maximum	88.200000
Second Largest	56.200000
Mean	16.626667
Geometric Mean	0
First Quartile	9.4000000
Median	14.800000
Third Quartile	21.500000
SD	10.570821
Variance	111.74226
Coefficient of Variation	0.6357751
Skewness	1.5936122

Data do not follow a Discernable Distribution (0.05)

Non-Parametric Background Statistics	
90% Percentile	30.240000
95% Percentile	35.520000
97.5% Percentile	43.800000
99% Percentile	47.556000

97.5% UTL with 97.5% Coverage	
Order Statistic	400
Achieved CC	0.9743602
UTL	46.500000

97.5% BCA Bootstrap UTL with 97.5% Coverage	46.450000
97.5% Percentile Bootstrap UTL with 97.5% Coverage	46.450000
97.5% UPL	44.495000
97.5% Chebyshev UPL	82.722872
Upper Limit Based upon IQR	39.650000

Table 2b. RAM - BTV 99%

Nonparametric Background Statistics for Full Data Sets

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ProUCL PCAM Data_2013-06-26.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Coverage	99%
Number of Bootstrap Operations	2000

ALL RAM

Some Non-Parametric Statistics

Number of Valid Observations	405.00000
Number of Distinct Observations	246
Minimum	0
Maximum	88.200000
Second Largest	56.200000
Mean	16.626667
Geometric Mean	0
First Quartile	9.4000000
Median	14.800000
Third Quartile	21.500000
SD	10.570821
Variance	111.74226
Coefficient of Variation	0.6357751
Skewness	1.5936122

Data do not follow a Discernable Distribution (0.05)

Non-Parametric Background Statistics

90% Percentile	30.240000
95% Percentile	35.520000
99% Percentile	47.556000

99% UTL with 99% Coverage

Order Statistic	404
Achieved CC	0.9829292
UTL	56.200000

99% BCA Bootstrap UTL with 99% Coverage	56.200000
99% Percentile Bootstrap UTL with 99% Coverage	56.200000

99% UPL	49.292000
99% Chebyshev UPL	121.93478

Upper Limit Based upon IQR	39.650000

Table 2c. RAM - BTV 95%

Nonparametric Background Statistics for Full Data Sets

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ProUCL PCAM Data_2013-06-26.xls.wst
Full Precision	ON
Confidence Coefficient	95%
Coverage	95%
Number of Bootstrap Operations	2000

ALL RAM

Some Non-Parametric Statistics

Number of Valid Observations	405.00000
Number of Distinct Observations	246
Minimum	0
Maximum	88.200000
Second Largest	56.200000
Mean	16.626667
Geometric Mean	0
First Quartile	9.4000000
Median	14.800000
Third Quartile	21.500000
SD	10.570821
Variance	111.74226
Coefficient of Variation	0.6357751
Skewness	1.5936122

Data do not follow a Discernable Distribution (0.05)

Non-Parametric Background Statistics

90% Percentile	30.240000
95% Percentile	35.520000
99% Percentile	47.556000

95% UTL with 95% Coverage

Order Statistic	391
Achieved CC	0.9448704
UTL	37.500000
95% BCA Bootstrap UTL with 95% Coverage	37.500000
95% Percentile Bootstrap UTL with 95% Coverage	37.500000
95% UPL	35.700000
95% Chebyshev UPL	62.760658
Upper Limit Based upon IQR	39.650000

Table 2d. RAM - UCLs

Nonparametric UCL Statistics for Full Data Sets

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ProUCL PCAM Data_2013-06-26.xls.wst
Full Precision	ON
Confidence Coefficient	97.5%
Number of Bootstrap Operations	2000

ALL RAM

Number of Valid Observations	405
Number of Distinct Observations	246
Minimum	0
Maximum	88.200000
Mean	16.626667
Geometric Mean	0
Median	14.800000
SD	10.570821
Variance	111.74226
Std. Error of Mean	0.5252683
Coefficient of Variation	0.6357751
Skewness	1.5936122

Data do not follow a Discernable Distribution

97.5% Useful UCLs

Student's-t UCL	17.659267

97.5% UCLs (Adjusted for Skewness)

97.5% Adjusted-CLT UCL (Chen-1995)	17.716367
97.5% Modified-t UCL (Johnson-1978)	17.666199

Non-Parametric UCLs

97.5% CLT UCL	17.656174
97.5% Jackknife UCL	17.659267
97.5% Standard Bootstrap UCL	17.682080
97.5% Bootstrap-t UCL	17.718466
97.5% Hall's Bootstrap UCL	17.674950
97.5% Percentile Bootstrap UCL	17.665185
97.5% BCA Bootstrap UCL	17.687654
95% Chebyshev(Mean, Sd) UCL	18.916258
97.5% Chebyshev(Mean, Sd) UCL	19.906966
99% Chebyshev(Mean, Sd) UCL	21.853020

Potential UCL to Use

Recommendation Provided only for 95% Confidence Coefficient

3a. Total Particulate – BTV 97.5%

Nonparametric Background Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ProUCL_LAB Data FORMAT_2013-07-03.xls.wst
Full Precision	ON
Confidence Coefficient	97.50%
Coverage	97.50%
Different or Future K Values	1

PART-1

Total Number of Data	284
Number of Non-Detect Data	11
Number of Detected Data	273
Minimum Detected	4
Maximum Detected	36
Percent Non-Detects	3.87%
Minimum Non-detect	3
Maximum Non-detect	8
Mean of Detected Data	12.8315
SD of Detected Data	5.443645
Mean of Log-Transformed Detected Data	2.464888
SD of Log-Transformed Detected Data	0.42173

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

Tolerance Factor K	2.173478
97.5% UTL with 97.5% Coverage	
Order Statistic	281
Achieved CC	0.973838
UTL	28
Largest Non-detect at Order	52
97.5% UPL	
97.5% UPL	25.875

Kaplan-Meier (KM) Method	
Mean	12.49544
SD	5.585547
Standard Error of Mean	0.332077
97.5% UTL 97.5% Coverage	24.63551
97.5% KM Chebyshev UPL	47.43853
97.5% KM UPL (t)	23.50927
90% KM Percentile (z)	19.65361
95% KM Percentile (z)	21.6829
97.5% Percentile (z)	23.4429
99% KM Percentile (z)	25.4894

3.b Total Particulate – BTV 99%

Nonparametric Background Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ProUCL_LAB Data FORMAT_2013-07-03.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Coverage	99%
Different or Future K Values	1

PART-1

Total Number of Data	284
Number of Non-Detect Data	11
Number of Detected Data	273
Minimum Detected	4
Maximum Detected	36
Percent Non-Detects	3.87%
Minimum Non-detect	3
Maximum Non-detect	8
Mean of Detected Data	12.8315
SD of Detected Data	5.443645
Mean of Log-Transformed Detected Data	2.464888
SD of Log-Transformed Detected Data	0.42173

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

Tolerance Factor K	2.617117
99% UTL with 99% Coverage	
Order Statistic	284
Achieved CC	1
UTL	36
Largest Non-detect at Order	52
99% UPL	
99% UPL	29.3

Kaplan-Meier (KM) Method	
Mean	12.49544
SD	5.585547
Standard Error of Mean	0.332077
99% UTL 99% Coverage	27.11347
99% KM Chebyshev UPL	68.16869
99% KM UPL (t)	25.58636
90% KM Percentile (z)	19.65361
95% KM Percentile (z)	21.68285
99% KM Percentile (z)	25.48937

3c. Total Particulate – BTV 95%

Nonparametric Background Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ProUCL_LAB Data FORMAT_2013-07-03.xls.wst
Full Precision	ON
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1

PART-1

Total Number of Data	284
Number of Non-Detect Data	11
Number of Detected Data	273
Minimum Detected	4
Maximum Detected	36
Percent Non-Detects	3.87%
Minimum Non-detect	3
Maximum Non-detect	8
Mean of Detected Data	12.8315
SD of Detected Data	5.443645
Mean of Log-Transformed Detected Data	2.464888
SD of Log-Transformed Detected Data	0.42173

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

Tolerance Factor K	1.803186
95% UTL with 95% Coverage	
Order Statistic	275
Achieved CC	0.948106
UTL	24
Largest Non-detect at Order	52
95% UPL	
95% UPL	23

Kaplan-Meier (KM) Method	
Mean	12.49544
SD	5.585547
Standard Error of Mean	0.332077
95% UTL 95% Coverage	22.56722
95% KM Chebyshev UPL	36.88511
95% KM UPL (t)	21.72924
90% KM Percentile (z)	19.65361
95% KM Percentile (z)	21.68285
99% KM Percentile (z)	25.48937

3d. Total Particulate – UCLs

Nonparametric UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ProUCL_LAB Data FORMAT_2013-07-03.xls.wst
Full Precision	ON
Confidence Coefficient	97.50%
Number of Bootstrap Operations	2000

PART-1

Total Number of Data	284
Number of Non-Detect Data	11
Number of Detected Data	273
Minimum Detected	4
Maximum Detected	36
Percent Non-Detects	3.87%
Minimum Non-detect	3
Maximum Non-detect	8
Mean of Detected Data	12.8315
Median of Detected Data	12
Variance of Detected Data	29.63327
SD of Detected Data	5.443645
CV of Detected Data	0.424241
Skewness of Detected Data	0.969603
Mean of Detected log data	2.464888
SD of Detected Log data	0.42173

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest DL are treated as NDs

Number treated as Non-Detect	52
Number treated as Detected	232
Single DL Percent Detection	18.31%

Data Dsitribution Test with Detected Values Only
Data do not follow a Discernable Distribution (0.05)

Winsorization Method	18.31%
Mean	12.0669
SD	5.478158
97.5% Winsor (t) UCL	12.70836
Kaplan Meier (KM) Method	
Mean	12.49544
SD	5.585547
Standard Error of Mean	0.332077
97.5% KM (t) UCL	13.1491
97.5% KM (z) UCL	13.1463
97.5% KM (BCA) UCL	13.11288
97.5% KM (Percentile Bootstrap) UCL	13.14302
95% KM (Chebyshev) UCL	13.9429
97.5% KM (Chebyshev) UCL	14.5693
99% KM (Chebyshev) UCL	15.7996
97.5% K-M (Chebyshev) UCL	14.56926

4A. Hexavalent Chromium – BTV 97.5%

Nonparametric Background Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ProUCL_LAB Data FORMAT_2013-07-03.xls.wst
Full Precision	ON
Confidence Coefficient	97.50%
Coverage	97.50%
Different or Future K Values	1

CrVI-1

Total Number of Data	279
Number of Non-Detect Data	50
Number of Detected Data	229
Minimum Detected	0.71
Maximum Detected	8.1
Percent Non-Detects	17.92%
Minimum Non-detect	0.6
Maximum Non-detect	0.78
Mean of Detected Data	2.469214
SD of Detected Data	1.433919
Mean of Log-Transformed Detected Data	0.751372
SD of Log-Transformed Detected Data	0.551094

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

Tolerance Factor K	2.175531
97.5% UTL with 97.5% Coverage	
Order Statistic	276
Achieved CC	0.971207
UTL	7.1
Largest Non-detect at Order	56
97.5% UPL	
97.5% UPL	5.9

Kaplan-Meier (KM) Method	
Mean	2.153951
SD	1.461329
Standard Error of Mean	0.087679
97.5% UTL 97.5% Coverage	5.333117
97.5% KM Chebyshev UPL	11.29629
97.5% KM UPL (t)	5.035778
90% KM Percentile (z)	4.02672
95% KM Percentile (z)	4.55762
97.5% Percentile (z)	5.0181
99% KM Percentile (z)	5.55351

4B. Hexavalent Chromium – BTV 99%

Nonparametric Background Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ProUCL_LAB Data FORMAT_2013-07-03.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Coverage	99%
Different or Future K Values	1

CrVI-1

Total Number of Data	279
Number of Non-Detect Data	50
Number of Detected Data	229
Minimum Detected	0.71
Maximum Detected	8.1
Percent Non-Detects	17.92%
Minimum Non-detect	0.6
Maximum Non-detect	0.78
Mean of Detected Data	2.46921
SD of Detected Data	1.433919
Mean of Log-Transformed Detected Data	0.751372
SD of Log-Transformed Detected Data	0.551094

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

Tolerance Factor K	2.619965
99% UTL with 99% Coverage	
Order Statistic	279
Achieved CC	1
UTL	8.1
Largest Non-detect at Order	56
99% UPL	
99% UPL	7.62

Kaplan-Meier (KM) Method	
Mean	2.153951
SD	1.461329
Standard Error of Mean	0.087679
99% UTL 99% Coverage	5.982583
99% KM Chebyshev UPL	16.72003
99% KM UPL (t)	5.579344
90% KM Percentile (z)	4.02672
95% KM Percentile (z)	4.557624
99% KM Percentile (z)	5.553511

4C. Hexavalent Chromium – BTV 95%

Nonparametric Background Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ProUCL_LAB Data FORMAT_2013-07-03.xls.wst
Full Precision	ON
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1

CrVI-1

Total Number of Data	279
Number of Non-Detect Data	50
Number of Detected Data	229
Minimum Detected	0.71
Maximum Detected	8.1
Percent Non-Detects	17.92%
Minimum Non-detect	0.6
Maximum Non-detect	0.78
Mean of Detected Data	2.469214
SD of Detected Data	1.433919
Mean of Log-Transformed Detected Data	0.751372
SD of Log-Transformed Detected Data	0.551094

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

Tolerance Factor K	1.804683
95% UTL with 95% Coverage	
Order Statistic	270
Achieved CC	0.941045
UTL	5.4
Largest Non-detect at Order	56
95% UPL	
95% UPL	5.2

Kaplan-Meier (KM) Method	
Mean	2.153951
SD	1.461329
Standard Error of Mean	0.087679
95% UTL 95% Coverage	4.791188
95% KM Chebyshev UPL	8.535142
95% KM UPL (t)	4.569979
90% KM Percentile (z)	4.02672
95% KM Percentile (z)	4.557624
99% KM Percentile (z)	5.553511

4D. Hexavalent Chromium – UCLs

Nonparametric UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ProUCL_LAB Data FORMAT_2013-07-03.xls.wst
Full Precision	ON
Confidence Coefficient	97.50%
Number of Bootstrap Operations	2000

CrVI-1

Total Number of Data	279
Number of Non-Detect Data	50
Number of Detected Data	229
Minimum Detected	0.71
Maximum Detected	8.1
Percent Non-Detects	17.92%
Minimum Non-detect	0.6
Maximum Non-detect	0.78
Mean of Detected Data	2.469214
Median of Detected Data	2.1
Variance of Detected Data	2.056124
SD of Detected Data	1.433919
CV of Detected Data	0.580719
Skewness of Detected Data	1.303923
Mean of Detected log data	0.751372
SD of Detected Log data	0.551094

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest DL are treated as NDs

Number treated as Non-Detect	56
Number treated as Detected	223
Single DL Percent Detection	20.07%

Data Dsitribution Test with Detected Values Only
Data do not follow a Discernable Distribution (0.05)

Winsorization Method	20.07%
Mean	1.916272
SD	1.591371
97.5% Winsor (t) UCL	2.104375
Kaplan Meier (KM) Method	
Mean	2.153951
SD	1.461329
Standard Error of Mean	0.087679
97.5% KM (t) UCL	2.326551
97.5% KM (z) UCL	2.325799
97.5% KM (BCA) UCL	2.313777
97.5% KM (Percentile Bootstrap) UCL	2.328249
95% KM (Chebyshev) UCL	2.53614
97.5% KM (Chebyshev) UCL	2.70151
99% KM (Chebyshev) UCL	3.02635
97.5% K-M (Chebyshev) UCL	2.701507

Table 5a. Upwind CrVI versus Downwind CrVI - Set 1

t-Test Site vs Background Comparison for Full Data Sets without NDs

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ ProUCL PCAM Wind Analyses_2013-06-30.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean Less Than or Equal to Background Mean (Form 1)
Alternative Hypothesis	Site or AOC Mean Greater Than the Background Mean

Area of Concern Data: DCrVI
Background Data: UCRVI

Raw Statistics

	Site	Background
Number of Valid Observations	28	28
Number of Missing Values	8	8
Number of Distinct Observations	20	19
Minimum	0.65	0.68
Maximum	3.9	3.7
Mean	1.836786	1.784286
Median	1.55	1.55
SD	1.207643	1.01933
SE of Mean	0.228223	0.192635

Site vs Background Two-Sample t-Test

H0: Mu of Site - Mu of Background <= 0

Method	DF	t-Test Value	Critical t (0.010)	P-Value
Pooled (Equal Variance)	54	0.176	2.397	0.431
Welch-Satterthwaite (Unequal Vari	52.5	0.176	2.399	0.431

Pooled SD 1.117

Conclusion with Alpha = 0.010
 * Student t (Pooled) Test: Do Not Reject H0, Conclude Site <= Background
 * Welch-Satterthwaite Test: Do Not Reject H0, Conclude Site <= Background

Test of Equality of Variances

Variance of Site	1.4584
Variance of Background	1.039033

Numerator DF	Denominator DF	F-Test Value	P-Value
27	27	1.404	0.384

Conclusion with Alpha = 0.01
 * Two variances appear to be equal

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ ProUCL PCAM Wind Analyses_2013-06-30.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: DCrVI
Background Data: UCRVI

Raw Statistics

	Site	Background
Number of Valid Data	28	28
Number of Missing Values	8	8
Number of Non-Detect Data	9	7
Number of Detect Data	19	21
Minimum Non-Detect	0.65	0.68
Maximum Non-Detect	0.7	0.7
Percent Non detects	32.14%	25.00%
Minimum Detected	0.8	0.88
Maximum Detected	3.9	3.7
Mean of Detected Data	2.380526	2.146667
Median of Detected Data	2.2	1.9
SD of Detected Data	1.102968	0.922569

Wilcoxon-Mann-Whitney Site vs Background Test
All observations <= 0.7000000 (Max DL) are ranked the same
Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	799.5
WMW Test U-Stat	0.016387
WMW Critical Value (0.010)	2.326348
P-Value	0.493463

Conclusion with Alpha = 0.01
 Do Not Reject H0, Conclude Site <= Background
 P-Value >= alpha (0.0100000)

Table 5b. Upwind CrVI versus Downwind CrVI - Set 2

t-Test Site vs Background Comparison for Full Data Sets without NDs

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ ProUCL PCAM Wind Analyses_2013-06-30.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean Less Than or Equal to Background Mean (Form 1)
Alternative Hypothesis	Site or AOC Mean Greater Than the Background Mean

Area of Concern Data: 2DCrVI
Background Data: 2UCRVI

Raw Statistics

	Site	Background
Number of Valid Observations	28	28
Number of Missing Values	8	8
Number of Distinct Observations	19	17
Minimum	0.65	0.7
Maximum	5.9	3.7
Mean	1.841429	1.813571
Median	1.4	1.55
SD	1.397606	1.029406
SE of Mean	0.264123	0.194539

Site vs Background Two-Sample t-Test

H0: Mu of Site - Mu of Background <= 0

Method	DF	t-Test Value	Critical t (0.010)	P-Value
Pooled (Equal Variance)	54	0.085	2.397	0.466
Welch-Satterthwaite (Unequal Vari	49.6	0.085	2.403	0.466

Pooled SD 1.227

Conclusion with Alpha = 0.010
* Student t (Pooled) Test: Do Not Reject H0, Conclude Site <= Background
* Welch-Satterthwaite Test: Do Not Reject H0, Conclude Site <= Background

Test of Equality of Variances

Variance of Site	1.953302
Variance of Background	1.059676

Numerator DF	Denominator DF	F-Test Value	P-Value
27	27	1.843	0.118

Conclusion with Alpha = 0.01
* Two variances appear to be equal

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ ProUCL PCAM Wind Analyses_2013-06-30.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: 2DCrVI
Background Data: 2UCRVI

Raw Statistics

	Site	Background
Number of Valid Data	28	28
Number of Missing Values	8	8
Number of Non-Detect Data	10	7
Number of Detect Data	18	21
Minimum Non-Detect	0.65	0.7
Maximum Non-Detect	0.7	0.7
Percent Non detects	35.71%	25.00%
Minimum Detected	0.77	0.88
Maximum Detected	5.9	3.7
Mean of Detected Data	2.481667	2.184762
Median of Detected Data	2.25	2.2
SD of Detected Data	1.373631	0.922971

Wilcoxon-Mann-Whitney Site vs Background Test
All observations <= 0.7000000 (Max DL) are ranked the same
Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	774
WMW Test U-Stat	-0.40148
WMW Critical Value (0.010)	2.326348
P-Value	0.655966

Conclusion with Alpha = 0.01
Do Not Reject H0, Conclude Site <= Background
P-Value >= alpha (0.0100000)

Table 6a. Dry Low Wind CrVI (Background) versus Dry High Wind (AoC)

t-Test Site vs Background Comparison for Full Data Sets without NDs

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\AIR\AMP DOCS\WEATHER\ProUCL Weather Data_2013-07-08.xls.wst
Full Precision	ON
Confidence Coefficient	99.00%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean Less Than or Equal to Background Mean (Form 1)
Alternative Hypothesis	Site or AOC Mean Greater Than the Background Mean

Area of Concern Data: DHW CrVI	
Background Data: DLW CrVI	

Raw Statistics

	Site	Background
Number of Valid Observations	56	84
Number of Missing Values	0	1
Number of Distinct Observations	31	37
Minimum	0.68	0.6
Maximum	7.7	6
Mean	2.5646429	1.7761905
Median	2.15	1.3
SD	1.5561923	1.2950442
SE of Mean	0.2079549	0.1413009

Site vs Background Two-Sample t-Test

H0: Mu of Site - Mu of Background <= 0

Method	DF	t-Test Value	Critical t (0.010)	P-Value
Pooled (Equal Variance)	138	3.253	2.354	0.001
Welch-Satterthwaite (Unequal Va	103	3.136	2.363	0.001

Pooled SD 1.405

Conclusion with Alpha = 0.010

* Student t (Pooled) Test: Reject H0, Conclude Site > Background	
* Welch-Satterthwaite Test: Reject H0, Conclude Site > Background	

Test of Equality of Variances

Variance of Site	2.4217344
Variance of Background	1.6771395

Numerator DF	Denominator DF	F-Test Value	P-Value
55	83	1.444	0.129

Conclusion with Alpha = 0.01
* Two variances appear to be equal

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\AIR\AMP DOCS\WEATHER\ProUCL Weather Data_2013-07-08.xls.wst
Full Precision	ON
Confidence Coefficient	99.00%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: DHW CrVI
Background Data: DLW CrVI

Raw Statistics

	Site	Background
Number of Valid Data	56	84
Number of Missing Values	0	1
Number of Non-Detect Data	7	24
Number of Detect Data	49	60
Minimum Non-Detect	0.68	0.7
Maximum Non-Detect	0.73	0.7
Percent Non detects	12.50%	28.57%
Minimum Detected	1.2	0.6
Maximum Detected	7.7	6
Mean of Detected Data	2.8306122	2.2066667
Median of Detected Data	2.2	1.7
SD of Detected Data	1.4822848	1.3037594

Wilcoxon-Mann-Whitney Site vs Background Test
All observations <= 0.7300000 (Max DL) are ranked the same
Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	4786
WMW Test U-Stat	3.5623142
WMW Critical Value (0.010)	2.3263479
P-Value	1.84E-04

Conclusion with Alpha = 0.01	
Reject H0, Conclude Site > Background	
P-Value < alpha (0.0100000)	

Table 6b. Rain CrVI (Background) versus Dry Light Wind (AoC)

t-Test Site vs Background Comparison for Full Data Sets without NDs

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\AIR\AMP DOCS\WEATHER\ProUCL Weather Data_2013-07-08.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean Less Than or Equal to Background Mean (Form 1)
Alternative Hypothesis	Site or AOC Mean Greater Than the Background Mean

Area of Concern Data: DLW CrVI	
Background Data: WET CrVI	

Raw Statistics

	Site	Background
Number of Valid Observations	84	72
Number of Distinct Observations	37	37
Minimum	0.6	0.65
Maximum	6	5.2
Mean	1.776191	1.94
Median	1.3	1.7
SD	1.295044	1.102196
SE of Mean	0.141301	0.129895

Site vs Background Two-Sample t-Test

H0: Mu of Site - Mu of Background <= 0

Method	DF	t-Test Value	Critical t (0.010)	P-Value
Pooled (Equal Variance)	154	-0.843	2.351	0.8
Welch-Satterthwaite (Unequal Va	154	-0.853	2.351	0.803

Pooled SD 1.210

Conclusion with Alpha = 0.010

* Student t (Pooled) Test: Do Not Reject H0, Conclude Site <= Background	
* Welch-Satterthwaite Test: Do Not Reject H0, Conclude Site <= Background	

Test of Equality of Variances

Variance of Site	1.67714
Variance of Background	1.214837

Numerator DF	Denominator DF	F-Test Value	P-Value
83	71	1.381	0.164

Conclusion with Alpha = 0.01
* Two variances appear to be equal

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\AIR\AMP DOCS\WEATHER\ProUCL Weather Data_2013-07-08.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: DLW CrVI
Background Data: WET CrVI

Raw Statistics

	Site	Background
Number of Valid Data	84	72
Number of Non-Detect Data	24	13
Number of Detect Data	60	59
Minimum Non-Detect	0.7	0.65
Maximum Non-Detect	0.7	0.78
Percent Non detects	28.57%	18.06%
Minimum Detected	0.6	0.77
Maximum Detected	6	5.2
Mean of Detected Data	2.206667	2.216102
Median of Detected Data	1.7	2.1
SD of Detected Data	1.303759	1.028315

Wilcoxon-Mann-Whitney Site vs Background Test
All observations <= 0.7800000 (Max DL) are ranked the same
Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	6122
WMW Test U-Stat	-1.67972
WMW Critical Value (0.010)	2.326348
P-Value	0.953494

Conclusion with Alpha = 0.01
Do Not Reject H0, Conclude Site <= Background
P-Value >= alpha (0.0100000)

Table 6c. Rain CrVI (Background) versus Dry Heavy Wind (AoC)

t-Test Site vs Background Comparison for Full Data Sets without NDs

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\AIR\AMP DOCS\WEATHER\ProUCL Weather Data_2013-07-08.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean Less Than or Equal to Background Mean (Form 1)
Alternative Hypothesis	Site or AOC Mean Greater Than the Background Mean

Area of Concern Data: DHW CrVI
Background Data: WET CrVI

Raw Statistics

	Site	Background
Number of Valid Observations	56	72
Number of Distinct Observations	31	37
Minimum	0.68	0.65
Maximum	7.7	5.2
Mean	2.564643	1.94
Median	2.15	1.7
SD	1.556192	1.102196
SE of Mean	0.207955	0.129895

Site vs Background Two-Sample t-Test

H0: Mu of Site - Mu of Background <= 0

Method	DF	t-Test Value	Critical t (0.010)	P-Value
Pooled (Equal Variance)	126	2.656	2.356	0.004
Welch-Satterthwaite (Unequal Va	95.1	2.548	2.366	0.006

Pooled SD 1.320

Conclusion with Alpha = 0.010

* Student t (Pooled) Test: Reject H0, Conclude Site > Background
* Welch-Satterthwaite Test: Reject H0, Conclude Site > Background

Test of Equality of Variances

Variance of Site	2.421734
Variance of Background	1.214837

Numerator DF	Denominator DF	F-Test Value	P-Value
55	71	1.993	0.006

Conclusion with Alpha = 0.01

* Two variances are not equal

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\AIR\AMP DOCS\WEATHER\ProUCL Weather Data_2013-07-08.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: DHW CrVI

Background Data: WET CrVI

Raw Statistics

	Site	Background
Number of Valid Data	56	72
Number of Non-Detect Data	7	13
Number of Detect Data	49	59
Minimum Non-Detect	0.68	0.65
Maximum Non-Detect	0.73	0.78
Percent Non detects	12.50%	18.06%
Minimum Detected	1.2	0.77
Maximum Detected	7.7	5.2
Mean of Detected Data	2.830612	2.216102
Median of Detected Data	2.2	2.1
SD of Detected Data	1.482285	1.028315

Wilcoxon-Mann-Whitney Site vs Background Test

All observations <= 0.7800000 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	4060
WMW Test U-Stat	2.149456
WMW Critical Value (0.010)	2.326348
P-Value	0.015799

Conclusion with Alpha = 0.01

Do Not Reject H0, Conclude Site <= Background

P-Value >= alpha (0.0100000)

Table 7. Particle Size Distibution ProUCL4.1 Dataset

Total RAM	Total PSA	PM 10	PM 4	PM 2.5	PM 1	Total PART	D-Total PART	PM 2.5 PART	D_PM2.5 PART	Total	D-Total	PM 2.5	D_PM2.5	Total CrVI	D-Total CrVI	PM 2.5 CrVI	D_PM2.5 CrVI
19.10	15.86	15.80	15.54	15.36	15.00	1.60	1	1.40	1	16.0	1	18.26	1	1.6	1	1.4	1
35.80	35.43	35.32	35.05	34.89	34.73	4.00	1	2.10	1	18	1	28.2	1	4.0	1	2.1	1
43.90	43.38	43.26	42.97	42.83	42.63	2.30	1	1.90	1	18.0	1	17.9	1	2.3	1	1.9	1
8.90	8.23	8.20	8.09	8.03	7.92	1.90	1	1.80	1	20.0	1	0.85	1	1.9	1	1.8	1
16.20	19.26	19.18	18.94	18.80	18.66	1.60	1	1.80	1	20.0	1	13.05	1	1.6	1	1.8	1
29.50	31.67	31.63	31.47	31.34	31.22	1.60	1	2.90	1	25	1	23.6	1	1.6	1	2.9	1
17.10	18.50	18.48	18.38	18.30	18.20	0.97	1	2.90	1	17.0	1	16.36	1	1.0	1	2.9	1
36.00	37.03	37.01	36.90	36.82	36.68	3.50	1	2.70	1	23.0	1	14.33	1	3.5	1	2.7	1
18.70	17.21	17.18	17.03	16.95	16.81	1.60	1	1.30	1	10.0	1	26.85	1	1.6	1	1.3	1
16.10	17.21	17.03	16.81	16.95	17.18	2.50	1	2.00	1	6	1	6.7	1	2.5	1	2.0	1
18.09	21.12	21.01	20.57	20.41	20.19	1.60	1	2.20	1	4.0	1	4.37	1	1.6	1	2.2	1
20.26	16.09	16.06	15.92	15.85	15.66	3.20	1	2.20	1	11.0	1	9.19	1	3.2	1	2.2	1
18.98	15.38	15.37	15.30	15.23	15.03	1.50	1	2.20	1	18.0	1	10.63	1	1.5	1	2.2	1
16.50	16.21	16.08	14.94	14.10	13.40	2.70	1	1.80	1	14.0	1	7.23	1	2.7	1	1.8	1
32.40	33.84	33.63	32.70	32.13	31.84	1.40	1	1.60	1	19.0	1	20.26	1	1.4	1	1.6	1
40.40	41.27	40.98	39.88	39.26	38.83	1.80	1	0.91	1	19.0	1	4.84	1	1.8	1	0.9	1
6.90	3.75	3.65	3.16	2.87	2.65	1.8	1	2.4	1	14.0	1	15.38	1	1.80	1	2.4	1
15.00	14.46	14.31	13.75	13.39	13.17	0.92	1	0.63	0	14.0	1	24.26	1	0.92	1	0.6	0
25.70	28.49	28.23	27.23	26.71	26.34	0.65	1	2	1	16.0	1	28.29	1	0.65	1	2.0	1
13.90	13.66	13.51	12.96	12.59	12.38	1.6	1	1.7	1	12.0	1	21.13	1	1.60	1	1.7	1
31.20	32.21	31.59	29.52	28.76	28.24	4.3	1	2	1	6.0	1	39.21	1	4.3	1	2.0	1
13.90	10.06	9.83	8.98	8.48	8.14	5.2	1	1.9	1	22.0	1	25.89	1	5.2	1	1.9	1
13.60	10.97	10.68	9.54	8.94	8.52	5.4	1	2.7	1	17.0	1	34.85	1	5.4	1	2.7	1
18.70	15.62	15.35	13.90	13.17	12.64	4.3	1	4.7	1	9.0	1	38.84	1	4.3	1	4.7	1
16.55	9.83	9.66	8.66	7.92	7.24	4	1	1.9	1	8.0	1	100.36	1	4	1	1.9	1
16.10	8.44	8.29	7.56	6.98	6.30	4.1	1	1.5	1	2.0	0	21.23	1	4.1	1	1.5	1
	18.36	18.06	17.29	16.84	16.14	4	1	1.6	1	12.0	1	20.13	1	4	1	1.6	1
31.80	37.19	36.81	36.14	35.80	35.54	3.6	1	1.5	1	13	1	20.36	1	3.6	1	1.5	1
23.90	47.45	46.98	46.28	45.94	45.51	4.5	1	1.3	1	6	1	2.89	1	4.5	1	1.3	1
2.80	8.55	7.89	8.44	8.06	8.20	1.9	1	1.4	1	12	1	5.49	1	1.9	1	1.4	1
7.00	17.28	17.17	16.88	16.71	16.57	1.3	1	1.9	1	6	1	11.61	1	1.3	1	1.9	1
14.30	30.61	30.37	29.88	29.65	29.40	1.9	1	2.3	1	14	1	0.134	0	1.9	1	2.3	1
6.40	17.77	17.60	17.24	17.06	16.86												
15.70	35.16	34.81	34.12	33.83	33.44												
6.90	16.90	16.61	16.02	15.74	15.44												
7.00	16.00	15.81	15.29	15.04	14.75												
8.20	18.52	18.33	17.80	17.57	17.30												
7.90	14.43	14.33	13.98	13.75	13.28												
6.90	13.00	12.89	12.64	12.44	12.03												
16.50	17.28	16.87	15.81	15.17	14.37												
32.70	35.08	34.68	33.76	33.33	33.04												
37.40	41.43	41.04	40.28	39.88	39.42												
7.30	5.78	5.40	4.92	4.72	4.51												
14.60	15.17	14.91	14.31	14.03	13.81												
25.80	30.07	29.36	28.31	27.91	27.52												
12.20	14.83	14.53	14.07	13.83	13.61												
24.80	28.95	28.74	28.12	27.80	27.43												
15.00																	
12.70																	
14.58	16.49	16.40	15.87	15.56	15.32												
	14.53	14.48	14.06	13.62	13.08												
7.93	12.72	12.66	12.30	11.96	11.43												

Table 8a. Particle Size Analyes (PSA) BTVs 99%

General Background Statistics for Full Data Sets

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ProUCL 4.1\PSA\ERM_PSA_2013-06-27.wst
Full Precision	ON
Confidence Coefficient	99%
Coverage	99%
Different or Future K Values	1
Number of Bootstrap Operations	2000

PSA

General Statistics

Total Number of Observations	50	Number of Distinct Observations	48
Tolerance Factor	3.132689	Number of Missing Values	2

Raw Statistics		Log-Transformed Statistics	
Minimum	3.75	Minimum	1.321756
Maximum	47.45	Maximum	3.859677
Second Largest	43.38	Second Largest	3.769999
First Quartile	14.4775	First Quartile	2.672594
Median	17.21	Median	2.845491
Third Quartile	30.475	Third Quartile	3.416877
Mean	21.1746	Mean	2.91636
Geometric Mean	18.47392	SD	0.545909
SD	10.94824		
Coefficient of Variation	0.517046		
Skewness	0.735415		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.895636	Shapiro Wilk Test Statistic	0.946667
Shapiro Wilk Critical Value	0.947	Shapiro Wilk Critical Value	0.947
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
99% UTL with 99% Coverage	55.47204	99% UTL with 99% Coverage	102.1582
99% UPL (t)	47.76593	99% UPL (t)	69.56592
90% Percentile (z)	35.20534	90% Percentile (z)	37.18741
95% Percentile (z)	39.18286	95% Percentile (z)	45.345
99% Percentile (z)	46.64402	99% Percentile (z)	65.78116

Gamma Distribution Test		Data Distribution Test	
k star	3.607182	Data do not follow a Discernable Distribution (0.05)	
Theta Star	5.870123		
MLE of Mean	21.1746		
MLE of Standard Deviation	11.14888		
nu star	360.7182		
A-D Test Statistic	1.207326	Nonparametric Statistics	
5% A-D Critical Value	0.754121	90% Percentile	37.046
K-S Test Statistic	0.173072	95% Percentile	41.358
5% K-S Critical Value	0.125811	99% Percentile	45.4557
Data not Gamma Distributed at 5% Significance Level			

Assuming Gamma Distribution			
90% Percentile	36.12293	99% UTL with 99% Coverage	47.45
95% Percentile	42.20198	99% Percentile Bootstrap UTL with 99% Coverage	47.45
99% Percentile	55.25313	99% BCA Bootstrap UTL with 99% Coverage	47.45
		99% UPL	47.45
		99% Chebyshev UPL	131.1922
99% WH Approx. Gamma UPL	56.71495	Upper Threshold Limit Based upon IQR	54.47125
99% HW Approx. Gamma UPL	58.95205		
99% WH Approx. Gamma UTL with 99% Coverage	72.8856		
99% HW Approx. Gamma UTL with 99% Coverage	77.56853		

Table 8b. Particle Size Analyes (PSA) BTVs 97.5%

Nonparametric Background Statistics for Full Data Sets

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ProUCL 4.1\PSA\ERM_PSA_2013-06-27.wst
Full Precision	ON
Confidence Coefficient	97.50%
Coverage	97.50%
Number of Bootstrap Operations	2000

PSA

Some Non-Parametric Statistics	
Number of Valid Observations	50
Number of Missing Values	2
Number of Distinct Observations	48
Minimum	3.75
Maximum	47.45
Second Largest	43.38
Mean	21.1746
Geometric Mean	18.47392
First Quartile	14.4775
Median	17.21
Third Quartile	30.475
SD	10.94824
Variance	119.864
Coefficient of Variation	0.517046
Skewness	0.735415
Mean of Log-Transformed data	2.91636
SD of Log-Transformed data	0.545909

Data do not follow a Discernable Distribution (0.05)

Non-Parametric Background Statistics	
90% Percentile	37.046
95% Percentile	41.358
97.5% Percentile	42.94125
99% Percentile	45.4557
97.5% UTL with 97.5% Coverage	
Order Statistic	50
Achieved CC	1
UTL	47.45
97.5% BCA Bootstrap UTL with 97.5% Coverage	47.45
97.5% Percentile Bootstrap UTL with 97.5% Coverage	47.45
97.5% UPL	46.33075
97.5% Chebyshev UPL	90.22668
Upper Limit Based upon IQR	54.47125

Table 8c. Particle Size Analyes (PSA) BTVs 95%

Nonparametric Background Statistics for Full Data Sets

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ProUCL 4.1\PSA\ERM_PSA_2013-06-27.wst
Full Precision	ON
Confidence Coefficient	95%
Coverage	95%
Number of Bootstrap Operations	2000

PSA

Some Non-Parametric Statistics	
Number of Valid Observations	50
Number of Missing Values	2
Number of Distinct Observations	48
Minimum	3.75
Maximum	47.45
Second Largest	43.38
Mean	21.1746
Geometric Mean	18.47392
First Quartile	14.4775
Median	17.21
Third Quartile	30.475
SD	10.94824
Variance	119.864
Coefficient of Variation	0.517046
Skewness	0.735415
Mean of Log-Transformed data	2.91636
SD of Log-Transformed data	0.545909

Data do not follow a Discernable Distribution (0.05)

Non-Parametric Background Statistics	
90% Percentile	37.046
95% Percentile	41.358
99% Percentile	45.4557
95% UTL with 95% Coverage	
Order Statistic	49
Achieved CC	0.923055
UTL	43.38
95% BCA Bootstrap UTL with 95% Coverage	44.741
95% Percentile Bootstrap UTL with 95% Coverage	45.6185
95% UPL	42.3075
95% Chebyshev UPL	69.37174
Upper Limit Based upon IQR	54.47125

Table 8d. Particle Size Analyes (PSA) UCLs

Nonparametric UCL Statistics for Full Data Sets

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ProUCL 4.1\PSA\ERM_PSA_2013-06-27.wst
Full Precision	ON
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

PSA

Number of Valid Observations	50
Number of Distinct Observations	48
Minimum	3.75
Maximum	47.45
Mean	21.1746
Geometric Mean	18.47392
Median	17.21
SD	10.94824
Variance	119.864
Std. Error of Mean	1.548315
Coefficient of Variation	0.517046
Skewness	0.735415
Mean of log data	2.91636
SD of log data	0.545909

Data do not follow a Discernable Distribution

95% Useful UCLs	
Student's-t UCL	23.77043
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL (Chen-1995)	23.89342
95% Modified-t UCL (Johnson-1978)	23.79727
Non-Parametric UCLs	
95% CLT UCL	23.72135
95% Jackknife UCL	23.77043
95% Standard Bootstrap UCL	23.72118
95% Bootstrap-t UCL	23.97685
95% Hall's Bootstrap UCL	23.80296
95% Percentile Bootstrap UCL	23.5808
95% BCA Bootstrap UCL	23.9598
95% Chebyshev(Mean, Sd) UCL	27.92355
97.5% Chebyshev(Mean, Sd) UCL	30.84383
99% Chebyshev(Mean, Sd) UCL	36.58014

Potential UCL to Use	
Use 95% Chebyshev (Mean, Sd) UCL	27.92355

Table 9. Total Particulate Concentrations (NIOSH 0500) versus PM2.5 Concentrations (NIOSH 0500)

t-Test Site vs Background Comparison for Full Data Sets without NDs

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ ProUCL PSA LAB Data_2013-06-27.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean Less Than or Equal to Background Mean (Form 1)
Alternative Hypothesis	Site or AOC Mean Greater Than the Background Mean

Area of Concern Data: Total PART
Background Data: PM 2.5 PART

Raw Statistics

	Site	Background
Number of Valid Observations	32	32
Number of Distinct Observations	18	32
Minimum	2	0.134
Maximum	25	100.36
Mean	13.78125	19.77106
Median	14	18.08
SD	5.84606	18.07558
SE of Mean	1.033447	3.195341

Site vs Background Two-Sample t-Test

H0: Mu of Site - Mu of Background <= 0

Method	DF	t-Test Value	Critical t (0.010)	P-Value
Pooled (Equal Variance)	62	-1.784	2.388	0.96
Welch-Satterthwaite (Unequal Va	37.4	-1.784	2.431	0.959

Pooled SD 13.433
Conclusion with Alpha = 0.010
* Student t (Pooled) Test: Do Not Reject H0, Conclude Site <= Background
* Welch-Satterthwaite Test: Do Not Reject H0, Conclude Site <= Background

Test of Equality of Variances

Variance of Site	34.17641
Variance of Background	326.7265

Numerator DF	Denominator DF	F-Test Value	P-Value
31	31	9.56	0

Conclusion with Alpha = 0.01
* Two variances are not equal

Table 10. Total CrVI Concentrations (OSHA ID 215) versus PM2.5 Concentrations (OSHA ID 215)

t-Test Site vs Background Comparison for Full Data Sets without NDs

User Selected Options	
From File	C:\Users\jeff.boggs\Desktop\Air Data Review\ERM_ ProUCL PSA LAB Data_2013-06-27.xls.wst
Full Precision	ON
Confidence Coefficient	99%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean Less Than or Equal to Background Mean (Form 1)
Alternative Hypothesis	Site or AOC Mean Greater Than the Background Mean

Area of Concern Data: Total CrVI
Background Data: PM 2.5 CrVI

Raw Statistics

	Site	Background
Number of Valid Observations	32	32
Number of Distinct Observations	21	17
Minimum	0.65	0.63
Maximum	5.4	4.7
Mean	2.60125	1.973125
Median	1.9	1.9
SD	1.353273	0.720257
SE of Mean	0.239227	0.127325

Site vs Background Two-Sample t-Test

H0: Mu of Site - Mu of Background <= 0

Method	DF	t-Test Value	Critical t (0.010)	P-Value
Pooled (Equal Variance)	62	2.318	2.388	0.012
Welch-Satterthwaite (Unequal Va	47.3	2.318	2.408	0.012

Pooled SD 1.084

Conclusion with Alpha = 0.010
* Student t (Pooled) Test: Do Not Reject H0, Conclude Site <= Background
* Welch-Satterthwaite Test: Do Not Reject H0, Conclude Site <= Background

Test of Equality of Variances

Variance of Site	1.831347
Variance of Background	0.518771

Numerator DF	Denominator DF	F-Test Value	P-Value
31	31	3.53	0.001

Conclusion with Alpha = 0.01
* Two variances are not equal

Appendix C
Suggested Equipment

Davis Instruments Vantage Pro2™, Wireless Weather Station
WO-86403-03

Specifications	
Product Type	Weather Station
Barometric pressure range	26 to 32 in Hg (880 to 1080 mbar)
Barometric pressure accuracy	±0.03 in Hg (1.0 mbar)
Dew point range	-105 to 130°F (-76 to 54°C)
Temp accuracy (inside)	1°F (0.5°C)
Temp accuracy (outside)	1°F (0.5°C)
Temp range (inside)	32 to 140°F (0 to 60°C)
Temp range (outside)	-40 to 150 °F (-40 to 65°C)
RH range (inside)	10 to 90%
RH range (outside)	0 to 100%
RH accuracy (inside)	±5%
RH accuracy (outside)	±3%
Dew point accuracy	±3°F (1.5°C)
Wind speed range	2 to 150 mph; 2 to 130 knots; 1 to 67 m/s; 3 to 241 km/hr
Wind speed accuracy	±5%
Wind direction range	0 to 360°
Wind direction accuracy	±3°F (1.5°C)
Rain fall range	0 to 99.99 in
Rain fall accuracy	±4%
Time range	24 hours (12 or 24 hour format)

Time accuracy	8 sec/month
Display	LCD
Dimensions	**Display console:** 9.5 in W x 6 in H x 1.5 in D **Sensor assembly:** 8.25 in W x 7.25 in H x 7.75 in D
Power	110 VAC
CE Compliance	Yes
Brand	Davis Vantage Pro2
Compass range	16 compass points
Wind chill range	-110 to 130°F (-79 to 54°C)
Wind chill accuracy	±2°F (1°C)
Model	6152
Manufacturer number	6152

Drycal DC-Lite Primary Flow Meter

BIOS

Prod # 1120

Also Available for Purchase. See last page of catalog for details

The **Drycal DC-Lite** uses near-frictionless piston technology, eliminating the need for soap solution. This revolutionary method eliminates spills and operator error, making it a more accurate method of calibration.

Features:

- Primary flow standard
- Certified NIST traceable
- 5-minute auto shut-off
- Simple push-button operation
- Immune to flow-source pulsation
- Fast and accurate

Applications:

- Sampling pump calibration

Accessories:

- AC adapter
- Carrying case

Specifications:

Ranges	: 10 ml/min to 12 l/min 500 ml/min - 30 l/min
Operating modes	: Single cycle, continuous auto-repeat and 10-reading functions.
Operating temperature	: 0°C to 55°C
Dimensions	: 12.7 cm x 7.0 cm x 12.7 cm : (5.0” x 2.7” x 5.0”)
Weight	: 1200 g (42 oz)
Display	: LCD
Battery	: Sealed lead acid battery
Battery life	: 6 hrs

Appendix D
Analytical Methods

HEXAVALENT CHROMIUM IN WORKPLACE ATMOSPHERES

OSHA Method Number:	ID-215 (This method supersedes ID-103)
Matrix:	Air
OSHA Permissible Exposure Limit (proposed)	
Hexavalent Chromium [Cr(VI)]	
Time Weighted Average (TWA):	0.50 µg/m^3
Action Level (AL):	0.25 µg/m^3
Collection Device:	An air sample is collected using a 37-mm diameter polyvinyl chloride (PVC) filter (5-µm pore size) contained in a polystyrene cassette. A calibrated sampling pump is used to draw a representative air sample from the breathing zone of an employee through the cassette and collect particulate on the filter.
Recommended Sampling Rate:	2 liters per minute (L/min)
Recommended Air Volume:	
TWA and AL:	960 L (2 L/min for 480 min)
Analytical Procedure:	The hexavalent chromium, Cr(VI), is extracted from the PVC filter using an aqueous solution containing 10% sodium carbonate (Na_2CO_3)/ 2% sodium bicarbonate ($NaHCO_3$) and the mixture of phosphate buffer/magnesium sulfate [~10 mg as Mg (II)]. After dilution, an aliquot of this solution is analyzed for Cr(VI) by an ion chromatograph equipped with a UV-vis detector at 540-nm wavelength. A post-column derivatization of the Cr(VI) with 1,5-diphenyl carbazide is performed prior to detection.
Detection Limit	
Qualitative:	1.0×10^{-3} µg/m^3 as Cr(VI) (960-L air sample)
Quantitative:	3.0×10^{-3} µg/m^3 as Cr(VI) (960-L air sample)
Precision and Accuracy (Soluble and Insoluble)	
Validation Range:	0.12 to 0.42 µg/m^3 (960-L air sample)
CV_1(pooled):	0.059
Bias:	- 0.004
Overall Error:	±12.9%
Method Classification:	Validated Method
Chemists:	James C. Ku, Mary Eide
Date:	June, 1998

Commercial manufacturers and products mentioned in this method are for descriptive use only and do not constitute endorsements by USDOL-OSHA. Similar products from other sources can be substituted.

Branch of Inorganic Methods Development
OSHA Salt Lake Technical Center
Salt Lake City, Utah

1. Introduction

This method describes the sample collection and analysis of airborne hexavalent chromium, Cr(VI). This method should be used by industrial hygienists experienced in monitoring for exposures and analysts experienced in the use of ion chromatography and the interpretation of ion chromatograms. Samples are taken in the breathing zone of workplace personnel, and analysis is performed with an ion chromatograph (IC) equipped with a UV-vis detector and a postcolumn reagent delivery system. Hexavalent chromium most commonly exists in the workplace as a metal (M) chromate ($MCrO_4$), such as lead chromate, or also as chromium trioxide (CrO_3). Common interferences noted in past methods, such as Cr (III) and Fe(II) are kept to a minimum.

1.1 History

To sample for Cr(VI) in the workplace, a 37-mm diameter, 5-µm pore size polyvinyl chloride (PVC) filter is normally used as the sampling medium. The classical method of Cr(VI) analysis for industrial hygiene use was colorimetry using 1,5-diphenylcarbazide (DPC) for color development after acid extraction of the Cr(VI) from the sample (5.1, 5.2). This method was considered inadequate due to the insolubility of certain chromate compounds (5.3) and interferences from many heavy metals (5.2). In addition, reducing agents, such as Fe(II), could convert the Cr(VI) to Cr(III) in the acidic extraction medium used (5.4). To avoid reduction of Cr(VI) in acidic media, alternatives were researched. The extraction of Cr(VI) in basic solution, acidification, and subsequent analysis by colorimetry using DPC has been reported in the literature (5.3). This method took advantage of the fact that all soluble chromates and many of the insoluble chromates can be extracted in a basic solution (5.3, 5.7). However, the potential still existed for positive interferences. Also, Cr(VI) could be converted to Cr(III) by a reducing agent such as Fe(II) in the basic medium. To minimize these problems, a differential pulse polarographic (DPP) method was developed (5.8) at the OSHA Salt Lake Technical Center (SLTC). The buffer used for sample extraction in the DPP method, 10% Na_2CO_3 and 2% $NaHCO_3$ was a modification of that suggested in Reference 5.3. This buffer was also used as the supporting electrolyte during analysis.

Recently, a reduction in the Permissible Exposure Limit (PEL) for Cr(VI) has been proposed by OSHA, with 0.50 µg/m^3 for the Time Weighted Average (TWA) and 0.25 µg/m^3 for the Action Level (AL). The differential pulse polarographic method was not sufficiently sensitive to quantitate at the proposed levels, and a new method was developed using an IC equipped with a UV-vis detector and a postcolumn reagent delivery module. To prevent interferences, the Cr(VI) ion is separated from other analytes using an ion chromatographic column. The Cr(VI) then reacts with the DPC to form a colored derivative which is measured by the UV-vis detector at 540 nm. A significant increase in sensitivity for Cr(VI) is noted when compared to previous methods. Initial studies, performed using only a hot 10% sodium carbonate 2% sodium bicarbonate solution for extraction, still demonstrated a negative interference from Fe(II) and some conversion of Cr (III) to Cr(VI). Next we evaluated the modification presented by Vitale et al. and Zatka to inhibit the oxidation of Cr(III) to Cr(VI), whereby magnesium hydroxide was freshly precipitated in the carbonate buffer by the addition of a magnesium chloride solution (5.5, 5.6). The studies in this method showed that the addition per sample of ~10 mg Mg(II) in a phosphate buffer to the 10% sodium carbonate 2% sodium bicarbonate solution greatly decreased the negative interference of the Fe(II) and positive interference of the Cr(III).

1.2 Principle

Hexavalent chromium is collected on a 37-mm diameter PVC filter. Any compound existing in the Cr(VI) valence state is extracted from the PVC filter using a hot aqueous solution containing 10% sodium carbonate (Na_2CO_3), 2% sodium bicarbonate ($NaHCO_3$), and the phosphate buffer/magnesium sulfate mixture. The reaction between any chromate species and carbonate is illustrated by the following equation (5.3):

$$MCrO_4 + CO_3^{2-} \longrightarrow MCO_3 + CrO_4^{2-}$$

Where M = metals (e.g., lead, zinc, cadmium, sodium, potassium, calcium, etc.)

In the presence of a large excess of carbonate, the equilibrium is shifted quantitatively to the right. Any chromate compounds (soluble and insoluble) contained in the sample are converted to their corresponding soluble carbonates. Interferences are minimized by the addition of the magnesium.

After dilution, an aliquot of this extract is analyzed for Cr(VI) with an IC equipped with a postcolumn reagent delivery module and a UV-vis detector at 540-nm wavelength. Any Cr(VI) in a spray-paint sample on the filter is extracted additionally with a hot 5% NaOH/7.5% Na_2CO_3 extraction solution with the mixture of phosphate buffer/Mg(II) (see Section 3.5.7). Using a well-buffered ammonium sulfate [$(NH_4)_2SO_4$] and ammonium hydroxide (NH_4OH) eluent, Cr(VI) is chromatographed as the yellow divalent CrO_4^{2-} anion on the separator column. After the separation, Cr(VI) reacts with the reagent DPC to form a colored complex ion. The reaction is apparently the simultaneous oxidation of DPC to diphenylcarbazone and reduction of Cr(VI) to Cr(III). The actual structure of the chelate is not known, but the reaction is quantitative and the visible absorbance can be detected using a photometric detector at 540 nm (5.12). Although DPC, as previously stated, has the potential problem of reacting with other species, the addition of the chromatographic separation step minimizes any potential for interferences.

1.3 Advantages and Disadvantages

1.3.1 This method has adequate sensitivity for determining compliance with the proposed OSHA TWA and AL PELs for Cr(VI) exposure.

1.3.2 The method is simple, rapid, and easily automated.

1.3.3 The method is specific and can determine Cr(VI) in the presence of Cr(III). Most heavy metals, such as vanadium, copper, iron (III), and molybdenum, do not significantly interfere. Fe(II) appears to cause a negative interference during sampling and storage (see Sections 1.5 and 4.4 for further information).

1.3.4 By using alkaline extraction conditions (pH = 10 to 11) in which Cr(VI) is more stable, sample recovery is improved by preventing Cr(VI) losses which may occur in a more acidic extraction media. Both water soluble and insoluble Cr(VI) compounds are soluble in the alkaline (carbonate/ bicarbonate/Mg(II)/phosphate) buffer. The extraction medium specified in this method minimizes the possible interferences.

1.3.5 Extraction and preparation of samples for analyses involve simple procedures and equipment.

1.3.6 If necessary, the amount of Cr(VI) can also be analyzed and confirmed by differential pulse polarography (DPP), provided samples and standards are matrix-matched. This DPP technique is described in reference 5.8.

1.3.7. A disadvantage is the extraction solution and sulfuric acid used are very caustic. The extraction solution may also limit the column life and type of instrumentation used. The module used in this method is equipped with a reagent reservoir, a mixing tee/reaction coil system, and a post-column pneumatic controller. A Dionex membrane reactor was used during early stages of validation of this method. The mixing tee and reaction coil used in subsequent studies was found more suitable because the Dionex membrane reactor required: a) frequent maintenance; b) additional dilution of sample standards to minimize matrix effects from the extraction solution (resulting in a corresponding decrease in sensitivity); and c) greater expense. The mixing tee and reaction coil only require a 1:1 dilution prior to analysis.

1.4 Method Performance

A synopsis of the method performance is presented below. Further information can be found in Section 4.

1.4.1 This method was validated using soluble and insoluble chromate compounds. The compounds used were potassium dichromate and lead chromate for soluble and insoluble chromate, respectively. The significant availability and industrial use of potassium dichromate indicated it was a good choice to represent the chemical characteristics of the

soluble chromates for this evaluation. Solubility product values indicated that lead chromate was the least soluble of the chromate compounds commonly found in industry, therefore it was chosen to represent the insoluble chromate. Filter samples were spiked with about 0.11 to 0.40 µg [as Cr(VI)]. Using an 960-L air volume, these spiked samples would give an approximate concentration range of 0.115 to 0.417 µg/m^3 as Cr(VI). This method has the sensitivity necessary to determine compliance with the proposed regulatory limits.

1.4.2 The qualitative detection limit was 0.001 µg as Cr(VI) when using a 10-mL solution volume. This corresponds to 1.0×10^{-3} µg/m^3 as Cr(VI) for a 960-L air volume.

1.4.3 The quantitative detection limit was 0.003 µg as Cr(VI) when using a 10-mL solution volume. This corresponds to 3.0×10^{-3} µg/m^3 as Cr(VI) for a 960-L air volume. A 100-µL sample loop and a detector setting of 0.5 absorbance unit (AU) full-scale output were used for both qualitative and quantitative detection limits.

1.4.4 The sensitivity of the analytical method, when using the instrumental parameters listed in Section 3.6., was calculated from the slope of a linear working range curve [0.5 to 1,000 ng/mL Cr(VI)]. The sensitivity was 2.47×10^4 area units per 1 ng/mL, when using a Dionex Series 4500i ion chromatograph with AI450 computer software (Dionex, Sunnyvale, CA). The sensitivity was 1.57×10^4 area units per 1 ng/mL, when using a Dionex DX500 ion chromatograph with a 10 mm cell and a 150 µL sample loop (Dionex, Sunnyvale, CA). The sensitivity of this method was significantly better than OSHA Method No. ID-103 for Cr(VI) (5.8).

1.4.5 The total pooled coefficients of variation (CV_1), bias, and total overall error (OE) are as follows:

For soluble chromate:
CV_1 (pooled) = 0.054; bias = + 0.007; OE_T = ±11.5%

For insoluble chromate:
CV_1 (pooled) = 0.064; bias = - 0.014; OE_T = ±14.2%

For both types of chromate compounds (pooled soluble and insoluble):
CV_1 (pooled) = 0.059; bias = - 0.004; OE_T = ±12.9%

1.4.6 The collection efficiency of 0.945 ± 0.035 has been previous determined for chromic acid mist collected on PVC filters (5.11).

1.4.7 Quality control (QC) samples were prepared as single blind samples by spiking aqueous solutions of potassium dichromate on PVC filters. Amounts spiked ranged from 10 to 20 µg. Results of samples analyzed from 1982-89 using the DPP technique, and samples analyzed using this method (IC/UV-vis) are shown below. All samples were analyzed along with other field (compliance) samples. The following results were obtained:

	Method Used	
	DPP*	IC/UV-vis
Samples (N):	282	57
Average recovery:	94.1%	94.8%
CV_1(pooled):	0.10	0.054

*DPP data obtained from reference 5.12.

1.4.8 Samples can be stored at ambient (20 to 25 °C) temperature on a lab bench for a period of at least 30 days. The mean sample recovery after 30 days of storage was within ±5% of the recovery at Day 0.

1.5 Interferences

1.5.1 Reducing species such as Cr(III), V(III), and Cu(I), etc. in ten-fold excess over Cr(VI) did not produce a significant interference with this method. However, when Fe(II) was added in a slightly acidic environment, and the samples were extracted with the BE solution, the following losses occurred: 10% for a loading of Fe(II):Cr(VI) of 1:1, 30% when 5:1, 70% when 10:1, and 3% for 10:1 with the addition of the Mg(II) and phosphate buffer before extraction with BE solution. The effects of this negative interference are further detailed in Section 4.4. The samples were extracted with the buffer extraction (BE) solution only. These losses were significantly reduced by the addition of magnesium sulfate ~10 mg/mL as Mg (II), in a phosphate buffer to the BE solution, such that a 1:10 ratio of Cr(VI):Fe(II) had an average recovery of 96.6% (see Section 4.4.6). Loss in basic solutions appeared to be independent of Cr(VI)/Fe(II) ratio.

1.5.2 A positive interference can be any substance that has the same retention time as Cr(VI), and absorbs light at 540 nm wavelength when using the ion chromatographic operating conditions described in this method. Changing the chromatographic separation conditions (detector settings, column, eluent flow rate, and strength, etc.) may minimize the interference. None of the more common metallic species coexisting with Cr(VI) in the workplace and potentially soluble in the extraction solution were found to positively interfere when using the analytical conditions described in this method. A positive interference from Cr (III) can occur when extracted with BE or a more strongly basic extraction solution for spray paint samples (SPE) alone; however, the addition of the phosphate buffer/Mg(II) solution to the extraction process minimizes this positive interference. For samples having Cr(III) levels of 1 µg/mL, the positive interference changed from <1% for BE to <0.02% for BE with phosphate buffer/Mg(II). For SPE samples containing 10 µg/mL Cr(III), the positive interference changed from <0.2% for SPE to <0.03% for SPE with phosphate buffer/Mg(II) (see Sections 4.4.1, 4.4.3, and 4.4.4).

1.6 Uses

The principal commercial Cr(VI) compounds are chromium trioxide (chromic acid anhydride), and the chromates and dichromates of sodium, potassium, ammonium, calcium, barium, zinc, strontium, and lead. They are used as oxidizing agents in tanning, photography, dyeing, and electroplating, and as rust inhibitors and pigments.

1.7 Physical and Chemical Properties of Certain Chromates (5.15)

	Chromium (VI) trioxide	Potassium chromate	Lead chromate	Zinc chromate	Potassium dichromate
CAS No.	1333-82-0	7789-00-6	7758-97-6	13530-65-9	7778-50-9
Synonyms	Chromic acid, chromic anhydride; Chromia; Chromic trioxide	Chromic acid, dipotassium salt; Dipotassium monochromate	Chromic acid, lead salt; Crocoite; Phoenicochroite; Plumbous chromate	Chromic acid, zinc salt; Zinc tetraoxychromate; Zinc chromium oxide	Potassium bichromate; red potassium chromate
Description	Dark, purple-red crystals	Rhombic, yellow crystals	Yellow crystals	Lemon-yellow prisms	Yellow-red crystals
Formula	CrO_3	K_2CrO_4	$PbCrO_4$	$ZnCrO_4$*	$K_2Cr_2O_7$
Constants and Solubility	Mol wt: 100.01 mp: 196°C d: 2.70 Very sol in water (625 g/L at 20°C), insol in alcohol.	Mol wt: 194.20 mp: 971°C d: 2.732 at 18°C Sol in water (1,020 g/L at 100°C), insol in alcohol.	Mol wt: 323.22 mp: 844°C bp: decomposes d: 6.3 Very slightly sol in water (0.058 mg/L at 25°C), sol in strong acids and alkalies.	Mol wt: 181.4 mp: not available d: 3.40 Slightly sol in water, sol in acids.	Mol wt:294.2 mp: 396°C decomposition pt: 500°C d: 2.676 Sol in water (1.020g/L @ 100°C) insol in alcohol
Fire and explosion hazard	Dangerous: a very powerful oxidizing agent. In contact with organic matter or reducing agents in general it can cause violent reactions. Upon intimate contact with powerful reducing agents it can cause violent explosions.	Moderate, by chemical reaction; a powerful oxidizer.	Moderate, by chemical reaction.	Moderate, by chemical reaction.	Moderate, by chemical reaction

*Molecular formula was $4ZnO{\cdot}CrO_3{\cdot}3H_2O$, and confirmed in-house by X-ray diffraction.

1.8 Toxicology (5.16)

Information listed within this section is a synopsis of current knowledge of the physiological effects of chromic acid and chromates and is not intended to be used as a basis for OSHA policy.

1.8.1 Chromic acid and its salts have a corrosive action on the skin and mucous membranes. The characteristic lesion is a deep, penetrating ulcer, which, for the most part, does not tend to suppurate, and is slow in healing. Lesions are confined to the exposed area, and the skin of the nasal septum is a common site.

1.8.2 Breathing in high levels (greater than 2 $\mu g/m^3$) of Cr(VI) can cause irritation to the nasal passage, such as runny nose, sneezing, itching, nosebleeds, ulcers, and holes in the nasal septum. These effects have primarily occurred in factory workers who have produced or used Cr(VI) for several months to many years. Long-term exposure to Cr(VI) has been associated with lung cancer in workers exposed to high levels of Cr(VI) in workplace air.

1.8.3 Workers handling liquids or solids containing Cr(VI) compounds have developed skin ulcers.

1.8.4 Certain Cr(VI) compounds (calcium chromate, chromium trioxide, lead chromate, sodium dichromate, strontium chromate, and zinc chromate) are known animal and/or human carcinogens. The International Agency for Research on Cancer (IARC) has determined that Cr(VI) is carcinogenic to humans (Group 1), based on sufficient evidence in humans

for the carcinogenicity of Cr(VI) compounds as found in chromate production, chromate pigment production, and chromium plating industries (5.17). IARC's determination is also based on sufficient evidence in experimental animals for the carcinogenicity of calcium chromate, zinc chromate, strontium chromate, and lead chromate; and limited evidence in experimental animals for the carcinogenicity of chromic acid and sodium dichromate.

2. Sampling (See Interferences, Section 1.5 before sampling.)

Note: Bulk samples can be collected and analyzed. Filters or wipe samples collected on cellulose or cellulose esters are unacceptable due to the instability of Cr(VI) on these media.

Filter media used to validate this chromate method and to prepare QC samples are the PVC filters manufactured by MSA Inc. and Omega Special Instrument Co. as specified below. The Gelman GLA-5000 was also evaluated for extraction and storage and found acceptable. If a PVC filter from a different manufacturer is used, it will be necessary to at least evaluate the extraction efficiency and the storage, as it has been reported that there are interferences on some types of PVC filters which greatly reduce the hexavalent chromium to trivalent chromium.

2.1 Equipment

2.1.1 Calibrated personal sampling pumps capable of sampling within ±5% of the recommended flow rate of 2 L/min.

2.1.2 Tygon or other flexible tubing for connecting to pumps.

2.1.3 Plastic end plugs.

2.1.4 Sample assembly:
a) Filter holder consisting of a two-piece polystyrene cassette, 37-mm diameter.
b) Backup pad, 37-mm, cellulose.
c) Membrane filter, PVC, 37-mm, 5-µm pore size [part no. 625413, Mine Safety Appliances (MSA), Pittsburgh, PA; or cat. no. P-503700, Omega Specialty Instrument Co., Chelmsford, MA].
d) Gel bands (Omega Specialty Instrument Co., Chelmsford, MA) for sealing cassettes.
e) Forceps, Teflon coated.

2.1.5 Stopwatch and bubble tube or meter for pump calibration.

2.1.6 Scintillation vials (for wipe or bulk samples), 20-mL, part no. 74515 or 58515, (Kimble, Div. of Owen-Illinois Inc., Toledo, OH) with polypropylene or Teflon cap liners.

2.2 Sampling Procedure - Air Samples

2.2.1 Place a PVC filter and a cellulose backup pad in each two-piece cassette. Compress the cassette and then seal each cassette with a gel band. The atmosphere being sampled should pass through the PVC filter first.

2.2.2 Calibrate each personal sampling pump with a prepared cassette in-line to approximately 2 L/min flow rate.

2.2.3 Attach prepared cassettes to calibrated sampling pumps (the backup pad should face the pump) using appropriate lengths of tubing. Place each cassette within the breathing zone on each employee as appropriate. If possible, collect each sample for a full work shift (approximately 960-L air volume).

2.2.4 If the filter becomes overloaded while sampling, consecutive samples using shorter sampling periods should be taken.

2.2.5 After sampling, place plastic end caps tightly on both ends of the cassette and apply OSHA Form 21 seals in such a way as to secure the end caps. Record the sampling conditions such as sampling time, air volume, etc. on the OSHA 91A form. **(Note: It is very important to record the operation sampled (i.e., spray paint, chrome plating, welding, etc.).)** When other compounds are known or suspected to be present in the air, record such information and transmit with the samples.

2.2.6 Use the same lots of filters and backup pads for blanks and collected samples. Handle the blank cassettes in exactly the same manner as the sample cassettes except that no air is drawn through them. Submit at least one blank cassette for each batch of ten samples.

2.3 Sampling Procedure - Wipe Samples

Wipe samples can be taken using PVC filters as the wipe media. Wear clean, impervious, disposable gloves when taking each wipe sample. If possible, carefully wipe a surface area covering 100 cm^2. Carefully fold the wipe sample with the exposed side in and then transfer into a 20-mL scintillation vial.

2.4 Sampling Procedure - Bulk Samples

If bulk samples are necessary, collect the bulk samples using a grab sampling technique suitable for the particular material(s) in use. If possible, transfer any bulk samples into 20-mL scintillation vials.

2.5 Shipment

2.5.1 Immediately send the samples to the laboratory with the OSHA 91A paperwork requesting hexavalent chromium [Cr(VI)] analysis.

2.5.2 Ship any bulk samples separately from air samples. Enclose Material Safety Data Sheets if available. Check current shipping restrictions and ship to the laboratory by the appropriate method and proper labeling.

3. Analysis

3.1 Safety Precautions

3.1.1 Refer to appropriate IC instrument manuals, UV-vis detector maintenance manual, and any Standard Operating Procedures (SOP) for proper instrument operation (5.19).

3.1.2 Observe laboratory safety regulations and practices.

3.1.3 Certain chromate compounds have been identified as carcinogens (5.16, 5.17). Care should be exercised when handling these compounds.

3.1.4 Some chemicals are corrosive. Use appropriate personal protective equipment such as safety glasses, goggles, face shields, gloves, and lab coat when handling corrosive chemicals.

3.1.5 The buffer/extraction (BE) and spray-paint extraction (SPE) solutions are basic and somewhat corrosive. Clean up any spills immediately. Store these solutions in polyethylene bottles. If the solutions are stored in glass, precipitated salts readily form over time from evaporation and will cause glass stoppers to seize. The strongly basic solutions will also attack the glass walls of the containers. Samples placed in glass volumetric flasks

should be analyzed, properly disposed of, and the flasks rinsed and washed as soon as possible after analysis is completed and results are reported.

3.2 Equipment

3.2.1 Ion chromatograph (Model 4000i, 4500i, or DX500 Dionex, Sunnyvale, CA) equipped with a UV/vis detector and a postcolumn reagent delivery system containing a pressurized reagent reservoir with a 1-L polyethylene bottle, a post column pneumatic controller, and a mixing tee and reaction coil (Note: A membrane reactor module can be used in place of a mixing tee and reaction coil; however, extra maintenance is required, and depending on the module, additional dilution of the sample prior to analysis may be necessary.).

3.2.2 Hot plate and exhaust hood.

3.2.3 For extraction of air samples, use Phillips beakers, borosilicate, 125-mL, with watch glass covers, or Erlenmeyer flasks, 50-mL. It is recommended that the beakers or flasks used for extraction of bulks be of a larger size (250 mL has been used) than the beakers or flasks used for air samples, to help prevent contamination of air samples from improperly cleaned glassware which may have contained high levels of Cr (VI). Glassware which should not be used for sample analysis of chromate compounds are those:

1) previously cleaned with chromic acid cleaning solution,
2) previously used for storage of Cr(VI) stock standard solutions, and
3) previously used for storage of bulks containing high concentrations of Cr(VI).

3.2.4 Teflon-coated magnetic stirring bar and stirrer, or ultrasonicator.

3.2.5 Micro-analytical balance (0.01 mg).

3.2.6 Polyethylene bottles, 100-mL to 1-L size with caps with plastic liners.

3.2.7 Calibrated micro-pipettes or pipets, volumetric flasks, beakers, and general laboratory glassware. The calibration on the micro-pipettes should be checked before each use. Alternately serial dilutions may be made using volumetric pipets.

3.2.8 Automatic sampler (Dionex Model AS-1) and sample vials (0.5 mL) with filter caps.

3.2.9 Laboratory automation system: Ion chromatograph interfaced with a data reduction system (AI450, Dionex).

3.2.10 Separator and guard columns, anion (Model IonPac-AS7 and IonPac-NG1, Dionex).

3.2.11 Syringe prefilters, 0.5-µm pore size (part no. SLSR 025 NS, Millipore Corp., Bedford, MA).

Note: Some syringe prefilters are not cation- or anion-free. Tests should be performed with blank solutions first to determine contamination and suitability with the analyte.

3.2.12 Scintillation vials, glass, 20-mL.

3.2.13 Equipment for eluent degassing (vacuum pump, ultrasonic bath).

3.2.14 Optional: Centrifuge for spinning down precipitate in samples.

3.3 Reagents - All chemicals should be at least reagent grade. Consult latest material safety data sheets (MSDS) for cautions and proper handling.

3.3.1 Principal reagents:

Sodium carbonate (Na_2CO_3), 99%
Sodium bicarbonate ($NaHCO_3$), 99%
Potassium dichromate ($K_2Cr_2O_7$), 99.9% or Potassium chromate (K_2CrO_4), 99.9%
Magnesium sulfate, anhydrous ($MgSO_4$), 99%
Ammonium sulfate [$(NH_4)_2SO_4$], 99+%
Ammonium hydroxide (NH_4OH), 29%
1,5-Diphenylcarbazide (DPC) - $C_6H_5NHNHCONHNHC_6H_5$, 99%
Methanol (CH_3OH), HPLC grade
Sulfuric acid (H_2SO_4), concentrated (98%)
Nitric acid (HNO_3), concentrated (69 - 71%)
Deionized water (DI H_2O)

The initial studies were performed using magnesium chloride as the source of magnesium, but this formed a very fine precipitate of magnesium hydroxide. The source of magnesium was switched to magnesium sulfate, because the magnesium sulfate formed a larger sized precipitate which was easier to separate.

3.3.2 Nitric acid, 10% (v/v):

Carefully add 100 mL of concentrated HNO_3 to about 500-mL DI H_2O contained in a 1.0-L volumetric flask and dilute to the mark with DI H_2O.

3.3.3 Buffer/extraction (BE) solution (10% Na_2CO_3 + 2% $NaHCO_3$):

Dissolve 100 g Na_2CO_3 and 20 g $NaHCO_3$ in about 500 mL DI H_2O contained in a 1.0-L volumetric flask. A Teflon-coated magnetic stirring bar and stirrer will facilitate dissolution. Remove and rinse the stirring bar, adding the rinses to the volumetric flask, and then dilute to the mark with DI H_2O. Alternately, a sonicator can be used instead of a stirring bar and stirrer. Transfer and store this solution in a tightly capped polyethylene bottle. Prepare monthly.

3.3.4 Spray-paint extraction (SPE) solution (5% NaOH + 7.5% Na_2CO_3):

Dissolve 50 g NaOH and 75 g Na_2CO_3 in about 500 mL DI H_2O contained in a 1.0-L volumetric flask. A Teflon-coated magnetic stirring bar and stirrer will facilitate dissolution. Remove and rinse the stirring bar, adding the rinses to the volumetric flask, allow the solution to cool to room temperature, and then dilute to the mark with DI H_2O. Alternately, a sonicator can be used instead of a stirring bar and stirrer. Transfer and store this solution in a tightly capped polyethylene bottle. Use this solution only for extraction of samples taken to assess exposure during spray-paint operations. Prepare monthly.

3.3.5 Magnesium sulfate solution [~10 mg/mL as Mg(II)]:

Dissolve 9.90 g of anhydrous $MgSO_4$ in 100-mL volumetric flask containing 50 mL DI H_2O. Mix well and dilute to the mark with DI H_2O. Prepare monthly.

3.3.6 Phosphate buffer (0.5 M KH_2PO_4/0.5 M $K_2HPO_4 \cdot 3H_2O$):

Dissolve 6.80 g of KH_2PO_4 and 11.41 g of $K_2HPO_4 \cdot 3H_2O$ in 100-mL volumetric flask containing 50 mL DI H_2O. Mix well and dilute to the mark with DI H_2O. Prepare monthly.

3.3.7 Phosphate buffer/Mg(II) (PBM) solution:

Pipette 25 mL of the magnesium sulfate solution (Section 3.3.5) into a 100-mL beaker containing 50 mL of phosphate buffer (Section 3.3.6). Mix well (Note: Do not dilute with DI H_2O). Prepare just before each analysis.

3.3.8 Dilute Buffer Extraction/Phosphate buffer/Mg(II) or DBE/PBM solution [for working standard preparation (Section 3.4)]:

Pipette 50 mL of the BE solution (Section 3.3.3) into a 100-mL volumetric flask containing 15 mL of PBM solution (Section 3.3.7). Mix well and dilute to the mark with DI H_2O. Magnesium hydroxide will form and precipitate out of solution. Allow the precipitation to settle for at least 60 min., or place in a centrifuge at 3,200 rpm for 10 min. Transfer the "clear" solution to a beaker. Prepare this solution just before working standard preparation.

3.3.9 Eluent [250 mM $(NH_4)_2SO_4$ + 100 mM NH_4OH]:

Dissolve 33 g of $(NH_4)_2SO_4$ in about 500 mL of DI H_2O. Add 6.5 mL of 29% NH_4OH. Mix well and dilute with DI H_2O to 1.0 L in a volumetric flask. Sonicate this solution and degas under vacuum for 5 min. Transfer the solution to the eluent container.

3.3.10 Postcolumn derivatization reagent (2.0 mM DPC + 10% CH_3OH + 1N H_2SO_4):

1) First dissolve 0.5 g of DPC in 100 mL of HPLC grade CH_3OH. 2) Add 28 mL of 98% H_2SO_4 to about 500 mL of DI H_2O (**CAUTION !!! Make additions very, very slowly, with mixing, and allow to cool.)** 3) Mix solutions 1) and 2) carefully and dilute, with stirring, in an 1-L volumetric flask with DI H_2O. Cool solution to room temperature (**Caution: the reaction of the DPC with Cr(VI) will be incomplete if this solution is warm.)** Transfer the solution to the 1-L polyethylene bottle located in the pressurized reagent reservoir. The solution is stable for up to 3 days but should only be prepared as it is used, 1.0 L at a time. The sensitivity of the method is dependent on the freshness of the DPC solution.

3.3.11 Cr(VI) stock standard (100 µg/mL):

Dissolve and dilute 0.2828 g of $K_2Cr_2O_7$ or 0.3735 g of K_2CrO_4 to 1.0 L with DI H_2O. Prepare this solution every three months.

3.3.12 Cr(VI) standards (10.0 and 1.0 µg/mL):

To prepare 10.0 and 1.0 µg/mL Cr(VI) standards: 1) Pipette 12.5-mL BE solution into two 25-mL volumetric flasks. 2) Using a calibrated micropipette, pipette 2.5 and 0.25 mL of the 100 µg/mL Cr(VI) stock standard into each of the flasks. 3) Then dilute each flask to the mark with DI H_2O. Prepare these solutions weekly. Alternately, volumetric pipets and 10-mL volumetric flasks may be used to prepare standards through serial dilutions.

Note: The laboratory should have an effective, independent quality control (QC) program in place and QC samples of the analyte should be routinely analyzed along with field samples. Depending on the capabilities of the program, QC samples can either be generated using the collection media and chromate compounds under controlled conditions, or media can be spiked with the analyte (such as K_2CrO_4 or $K_2Cr_2O_7$). If QC samples cannot be routinely prepared and analyzed, two different standard stock solutions should always be prepared and these solutions should routinely be compared to each other. Always prepare the stocks from two different sources or, as last resort, from different lots.

3.4 Working Standard Preparation - Prepare weekly.

Prepare Cr(VI) working standards in "clear" DBE/PBM solution. A suggested scheme for preparing a series of working standards using 10-mL final solution volumes and a calibrated micro-pipette is shown below, (the calibration on the micropipette should be checked on a monthly basis):

Working Std (ng/mL)	Std Solution (µg/mL)	Aliquot (µL)	DBE/PBM Added (mL)
1.0	1.0	10.0	9.99
5.0	1.0	50.0	9.95
10.0	1.0	100.0	9.90
20.0	10.0	20.0	9.98
50.0	10.0	50.0	9.95
100.0	10.0	100.0	9.90
200.0	100.0	20.0	9.98
500.0	100.0	50.0	9.95
1000.0	100.0	100.0	9.90

Serial dilutions with volumetric pipets and volumetric flasks may be used instead of a micropipette.

3.5 Sample Preparation

3.5.1 Wash all glassware in hot water with detergent and rinse with tap water, 10% HNO_3, and DI H_2O (in that order). **Caution: Under no circumstances should chromic acid cleaning solutions be used.**

3.5.2 Adjust the hot plate to a temperature below the boiling point of the BE solution. A plate surface temperature near 135°C is adequate for extraction. If the hotplate cannot be adjusted to 135°C, use a hot water bath.

3.5.3 If bulk samples are submitted, weigh out a representative aliquot of each bulk on separate PVC blank filters. The bulk and PVC filters are placed in a beaker or flask. To prevent potential future contamination, a beaker or flask of larger size than the air samples should be used.

3.5.4 Carefully remove each PVC filter from their cassettes or balance, place them face-down in separate 125-mL Phillips beakers (or 50-mL Erlenmeyer flask or other size of heat-resistant glassware used), add 1.5 mL of PBM solution, mix well, and finally add 5 mL of BE solution.

Note: Always add PBM solution before adding the extraction solution. The freshly precipitated magnesium hydroxide [10 mg of Mg(II)] formed suppresses the oxidation of dissolved Cr(III) to Cr(VI) (see Section 4.4. for details).

Swirl the beaker slowly until the white precipitate occurs. Cover the beaker with a watch glass and very slowly heat the solution on the hot plate (surface temperature near 135 °C), with occasional swirling for 60 to 90 min. Allow extra extraction time for heavily loaded samples taken from spray-paint operations (See section 3.5.7). **DO NOT ALLOW ANY SOLUTIONS TO BOIL OR EVAPORATE TO DRYNESS**. Conversion of Cr(VI) to Cr(III) can occur from excess heat (5.4) causing loss of sample.

3.5.5 Allow the solutions to cool to room temperature. Quantitatively transfer each solution to a 10-mL volumetric flask using DI H_2O. Dilute to volume with DI H_2O.

3.5.6. If the solution is cloudy and/or other metal analyses are desired, filter the solution through a syringe prefilter. Alternately, cloudy samples may be centrifuged at 3,200 rpm for 10 min. to precipitate the MgOH. Avoid transferring any of the precipitate to the autosampler vials, as it will clog the IC autosampler, tubing, and/or column frits.

3.5.7. **FOR SAMPLES TAKEN FROM SPRAY-PAINTING OPERATIONS ONLY, PERFORM AN ADDITIONAL EXTRACTION OF EACH FILTER CONTAINING THE PAINT RESIDUE ACCORDING TO THE FOLLOWING PROCEDURE:**

Note: Evidence indicates stronger base extractions are capable of recovering Cr(VI) in specific paint matrices (5.4). Due to the resistant properties of some industrial paints, an additional extraction is used for samples collected during spray-painting to assure complete recovery of all Cr(VI).

1) After the initial extraction with BE and PBM, the solutions are transferred to 10-mL volumetric flasks. Place the sample beakers containing the remaining paint residue/filters and any blanks in an exhaust hood.

2) Add 1.5 mL of PBM solution and then 5 mL of SPE solution (Section 3.3.4) to each beaker containing the filters. Swirl the beaker slowly until a white precipitate occurs. Cover the beaker with a watch glass and very slowly heat the solution on the hot plate at 135°C, with occasional swirling for 60 to 90 min. Allow extra extraction time for heavily loaded samples. **DO NOT ALLOW ANY SOLUTIONS TO BOIL OR EVAPORATE TO DRYNESS**. Sample loss from the conversion of Cr(VI) to Cr(III) can occur from excess heat (5.4). Potential conversion of Cr(III) to Cr(VI) using a strong hydroxide extraction solution has also been noted (5.4). However, the freshly precipitated magnesium hydroxide [10 mg of Mg(II)] formed suppresses the oxidation of dissolved Cr(III) to Cr(VI) (see Section 4.4 for details).

3) Allow the solutions to cool to room temperature. Transfer each solution to a 25-mL volumetric flask. Dilute to volume with DI H_2O. Allow the precipitate to settle, or centrifuge to segregate the precipitate to the bottom of the sample. Alternately, cloudy samples may be filtered through a syringe prefilter. It is important that none of the precipitate is transferred into the autosampler vials, as it can clog the IC autosampler, tubing, and/or column frits.

3.6 Analysis

3.6.1 Pipette a 0.5- to 0.6-mL "clear" portion of each standard or sample solution into separate automatic sampler vials (Note: Be careful not to transfer any of the milky-white magnesium hydroxide precipitate into the vials). Place a filtercap into each vial. The large filter portion of the cap should face the solution.

3.6.2 Load the automatic sampler with labeled samples, standards, and blanks.

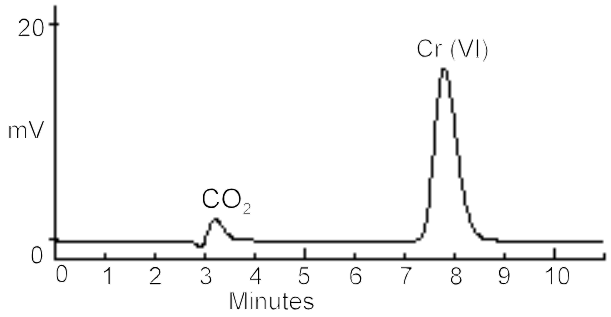
3.6.3 Set up the ion chromatograph in accordance with the Standard Operating Procedure (SOP) (5.19). A diagram of the system flow path (adapted from Reference 5.12) is shown in Figure 1. Typical operating conditions for a Dionex 4000i, 4500i, or DX500 with a UV-vis detector and an automated sampler are listed below:

Note: An SOP is a written procedure for a specific instrument. It is suggested that SOPs be prepared for each type of instrument used in a lab to enhance safe and effective operation.

Ion Chromatograph	
Eluent:	250 mM $(NH_4)_2SO_4$ /100 mM NH_4OH
Postcolumn reagent:	2 mM DPC/10% CH_3OH/1 N H_2SO_4
Column temperature:	ambient
Anion precolumn:	IonPac NG1
Anion separator column:	IonPac AS7
Output range:	0.5 absorbance unit full scale (AUFS)
Detection wavelength:	540 nm
Sample injection loop:	100 µL (a 150 µL loop was used on the DX-500)

Pump	
Pump pressure:	~950 psi
Eluent flow rate:	0.7 mL/min

Postcolumn reagent
flow rate: ~0.34 mL/min
Chromatogram:



A chromatogram of 100 ng/mL Cr(VI).

The CO_2 peak is from the reaction of the bicarbonate and carbonate ions with the sulfuric acid in the post column derivatization mixture. The size of the CO_2 peak can be changed or eliminated by the amount of back pressure on the waste line coming from the detector.

Run time: 11 min
Peak retention time: ~8 min for Cr(VI) (Please note that peak retention times are highly dependent on and individualized to the instrument in use and the age of the column.)

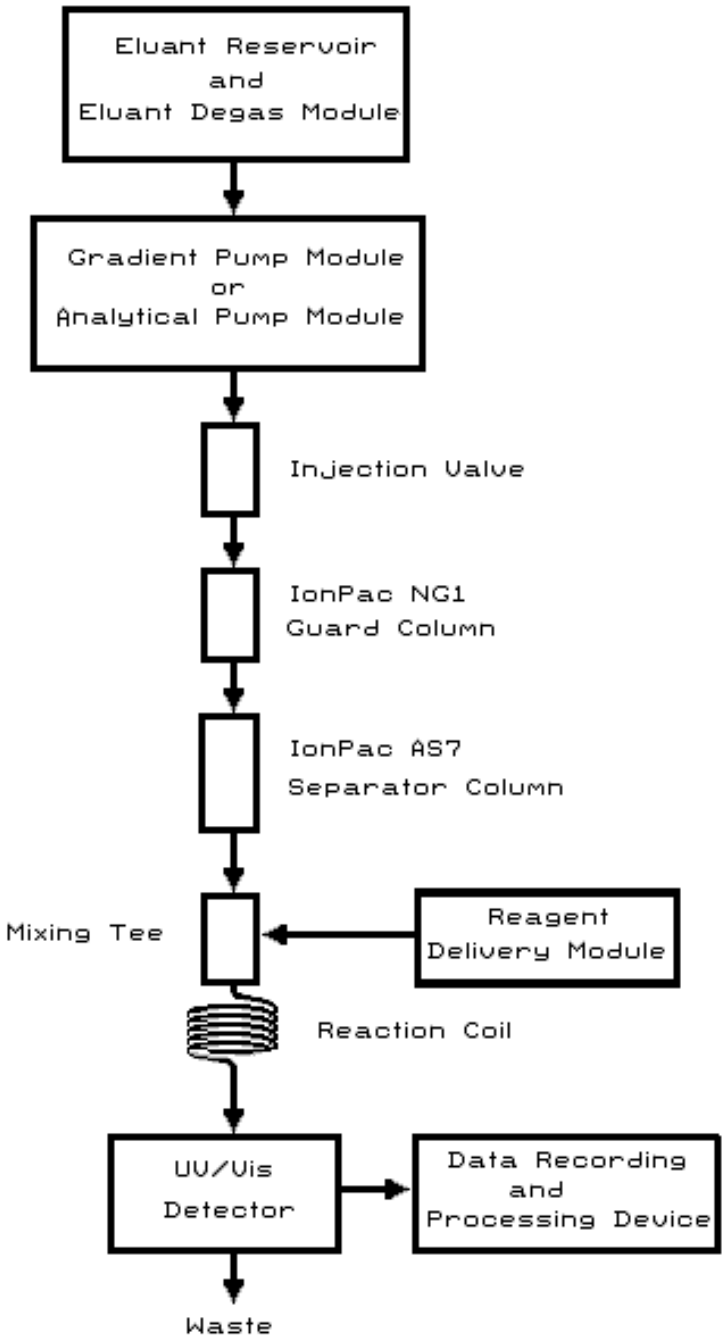


Figure 1. A diagram of the system flow path.

3.6.4 Follow the SOP for further instructions regarding analysis (5.19).

3.6.5 If any sample has a Cr(VI) concentration larger than the highest standard, dilute the sample by taking an appropriate aliquot and add an appropriate amount of DBE/PBM solution to bring the sample concentration within the range of the standards. A dilution factor (DF) as

calculated from the aliquot volume and diluent volume is used in final calculations (e.g., if a 2 mL aliquot is taken and 8 mL of DBE/PBM is added, then a DF of 5 is used.)

3.7 Calculations

3.7.1 After the analysis is completed, retrieve the peak areas or heights. Obtain hard copies of chromatograms from a printer.

3.7.2 Prepare a concentration-response curve by plotting the peak areas or peak heights versus the concentration of the Cr(VI) standards in ng/mL. Peak areas are preferred. Typical instrumental response for working standards from 10 to 1000 ng/mL range using a Dionex Model DX500 equipped with an AD20 Absorbance Detector and GP40 Gradient Pump as follows:

Level	Concentration ng/mL	Peak Height ($\times 10^4$)	Peak Area ($\times 10^6$)
1	0.500	0.005	0.015
2	1.000	0.010	0.031
3	5.000	0.051	0.152
4	10.00	0.095	0.279
5	20.00	0.190	0.545
6	50.00	0.491	1.422
7	100.0	0.980	2.803
8	200.0	1.858	5.245
9	500.0	4.522	12.363
10	1,000	9.628	24.736

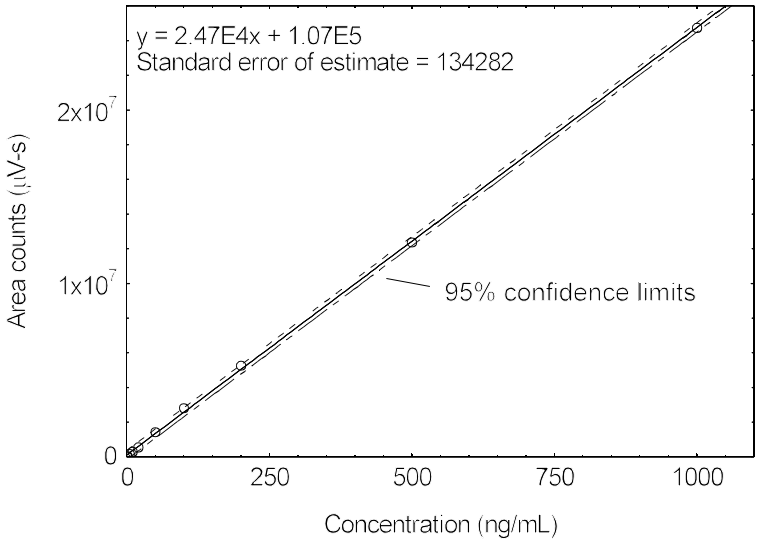


Figure 2. A plot of the standard curve of the above standards.

3.7.3 Perform a blank correction for each PVC filter result. Subtract the ng/mL Cr(VI) blank value (if any) from each sample reading if blank and sample solution volumes are the same. If a different solution volume is used, subtract the total ng blank value from each total ng sample value.

$$A_b = [ng/mL\ Cr(VI)]_b \times (Sol\ Vol)_b$$

$$A_s = [ng/mL\ Cr(VI)]_s \times (Sol\ Vol)_s$$

$$A = [A_s - A_b] \times DF$$

Then calculate the air concentration of Cr(VI) (in µg/m^3) for each air sample:

$$\mu g / m^3 = \frac{A}{AV}$$

Where:

A_b	=	Total ng Cr(VI) in blank
A_s	=	Total ng Cr(VI) in sample
A	=	ng Cr(VI) after blank correction
$[ng/mL\ Cr(VI)]_b$	=	Amount found (from calibration curve) in blank
$[ng/mL\ Cr(VI)]_s$	=	Amount found (from calibration curve) in sample
$(Sol\ Vol)_b$	=	Blank solution volume (mL) from Section 3.5.5 (normally 10 mL*)
$(Sol\ Vol)_s$	=	Sample solution volume (mL) from Section 3.5.5 (normally 10 mL*)
AV	=	Air volume (L)
DF	=	Dilution factor (if any, see Section 3.6.5)
	=	(mL Diluent + mL Aliquot)/mL Aliquot

*The solution volume for each SPE sample is normally 25 mL.

3.7.4 For bulk samples, calculate the total composition (in %) of Cr(VI) in each sample using:

$$\%(w/w)\ Cr(VI) = \frac{(A)(D)(100\%)}{(SW)(1000\ \mu g/mg)}$$

Where:

A	= µg Cr(VI) after blank correction
D	= Dilution factor (if any)
SW	= Aliquot (in mg) of bulk taken in Section 3.5.3

3.8 Reporting Results

3.8.1 For spray-paint samples, add results obtained from the SPE residue extraction, if any, to the initial extraction result.

3.8.2 Report air sample results to the industrial hygienist as µg/m^3 Cr(VI).

3.8.3 Report wipe sample results to the industrial hygienist as total micrograms or milligrams.

3.8.4 Report bulk sample results to the industrial hygienist as approximate per cent Cr(VI).

4. Backup Data

This method has been validated using a full shift sample of 480-min taken at a flow rate of 2 L/min for a 960-L air volume. The method validation was conducted near the proposed OSHA TWA PEL of 0.5 µg/m^3 as Cr(VI). The sampling media used during the validation consisted of a two-section polystyrene cassette containing a 37-mm PVC filter and a cellulose backup pad. The 37-mm, 5-µm pore size PVC filters were purchased from Mine Safety Appliances (MSA) (part no. 625413, Pittsburgh, PA) and from Omega Speciality Instrument Co. (cat. no. P-503700, Chelmsford, MA). The analytical method has been validated using soluble ($K_2Cr_2O_7$) and insoluble ($PbCrO_4$) chromate compounds.

The validation consisted of the following experiments and discussion:

1) An analysis of 18 spiked (soluble chromate) samples - This set consists of 6 samples each at 0.25×, 0.5×, and 1× the proposed OSHA TWA-PEL assuming 960-L air volumes, to determine bias, precision, and overall error (OE) (Note: One sample at 1× PEL was lost during analysis).

2) An analysis of 18 spiked (insoluble chromate) samples - This set consists of 6 samples each at 0.25×, 0.5×, and 1× the proposed OSHA TWA-PEL assuming 960-L air volumes, to determine bias, precision, and OE.

3) An evaluation of storage stability at room temperatures (20 to 25 °C) for 24 spiked samples.

4) A determination of the qualitative and quantitative detection limits for Cr(VI).

5) An interference study using varied amounts of reducing substances and addition of Mg (II) to prevent oxidation of Cr(III) to Cr(VI).

6) A comparison of BE dilutions using concentration ratios (v:v) of 1:10, 1:8, 1:5 and 1:2.

7) An analysis of 3 sets of Cr(VI) quality control (QC) samples.

8) An evaluation of a strong extraction solution for spray-paint samples.

9) An analysis of Cr(VI) field samples using both DPP and IC/UV-vis methods.

10) A summary.

An aerosol generation system to determine sampler efficiency was unavailable; however, this method (OSHA ID-215) uses the sampling device historically used for chromate collection, which was examined previously by NIOSH (5.13). All samples were analyzed using a Dionex model 4000, 4500i, or DX500 IC equipped with a postcolumn reagent delivery system and a UV-vis detector. A 100 µL sample loop was used on the Dionex 4000 and 4500i IC, and a 150 µL loop was used on the DX500 IC. The larger 150 µL sample loop on the DX500 increased the sensitivity slightly, allowing for the lower detection limits. All sample results were calculated from concentration-response curves and statistically examined for outliers. In addition, the analyses results were tested for homogeneity of variance. Possible outliers were determined using the Treatment of Outliers Test (5.21). Homogeneity of variance was determined using Bartlett's test (5.22). Statistical evaluation was conducted according to the Inorganic Methods Evaluation Protocol (5.23). The overall error (OE) (5.22) was calculated using the equation:

$$OE_i\% = \pm(|bias_i| + 2CV_i) \times 100\% \text{ (at the 95\% confidence level)}$$

Where *i* is the respective sample pool being examined.

4.1 Spiked Sample Analysis

Samples were prepared by adding known amounts of $K_2Cr_2O_7$ and $PbCrO_4$ stock solutions to PVC filters (also see Section 4.2 for preparation) to determine bias, precision, and OE for the analytical portion of the method. Samples were prepared with and without the addition of phosphate buffer/Mg(II) to evaluate any difference in recoveries. The lower concentration, 0.25× and 0.5× TWA PEL were used for this comparison.

4.1.1 Procedure: The PVC filters were spiked using a 25-µL syringe (Hamilton Microliter/Gastight Syringe, Hamilton Co., Reno, NV). Spikes (both $K_2Cr_2O_7$ and $PbCrO_4$) were 0.11, 0.20, and 0.40 µg as Cr(VI). These levels correspond approximately to 0.25, 0.5, and 1× the proposed OSHA TWA PEL for a 960-L air sample collected at a 2-L/min flow rate.

4.1.2 Results: Recoveries are presented in Tables 1a, 1b, and 1c. As shown, including addition of phosphate buffer/Mg(II) in Table 1c, the mean recovery for all levels tested is very close

to 1.0 for both soluble and insoluble chromate compounds. No DE corrections are necessary for Cr(VI) collection using PVC filters.

Table 1a
Cr(VI) Analysis
Analytical Recovery Using $K_2Cr_2O_7$ Spikes

Level	N	Mean Recovery	SD	CV	OE_T ±%
0.25 × PEL	6	1.047	0.061	0.058	16.3
0.5 × PEL	6	1.002	0.061	0.061	12.4
1 × PEL	5*	0.966	0.035	0.037	10.9
All Levels	17	1.007		0.054	11.5

*One sample was lost in analysis.

Table 1b
Cr(VI) Analysis
Analytical Recovery Using $PbCrO_4$ Spikes

Level	N	Mean Recovery	SD	CV	OE_T ±%
0.25 × PEL	6	1.019	0.079	0.078	17.5
0.5 × PEL	6	0.970	0.021	0.021	7.2
1 × PEL	6	0.969	0.074	0.076	18.3
All Levels	18	0.986		0.064**	14.2

**= CV_1 (pooled)

Table 1c
Cr(VI) Analysis
Analytical Recovery Using $K_2Cr_2O_7$ Spikes
After adding Phosphate Buffer/Mg(II)

Level	N	Mean Recovery	SD	CV	OE_T ±%
0.25 × PEL	6	1.000	0.112	0.112	22.4
0.5 × PEL	7	0.985	0.007	0.008	3.1

Where
N = Number of Samples; SD = Standard Derivation
CV = Coef. of Variation; OE_T = Overall Error (Total)

4.2. Storage Stability

Procedure: Twenty-four samples were spiked to evaluate stability prior to sample analysis. A $PbCrO_4$ stock solution was used to spike samples near 0.5 × the proposed OSHA TWA PEL [as Cr(VI)] for a 960-L sample and to demonstrate stability for insoluble chromates. Data from the SLTC Quality Control Division indicates that spiked samples prepared using soluble potassium dichromate at concentrations specified in Section 1.4.7 were stable at least one month after spiking. Solubility product values indicated that lead chromate was the least soluble of the chromate compounds commonly found in industry. However, data was not available for insoluble samples prepared in the extraction media. The $PbCrO_4$ was weighed out, extracted into solution using BE and then spiked onto PVC filters. After spiking, all samples (sealed cassettes containing PVC filters) were stored under normal laboratory conditions (20 to 25°C) in a lab drawer. Six samples were initially extracted and analyzed, then six samples were extracted and analyzed after various periods of storage (5, 15, and 30 days).

Another storage experiment was also conducted using prepared extraction solutions with DBE and phosphate buffer/Mg(II). This experiment was performed separately to evaluate storage after the samples were prepared. Six samples were spiked using the soluble $K_2Cr_2O_7$ stock solution at 0.25 ×the proposed OSHA TWA PEL [as Cr(VI)] for a 960-L sample. These separate samples were initially extracted and analyzed, and then the same samples were analyzed after 30 days.

Results: As shown in Tables 2a and 2b, the results of both tests conducted at room temperature show the mean recovery from filter and extracted samples analyzed after 30 days was within ±5% of the recovery value at Day 0.

Table 2a
Storage Stability Using Insoluble $PbCrO_4$
0.5× PEL

Day	N	Mean, µg	SD	CV	Recovery (%)
0	6	0.197	0.004	0.021	97.0
5	6	0.190	0.005	0.026	93.6
15	6	0.200	0.018	0.088	98.7
30	6	0.190	0.008	0.040	93.7

Table 2b
Storage Stability Using Soluble $K_2Cr_7O_4$ + DBE + Phosphate Buffer/Mg(II)
0.25× PEL

Day	N	Mean, µg	SD	CV	Recovery (%)
0	6	0.120	0.013	0.11	100
30	6	0.126	0.010	0.08	105

4.3 Qualitative and Quantitative Detection Limit Study

A modification of the National Institute for Occupational Safety and Health (NIOSH) detection limit calculation procedure (5.24, 5.25) was used to calculate detection limits.

Procedure: Ten different concentrations were used by spiking six separate PBM/DBE solutions (Section 3.3.8) with aliquots of aqueous standards prepared from $K_2Cr_2O_7$ (Section 3.3.11). All samples were analyzed using a 100-µL sample injection loop and a UV-vis detector setting of 0.5 AUFS.

Results: The spiked sample results are shown in Table 3 for qualitative and quantitative detection limits, respectively. The qualitative detection limit was 1 ng [as Cr(VI)] when using a 10-mL solution volume. This corresponds to 1.0×10^{-3} µg/m^3 as Cr(VI) for a 960-L air volume. The quantitative detection limit was 3 ng [as Cr(VI)] when using a 10-mL solution volume. This corresponds to 3.0×10^{-3} µg/m^3 as Cr(VI) for an 960-L air volume.

Table 3
Qualitative and Quantitative Detection Limits
Cr(VI) Level (as ng/mL)

Sample Number	0.1 PA	0.2 PA	0.3 PA	0.4 PA	0.5 PA	0.6 PA	0.7 PA	0.8 PA	0.9 PA	1.0 PA
1	1644	4786	7292	11136	15252	17612	19970	23583	29116	31324
2	1726	4911	7264	11143	15772	17188	19978	23190	29956	31414
3	1774	4933	7319	11575	15510	17412	19725	23444	29348	31402
4	1742	4999	7486	11576	14859	16850	21384	23667	29237	31697
5	1436	4862	7017	11553	14530	17528	21658	23519	29289	30908
6	1748	4902	7039	11675	15404	16978	21638	23680	30207	31968

PA = Integrated Peak Area
The blank integrated peak areas and their standard deviations (std dev) were all equal to zero.

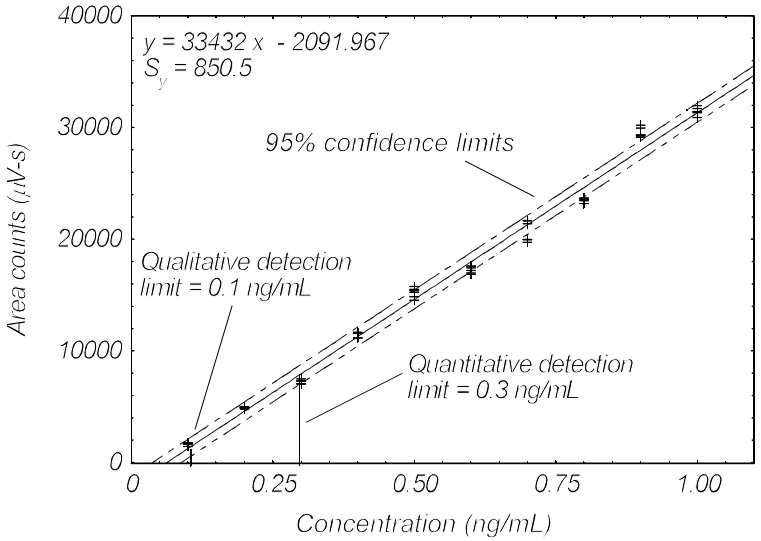


Figure 3. A plot of the standards to determine the detection limit.

The response of the low-level calibration samples were plotted to obtain the linear regression equation (Y = mX + b), and the predicted responses ($\hat{Y}_i$) at each X.

Using the equations:

$$S_y = [\sum(\hat{Y}_i - Y_i)^2/(N - 2)]^{½}$$
$$Q1 = (3S_y)/m$$
$$Q2 = 3.33\ Q1$$

Where:
Y_i = the measured response
m = analytical sensitivity or slope as calculated by linear regression
S_y = the standard error of the regression
N = the number of data points
Q1 = qualitative detection limit
Q2 = quantitative detection limit

Therefore, $Q1 = (3S_y)/m$
= 0.1 ng/mL as Cr(VI)
$\Rightarrow$ 1.0 ng as Cr(VI) (10-mL sample volume)
$\Rightarrow 1.0 \times 10^{-3}$ µg/m^3 as Cr(VI) (960-L air volume)

$Q2 = 3.33\ Q1$
$\Rightarrow 3.0 \times 10^{-3}$ µg/m^3 as Cr(VI) (960-L air volume)

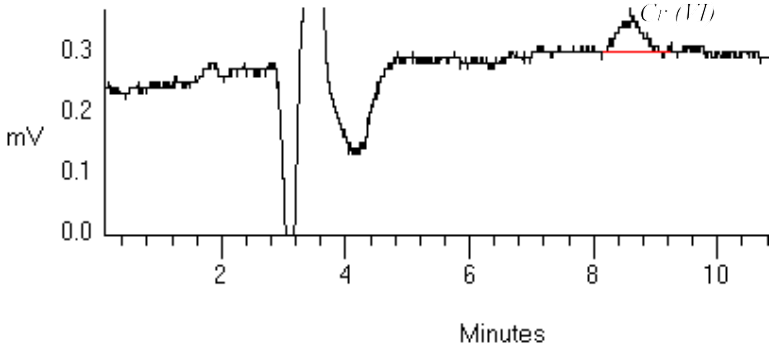


Figure 4. A chromatogram of the quantitative detection limit of 0.3 ng/mL Cr(VI).

It is interesting to note that the addition of phosphate buffer/Mg(II) to the solutions significantly increased detection limits. The qualitative and quantitative limits without addition of the Cr(III) conversion suppressor were approximately six times less than the limits stated above. In standards above 50 ng/mL this difference was not noted. In standards less than 50 ng/mL the difference between standards prepared with only BE and those with the addition of phosphate buffer/Mg(II) increases as the concentration of the standards decreases, such that the lower end of the calibration curve becomes quadratic.

4.4 Interference Study

Six experiments to test potential interferences from various amounts of Cr(III), Fe(II), Fe(III), V(V), Mo(VI), Cu(I), and Mn(II) were conducted. These substances may coexist with Cr(VI) compounds in some workplace atmospheres and may also interfere with the analysis of Cr(VI) (5.3). The following chemicals were used for preparing the solution spikes for this study:

Potassium dichromate, $K_2Cr_2O_7$, for Cr(VI); Chromium nitrate, $Cr(NO_3)_3 \cdot 9H_2O$, for Cr(III); Ferrous sulfate, $FeSO_4$, for Fe(II); Ferric nitrate, $Fe(NO_3)_3$, for Fe(III); Vanadium pentoxide, V_2O_5, for V(V); Molybdenum trioxide, MoO_3, for Mo(VI); Cuprous chloride, Cu_2Cl_2, for Cu(I); Manganous chloride, $MnCl_2 \cdot 4H_2O$, for Mn(II); and Magnesium chloride, $MgCl_2$, or Magnesium sulfate, $MgSO_4$, for Mg(II).

All Cr(III) solutions were used to test how much, if any, Cr(III) converts to Cr(VI) on PVC filters or in solution. Mixtures using Mg(II) were used to determine its ability to suppress potential interferences. Early experiments were conducted using magnesium chloride to provide the magnesium needed to form the magnesium hydroxide precipitate with any Cr (III) present. Magnesium sulfate was also used in a comparison between the two salts in an extraction study. Both the chloride and the sulfate of magnesium gave comparable results. Magnesium sulfate is recommended in this method because of the better, larger precipitate formation. A significant difference between the two salts was not noted in terms of recovery, peak characteristics, or retention times. A difference was noted in that the magnesium chloride gave a precipitate that was more difficult to decant.

The six experiments are detailed in Sections 4.4.1 through 4.4.6 below.

4.4.1 Differing amounts of Cr(VI) and each of the interfering substances were mixed in the same volumetric flasks and then spiked onto individual PVC filters. The concentrations of the spikes varied from 0 to 10 times the Cr(VI) concentration.

Procedure: Fifteen different potential interference mixture combinations and six samples of each combination were prepared, extracted with BE, and analyzed after 1:1 dilution. A large amount (887.6 and 872 ng/mL) of Cr(VI) was used for the spikes in this Experiment (and also Experiment 3) so that any significant effect would be analytically obvious.

Results: The recoveries for Cr(VI) with varied amounts of reducing substances are shown in Table 4a.

Table 4a - Experiment 1
Interference Study - 1:1 dilution BE
Known Amount of Cr(VI) = 887.6 ng/mL

No.	Mixture Composition	Ratio	N	Mean, ng/mL	SD	CV	Recovery, % As Cr(VI)
1	Cr(VI) only	1:0	6	887.6	26.0	0.029	100
2	Cr(VI):Cr(III)	1:10	6	911.5	23.5	0.026	103
3	Cr(VI):Fe(II)	1:10	6	258.9	8.79	0.034	29.2
4	Cr(VI):Fe(III)	1:10	6	918.5	19.5	0.021	103
5	Cr(VI):V(V)	1:10	5	915.8	29.7	0.032	103
6	Cr(VI):Mo(VI)	1:10	6	874.5	16.6	0.019	98.5
7	Cr(VI):Cu(I)	1:10	6	898.0	76.4	0.085	101
8	Cr(VI):Mn(II)	1:10	6	838.0	33.9	0.040	94.4
9	Cr(VI):Fe(II)	1:1	6	811.1	18.1	0.022	91.4
10	Cr(VI):Fe(II)	1:5	6	643.8	12.5	0.019	72.5
11	Cr(VI):Cr(III):Fe(II)	1:1:1	6	848.5	17.5	0.021	95.6
12	Cr(VI):Cr(III):Fe(II)	1:5:5	6	566.3	15.9	0.028	63.8
13	Cr(VI):Cr(III):Fe(II)	1:10:10	6	291.5	10.0	0.034	32.8
14	Cr(VI):Cr(III):Fe(II): Fe(III):V(V):Mo(VI)	1:1:1: 1:1:1	6	841.5	11.8	0.014	94.8
15	Cr(VI):Cr(III):Fe(II): Fe(III):V(V):Mo(VI)	1:10:10: 10:10:10	6	761.6	30.8	0.040	85.8

As shown above, except for the solution containing large amounts of Fe(II) over Cr(VI), the recovery range is very close to 100%. When Cr(III) was added to Fe(II) and Cr(VI) the recovery is 91%, as shown in samples in set no. 9. Cr(III) added to 1:5 Cr(VI):Fe(II) had a recovery of 64%, as shown in samples in set no. 12. Cr(III) added to 1:10 Cr(VI):Fe(II) had recovery of 33%, as shown in samples in set no. 13. These losses occurred in a slightly acidic environment [both analytes were prepared in DI H_2O (pH≈5.5) and contained in the same volumetric flask].

4.4.2 Once the Fe(II) interference was identified in Experiment 1, a smaller amount of Cr(VI) and Fe(II) were used for Experiment 2. An additional test was performed to determine conversion of Cr(III) to Cr(VI).

Procedure: Cr(VI) was spiked onto PVC filters first, dried, and then differing amounts of Fe(II) or Cr(III) were spiked on the Cr(VI) spot, dried, and then extracted with BE, and analyzed after 1:1 dilution.

Results: Table 4b shows the recoveries for Cr(VI) are close to 70% for 1:1, 1:5, and 1:10 Cr(VI) : Fe(II). This approximately 30% loss apparently occurred while both spikes were residing on the filter. A very small amount of Cr(III) converting to Cr(VI) is noted in Table 4b (0.71 ng/mL).

Table 4b - Experiment 2
Interference Study - 1:1 dilution BE
Known Amount of Cr(VI) =101.5 ng/mL

No.	Mixture Composition	Ratio or Amount	N	Mean, ng/mL	SD	CV	Recovery, % As Cr(VI)
1	Cr(VI) only	101.5 ng/mL Cr(VI)	6	101.5	3.72	0.037	100
2	Cr(III) only	1.0 µg/mL Cr(III)	6	0.71*	0.36	0.50	<1*
3	Cr(VI):Fe(II)	1:1	5	72.0	4.41	0.061	70.9
4	Cr(VI):Fe(II)	1:5	5	69.2	6.66	0.096	68.2
5	Cr(VI):Fe(II)	1:10	6	69.0	5.24	0.076	68.0

*Cr(III) converted to Cr(VI)

4.4.3 The SPE solution, which contained 5% NaOH and 7.5% Na_2CO_3, was used as an extraction solution in Experiment 3 to evaluate the ease of converting Cr(III) to Cr(VI) in a stronger base. The experiment was also conducted to test whether or not magnesium (Mg) can prevent conversion of Cr(III) to Cr(VI) in SPE solutions. This conversion was noted in the literature (5.6) when using a NaOH/Na_2CO_3 extraction similar to SPE, but was not noted in earlier work using BE solutions (5.8), primarily because of the significantly higher PEL and spiking concentrations used.

Procedure: Cr(VI) was spiked onto PVC filters first, dried, and then Cr(III) was spiked on the Cr(VI) spot, dried, and then extracted with SPE, and analyzed after 1:1 dilution.

Results: Table 4c shows adding 1 mg of Mg(II) can prevent Cr(III) converting to Cr(VI). This was the same conclusion presented in Reference 5.6.

Table 4c - Experiment 3
Interference Study - 1:1 dilution SPE
Known Amount of Cr(VI) =872 ng/mL

No.	Mixture Composition	Ratio or Amount	N	Mean, ng/mL	SD	CV	Cr(III) Converted to Cr(VI), %
1	Cr(VI) only	872 ng/mL Cr(VI)	4	872	16	0.018	-
2	Cr(III) only	10 µg/mL Cr(III)	4	18*	1.3	0.069	<0.2
3	Cr(VI):Cr(III)	1:10	4	880	12	0.013	<0.1
4	Cr(III) + 1 mg Mg(II)	10 µg/mL Cr(III)	4	ND	-	-	-
5	Cr(VI):Cr(III) + 1 mg Mg(II)	1:10	4	1055	10	0.012	<0.03

*Cr(III) converted to Cr(VI)
Note: ND = 0.251 ng/mL as Cr(VI)

4.4.4 Experiment 4 was conducted to further test the effectiveness of Mg(II) with large proportions of Cr(III) to Cr(VI) in both BE and SPE solutions. Because Cr(VI) is significantly more toxic than Cr(III) [Note: The TWA PELs for Cr(VI) and Cr(III) are 0.50 µg/m^3 (proposed) and 1 mg/m^3, respectively], the concentration ratio of Cr(VI) and Cr(III) in Experiment 4 was: Cr(VI) : Cr(III) = 250 ng: 5 mg = 1: 20,000.

Procedure: Experiment 4 included 10 tests. The first 5 tests were conducted using BE solution and the last 5 tests were conducted using SPE solution. Each sample was spiked with 250 ng of Cr(VI) or 5 mg of Cr(III) while contained in a 50-mL Erlenmeyer flask, 10 or 20 mg Mg(II), and then 5 mL BE (sample sets A through D) or SPE (sample sets A' through E') solution were added. Each sample was slowly extracted for 60 min, and finally diluted with DI H_2O to the mark of a 10-mL volumetric flask for BE and 25 mL for SPE. The following are designated set numbers for Experiment 4 (Mg added as $MgSO_4$.):

A: 250 ng of Cr(VI) (control samples);
B: 5 mg of Cr(III) [check for conversion to Cr(VI) during extraction];
C: 250 ng of Cr(VI) + 5 mg of Cr(III);
D: C + 10 mg Mg(II);
E: C + 20 mg Mg (II);
A': 250 ng of Cr(VI) (control samples);
B': 500 mg of Cr(III) [check for conversion to Cr(VI) during extraction];
C': 250 ng of Cr(VI) + 5 mg of Cr(III);
D': C' + 10 mg Mg(II);
E': C' + 20 mg Mg(II);

Results: Table 4d data suggests that the oxidation of Cr(III) occurred during the alkaline extraction process. When alkalinity was increased by using 5% NaOH, more Cr(III) was oxidized to Cr(VI) (as shown in SPE, Samples A' to E'). Although the conversion is small as percentage of Cr(III), it is very significant in terms of the proposed PEL. A previous work conducted by the author (5.8) did not note the conversion in BE solutions; however, the larger detection limit and lack of significance (the PEL of 0.05 mg/m^3 was used in the past work) were contributing factors. The net conversion of Cr(III) to Cr(IV) is considered extremely minor when comparing amounts to the PEL of 0.05 mg/m^3. In the presence of freshly precipitated magnesium hydroxide (10 or 20 mg of Mg) the oxidation of dissolved Cr(III) was suppressed to insignificantly low levels. As shown in Table 4d, the approach with Mg(II) is also applicable in the more strongly basic solution of SPE (5% NaOH/7.5% Na_2CO_3). It should be noted that the SPE extraction is performed after the BE extraction, and little, if any, soluble Cr(III) should still be present. It is important to note, for maximum effectiveness, the magnesium salt/phosphate buffer solution is added to the sample **before** BE or SPE solutions.

Table 4d - Experiment 4
Interference Study - 1:1 dilution BE (A to D) and SPE (A' to E')
Known Amount of Cr(VI) = 250 ng; Cr(III) = 5 mg

Set #	N	ng Cr(VI) found theoretical = 250 ng	SD	CV	Cr(III) converted to Cr(VI)(%)
A	6	249.57	3.98	0.016	-
B	6	128.03	7.93	0.062	0.00256
C	6	373.19*	7.74	0.021	0.00246
D	6	250.07*	5.27	0.021	-
E	6	237.82*	2.97	0.013	-
A'	6	253.06	3.60	0.014	-
B'	6	226.45	8.23	0.036	0.0045
C'	6	484.79*	13.07	0.027	0.0047
D'	6	281.43*	5.12	0.018	0.00063
E'	6	268.18*	6.17	0.023	0.00036

*Cr(III) converted to Cr(VI) plus 250 ng Cr(VI) spike

4.4.5 Experiment 5 was conducted to repeat certain aspects of Experiment 4 and to determine the amount of Mg(II) needed to prevent Cr(III) conversion to Cr(VI) during the extraction process.

Procedure: Experiment 5 repeated the design of Experiment 4, except that Cr(VI) : Cr(III) = 500 ng:5 mg = 1:10,000. The following sets used in this experiment are (Mg(II) is as $MgSO_4$):

F: 500 ng of Cr(VI) + 5 mg of Cr(III) + 5 mg Mg(II) with BE;
G: 500 ng of Cr(VI) + 5 mg of Cr(III) + 10 mg Mg(II) with BE;
H: 500 ng of Cr(VI) + 5 mg of Cr(III) + 15 mg Mg(II) with BE;
G': 500 ng of Cr(VI) + 5 mg of Cr(III) + 10 mg Mg(II) with SPE;

Results: Table 4e shows that, in BE solution, the addition of 5, 10, or 15 mg of Mg(II) to a mixture of Cr(III) and Cr(IV) gave comparable results. The slight decrease in recovery as Mg(II) increased

appears more so as noise resulting from analyzing a very small amount (500 ng) of Cr(VI). It was noted that the addition of Mg(II) produces a significant precipitate of magnesium hydroxide in the extraction solution and that the more added, the larger the precipitate. This precipitate must be carefully handled when transferring solutions for analysis to prevent injection into the ion chromatograph.

Table 4e - Experiment 5
Interference Study - 1:1 dilution BE (F to H) and SPE (G')
Known Amount of Cr(VI) = 500 ng; Cr(III) = 5 mg

Set #	N	Mean ng as Cr(VI) Theory=500ng	SD	CV	Cr(III) converted to Cr(VI), %
F	6	507.55*	2.88	0.0057	<0.01
G	6	496.59*	3.67	0.0074	-
H	6	497.35*	5.82	0.0096	-
G'	6	508.48*	4.86	0.0096	<0.01

*Cr(III) converted to Cr(VI) plus 500 ng Cr(VI) spike.

4.4.6 Experiment 6 was performed to test whether or not adding Mg(II) or phosphate buffer (0.5 M KH_2PO_4/0.5 M K_2HPO_4)/Mg(II) can also prevent the negative Fe(II) interference on Cr(VI) analysis. The phosphate buffer is thought to aid in complexing the Cr(III) (5.5).

Procedure: Experiment 6 included 2 tests. The first test was conducted using only Mg(II) spiking on Fe(II); the second test was performed using the mixture of phosphate buffer/Mg(II) on the Fe(II). A known amount of Cr(VI) was spiked on one side of each PVC filter and the Fe(II) spiked on the other side of each filter. The filters were allowed to dry overnight and then Mg(II) or the mixture of phosphate buffer/Mg(II) was added prior to extraction with BE solution. The following sets were used for this experiment:

I: 100 ng/mL of Cr(VI) + 1.0 µg/mL of Fe(II) + 10 mg Mg(II)(as $MgCl_2$)
J: 100 ng/mL of Cr(VI) + 1.0 µg/mL of Fe(II) + 10 mg Mg(II)(as $MgCl_2$ mixed with phosphate buffer).
K: 100 ng/mL of Cr(VI) + 1.0 µg/mL of Fe(II) + 10 mg Mg(II) (as $MgSO_4$ mixed with phosphate buffer).

Results: Table 4f shows a significant increase in recovery of Cr(VI) as compared to Experiment 2 is noted when adding Mg(II) or phosphate buffer/Mg(II) mixture.

Table 4f - Experiment 6
Interference Study - 1:1 dilution BE
Known Amount of Cr(VI) = 100 ng/mL

Set #	Mixture Composition	Ratio	N	Mean, ng/mL	SD	CV	Recovery, % As Cr(VI)
I	Cr(VI):Fe(II)	1:10	6	92.7	4.29	0.046	92.7
J	Cr(VI):Fe(II)	1:10	6	96.6	3.41	0.035	96.6
K	Cr(VI):Fe(II)	1:10	6	95.8	1.59	0.026	95.8

4.5 Comparison of Different DBE Solutions

Due to the strongly basic nature of the BE solution, a dilution with DI H_2O needs to be performed prior to analysis. To determine the most effective dilution, the following experiment was performed.

Procedure: In order to compare the performance of this method and to potentially increase the analytical sensitivity, different DBE solutions were used for testing. Four DBE solutions were prepared from the original BE solution: 1) 1 to 10 dilution of original BE solution; 2) 1 to 8 dilution; 3) 1 to 5 dilution; and 4) 1 to 1 dilution. A spike of 80 ng/mL Cr(VI) was added to each dilution.

Results: Table 5 shows results of the comparison study. As shown, there were no significant differences among the recoveries, however; certain characteristics of the chromatogram changed as the concentration of BE changed.

Table 5
Comparison Study - BE Dilution Factors

Dilution Factor 1 to x	N	Mean Cr(VI) µg	SD	CV	Ratio $\mu g_{(1 \text{ to } x)}/\mu g_{(1 \text{ to } 10)}$
1 to 10	6	77.5	3.6	0.047	-
1 to 8	6	80.6	1.7	0.021	1.04
1 to 5	6	76.5	2.9	0.037	0.99
1 to 1	5	77.3	3.5	0.046	1.00

An additional test was performed to assess the differences in the chromatogram using 100 ng/mL Cr(VI) standard in DI H_2O, in a 1:1 dilution, and in BE. As shown in the following figure, a peak appearing just before the Cr(VI) peak becomes larger as the concentration of DBE solution becomes stronger, though the size of this peak also depends on the freshness of the DBE/PBM solution, the age of the standards or samples, and the back pressure of the pumps. Broadening of the Cr(VI) peak also occurs, indicating that matrix matching of the standards and samples is necessary. A dilution of 1:1 was chosen to maintain adequate sensitivity with minimal peak broadening when compared to aqueous standards.

4.6 Evaluation of Extraction Solution for Spray-Paint Samples

Procedure: The resistance of spray-paints to extraction can be a serious problem as stated in OSHA method ID-103 (5.8). This method included a digestion step using perchloric and other mineral acids to assure all chromium was accounted for in spray-paint samples. In order to compare the extraction efficiency of solutions used for extracting Cr(VI) from spray-paint samples, two solutions were tested: 1) the buffer/extraction (BE) solution (10% Na_2CO_3 / 2% $NaHCO_3$); 2) a solution containing NaOH further designated as spray-paint extraction (SPE) (5% NaOH + 7.5% Na_2CO_3). Preparation of these two solutions are specified in Sections 3.3.3 and 3.3.4, respectively. Using a disposable plastic pipette, two drops of automotive finishes spray-paint (Sunfire 421, Acrylic

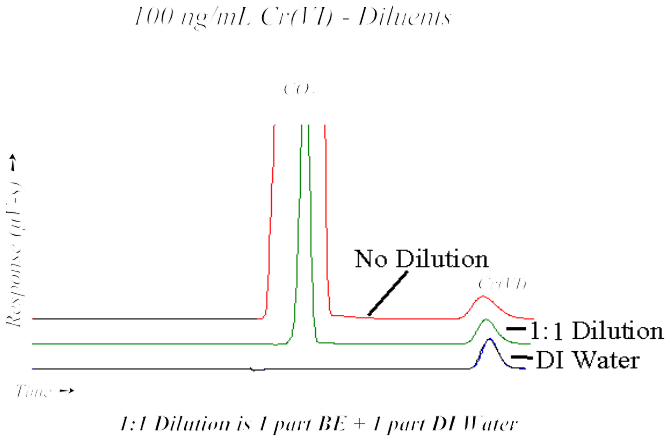


Figure 5. Overlapping chromatograms illustrating the effect of the amount of carbonate/magnesium/phosphate solution on these chromatograms.

Urethane Enamel, The Sherwin-William Co., Cleveland, OH) containing lead chromate (3% as chromium) were spiked onto PVC filters contained in individual 125-mL Phillips beakers. The

analyses followed the procedure described in Sections 3.5.1. through 3.5.7., however, due to the possible high content of Cr(VI), 5 mL of extraction solution (BE or SPE) was added to each sample, and then after extraction, diluted to 50 mL with DI H_2O. One mL of this solution was then taken and diluted to 10 mL with DI H_2O.

Results: Table 6 shows the results of a comparison of the effectiveness of these two extraction solutions. As shown, the SPE solution is superior to the BE solution for extraction of Cr(VI) in potentially resistant spray-paint samples.

Table 6
Comparison Study - BE Solution vs. SPE Solution

Extraction Solution	N	Mean, µg	SD	CV	Ratio, SPE/BE
BE	5	142	9.9	0.069	-
SPE	5	211	33	0.16	1.49

4.7 Comparison of Extraction with $MgCl_2$ and $MgSO_4$

Procedure: PVC filters were spiked with 1 µg Cr(VI) and extracted with a solution of 10 mg/mL Mg (II), in the form of either $MgCl_2$ or $MgSO_4$, in the phosphate buffer, and then BE solution was added.

Results: Table 7 shows that there was little difference in the extraction efficiency between the two different salts of magnesium.

Table 7
Comparison Study - $MgCl_2$ vs $MgSO_4$

Type of Mg	N	Mean ng Cr(VI)	SD	CV	Recovery, %
$MgCl_2$	6	1000	2.31	.063	100
$MgSO_4$	6	991	1.46	.042	99.1

4.8. Analysis of Cr(VI) Quality Control (QC) Samples

Procedure: Three sets of Cr(VI) QC samples were prepared by an independent source by spiking 10 to 20 µg Cr(VI) on the PVC filters. Samples were analyzed using the conditions stated in Section 3 of this method.

Results: Table 8 shows the results of the QC samples, which have amounts typical of those near or over the PEL of 0.05 mg/m^3 Cr(VI). Samples with higher concentrations can be analyzed using this method provided higher standards are prepared to bracket the samples, or the appropriate aliquot/dilution is performed.

Table 8
Cr(VI) QC Samples

Set	N	Mean, F/T*	SD	CV	Recovery, %
I	4	0.949	0.019	0.020	94.9
II	4	0.978	0.050	0.051	97.8
III	4	0.940	0.049	0.053	94.0
				0.044**	95.6 ave.

*F/T = Found/Theoretical (Recovery)
**CV (pooled)

4.9 Analysis of Cr(VI) Field Samples

Procedure: In order to compare the new IC/UV-vis method to the previous method, Cr(VI) samples collected during field surveys were used. These samples had been previously analyzed by a SLTC chemist using the DPP method (OSHA method no. ID-103).

Results: Table 9 shows the Cr(VI) results in mg/m^3. The DPP results are in parenthesis for comparison purposes. As shown, both methods are in good agreement except for a few very low concentrations in which the DPP method gave "none detected"results. However, for those DPP-ND samples, the IC/UV-vis method detected the presence of Cr(VI) and was able to quantitate amounts.

Table 9 - Analysis Cr(VI) Field Samples

Sample No.	Air Volume, L	ng/mL, Cr(VI)	µg, Cr(VI)	mg/m^3, Cr(VI)
01	512.0	ND	ND	ND (ND)
02	632.0	ND	ND	ND (ND)
03	602.0	ND	ND	ND (ND)
04 (Bl)	0	ND	ND	ND (ND)
05	42.5	62.9	6.29	0.1480 (0.1838)
06 (Bl)	0	ND	ND	ND (ND)
07	876.0	8.98	2.25	0.0026 (0.0019)
08	588.0	6.81	1.70	0.0029 (0.0017)
09	802.0	9.82	2.46	0.0031 (0.0023)
10	0	ND	ND	ND (ND)
11	799.2	13.3	3.33	0.0042 (0.0039)
12	797.0	8.85	2.21	0.0028 (0.0020)
13	869.5	13.9	3.49	0.0040 (0.0041)
14	827.5	19.1	4.79	0.0058 (0.0059)
15	945.6	6.84	1.71	0.0018 (0.0011)
16	930.0	4.48	1.12	0.0013 (ND)
17	882.0	17.4	4.35	0.0049 (0.0050)
18	884.1	7.84	1.96	0.0022 (0.0016)
19	887.3	6.07	1.52	0.0017 (ND)
20	276.0	ND	ND	ND (ND)
21	392.0	5.37	1.34	0.0034 (ND)
22 (Bl)	0	ND	ND	ND (ND)
23 (Wipe)	0	5.09	1.27 µg	1.27 µg (1.06 µg)
24	64.3	15.4	1.54	0.0239 (0.0247)
25	52.0	ND	ND	ND (ND)
26	181.7	ND	ND	ND (ND)
27 (Wipe)	0	6.00	1.50 µg	1.50 µg (0.85 µg)
28 (Bl)	0	ND	ND	ND (ND)
29	63.0	4.72	0.47	0.0075 (ND)
30	74.1	ND	ND	ND (ND)
31 (Bl)	0	ND	ND	ND (ND)
32	566.0	ND	ND	ND (ND)
33	658.0	ND	ND	ND (ND)

Note: For IC/UV-vis, ND=2.51 ng as Cr(VI). For DPP, ND=100 ng as Cr(VI) (5.6.). Both NDs are based on 10-mL solution volume.

4.10. Summary

This analytical method has been shown to be precise and accurate when analyzing soluble and insoluble chromate compounds (as potassium dichromate and lead chromate, respectively) commonly found in the workplace. The validation results indicate the method meets the OSHA criteria for accuracy and precision (5.23). Performance during storage stability tests is adequate. Detection limits [as Cr(VI)] are very low when samples are taken for 8 h at 2 L/min. No significant interferences were found from various amounts of reducing substances except for samples containing Fe(II). Results indicate that not only does the addition of magnesium sulfate or

magnesium chloride prevent the conversion of Cr(III) to Cr(VI), but also can minimize the Fe(II) effect on Cr(VI) analysis.

A 1:1 dilution was used for optimal sensitivity. A peak prior to the Cr(VI) peak is noted, and slight peak broadening occurs with this dilution; however, as long as matrix matching of standards and samples occur, significant problems are not noted. The method demonstrates good performance in analyzing Cr(VI) QC samples and is not only in good agreement with the DPP technique (OSHA Method No. ID-103) when analyzing Cr(VI) field samples, but is more sensitive. A new spray-paint extraction solution was also developed for better extracting Cr(VI) from spray-paint samples.

5. References

5.1 **National Institute for Occupational Safety and Health:** Method No. P&CAM 169, in *NIOSH Manual of Analytical Methods*. 2nd ed., Vol. 1 (DHEW/NIOSH Pub. No. 77-157-A). Cincinnati, OH: National Institute for Occupational Safety and Health, 1977.

5.2 **National Institute for Occupational Safety and Health:** Method No. S317, in *NIOSH Manual of Analytical Methods*. 2nd ed., Vol. 3 (DHEW/NIOSH Pub. No. 77-157-C). Cincinnati, OH: National Institute for Occupational Safety and Health, 1977.

5.3 **Thomsen, E. and R.M. Stern:** A Simple Analytical Technique for the Determination of Hexavalent Chromium in Welding Fumes and Other Complex Matrices. *Scand. J. of Work, Environ. and Health 5*:386-403 (1979).

5.4 **Molina, D. and M.T. Abell:** An Ion Chromatographic Method for Insoluble Chromates in Paint Aerosol. *Am. Ind. Hyg. Assoc. J. 48*:830-835 (1987).

5.5 **Vitale, R.J., G.R. Mussoline, J.C. Petura, and B.R. James :** Hexavalent Chromium Extraction from Soils. *J. Environ. Qual. 23*: 1249-1256 (1994).

5.6 **Zatka,V.J.:** Speciation of Hexavalent Chromium in Welding Fumes Interference by Air Oxidation of Chromium. *Am. Ind. Hyg. Assoc. J. 46*:327-331 (1985).

5.7 **National Institute for Occupational Safety and Health:** Method No. 7600, in *NIOSH Manual of Analytical Methods*. 3rd ed. (DHHS/NIOSH Pub. No. 84-100). Cincinnati, OH: National Institute for Occupational Safety and Health, 1984.

5.8 **Occupational Safety and Health Administration Salt Lake Technical Center:** *Hexavalent Chromium* (USDOL/OSHA Method No. ID-103). Salt Lake City, UT, 1982, revised, 1990.

5.9 **Abell, M.T. and J.R. Carlberg:** A Simple Reliable Method for the Determination of Airborne Hexavalent Chromium. *Am. Ind. Hyg. Assoc. J.* 35:229-233 (1974).

5.10 **Occupational Safety and Health Administration Salt Lake Technical Center:** *Hexavalent Chromium Backup Data Report* by J.C. Ku (USDOL/OSHA-SLCAL Method No. ID-103). Salt Lake City, UT, 1982, revised 1989.

5.11 **Dutkiewicz, R., J. Konczalik, and M. Przechera:** Assessment of the Colorimetric Methods of Determination of Chromium in Air and Urine by Means of Radioisotope Techniques. *Acta Pol. Pharm. 26*:168-176 (1969).

5.12 **Dionex Corporation:** Determination of *Cr(VI) in Water, Wastewater, and Solid Waste Extracts, Technical Note 26*. Sunnyvale, CA, 1990.

5.13 **National Institute for Occupational Safety and Health:** Backup Data Report, Chromic Acid and Chromates, No. S317, in *Documentation of the NIOSH Validation Tests* by D. Taylor, R. Kupel, and J.

Bryant (DHEW/NIOSH Pub. No. 77-185, NIOSH Contract CDC-99-74-45). Cincinnati, OH: National Institute for Occupational Safety and Health, 1977.

5.14 **Occupational Safety and Health Administration Salt Lake Technical Center:** *Quality Control Data - Chromate Analysis* by B. Babcock. Salt Lake City, UT, 1982 - 1989.

5.15 **Manufacturing Chemists Association:** *Properties and Essential Information for Safe Handling and Use of Chromic Acid and Chromates* (Chemical Safety Data Sheet SD-44). Washington, D.C.: Manufacturing Chemists Association, 1952.

5.16 **U.S. Department of Health and Human Services:** *Update Toxicological Profile for Chromium* TP-92/08 U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. April, 1993.

5.17 **IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Chromium, Nickel and Welding:** Volume 49, International agency for Research on Cancer, Secrtariat of the World Health Organization: UK, 1990, ISBN 92 832 1249 5.

5.18 **Harper, M.:** SKC Inc., *Information regarding using the GLA-5000 filters to collect chromate samples,* personal communication, 1995.

5.19 **Occupational Safety and Health Administration Salt Lake Technical Center:** *Ion Chromatography Standard Operating Procedure* (Ion Chromatographic Committee). Salt Lake City, UT. In progress.

5.20 **National Institute for Occupational Safety and Health:** *Criteria for a Recommended Standard - Occupational Exposure to Cr(VI)* (DHEW/NIOSH Pub. No. 76-129). Cincinnati, OH: National Institute for Occupational Safety and Health, 1975.

5.21 **Mandel, J.:** Accuracy and Precision, Evaluation and Interpretation of Analytical Results, The Treatment of Outliers. In *Treatise On Analytical Chemistry*. 2nd ed., Vol. 1, edited by I. M. Kolthoff and P. J. Elving. New York: John Wiley and Sons, 1978. pp. 282-285.

5.22 **National Institute for Occupational Safety and Health:** *Documentation of the NIOSH Validation Tests* by D. Taylor, R. Kupel, and J. Bryant (DHEW/NIOSH Pub. No. 77-185, NIOSH Contract CDC-99-74-45). Cincinnati, OH: National Institute for Occupational Safety and Health, 1977. pp. 1-12.

5.23 **Occupational Safety and Health Administration Salt Lake Technical Center:** Evaluation Guidelines of the Inorganic Methods Branch. In *OSHA Analytical Methods Manual*. 2nd ed. Cincinnati, OH: American Conference of Governmental Industrial Hygienists, 1991. pp. 1-18.

5.24 **Burkart, J.A.:** General Procedures for Limit of Detection Calculations in the Industrial Hygiene Chemistry Laboratory. *Appl. Ind. Hyg. 1*:153-155 (1986).

5.25 **National Institute for Occupational Safety and Health:** *Standard Operating Procedures for Industrial Hygiene Sampling and Chemical Analysis* (SOP 018) Cincinnati, OH: National Institute for Occupational Safety and Health, Revised Sept., 1992.

ELEMENTS by ICP (Nitric/Perchloric Acid Ashing) 7300

MW: Table 1 CAS: Table 2 RTECS: Table 2

METHOD: 7300, Issue 3 **EVALUATION: PARTIAL** **Issue 1: 15 August 1990**
Issue 3: 15 March 2003

OSHA: Table 2
NIOSH: Table 2
ACGIH: Table 2

PROPERTIES: Table 1

ELEMENTS:

aluminum*	calcium	lanthanum	nickel	strontium	tungsten*
antimony*	chromium*	lithium*	potassium	tellurium	vanadium*
arsenic	cobalt*	magnesium	phosphorus	tin	yittrium
barium	copper	manganese*	selenium	thallium	zinc
beryllium*	iron	molybdenum*	silver	titanium	zirconium*
cadmium	lead*				

*Some compounds of these elements require special sample treatment.

SAMPLING

SAMPLER: FILTER (0.8-µm, cellulose ester membrane, or 5.0-µm, polyvinyl chloride membrane)

FLOWRATE: 1 to 4 L/min

VOL-MIN: Table 1
-MAX: Table 1

SHIPMENT: routine

SAMPLE STABILITY: stable

BLANKS: 2 to 10 field blanks per set

ACCURACY

RANGE STUDIED: not determined

BIAS: not determined

OVERALL PRECISION ($\hat{S}_{rT}$): not determined

ACCURACY: not determined

MEASUREMENT

TECHNIQUE: INDUCTIVELY COUPLED ARGON PLASMA, ATOMIC EMISSION SPECTROSCOPY (ICP-AES)

ANALYTE: elements above

ASHING REAGENTS: conc. HNO_3/ conc. $HClO_4$ (4:1), 5 mL; 2mL increments added as needed

CONDITIONS: room temperature, 30 min; 150 °C to near dryness

FINAL SOLUTION: 4% HNO_3, 1% $HClO_4$, 25 mL

WAVELENGTH: depends upon element; Table 3

BACKGROUND CORRECTION: spectral wavelength shift

CALIBRATION: elements in 4% HNO_3, 1% $HClO_4$

RANGE: varies with element [1]

ESTIMATED LOD: Tables 3 and 4

PRECISION ($\bar{S}$): Tables 3 and 4

APPLICABILITY: The working range of this method is 0.005 to 2.0 mg/m^3 for each element in a 500-L air sample. This is simultaneous elemental analysis, not compound specific. Verify that the types of compounds in the samples are soluble with the ashing procedure selected.

INTERFERENCES: Spectral interferences are the primary interferences encountered in ICP-AES analysis. These are minimized by judicious wavelength selection, interelement correction factors and background correction [1-4].

OTHER METHODS: This issue updates issues 1 and 2 of Method 7300, which replaced P&CAM 351 [3] for trace elements. Flame atomic absorption spectroscopy (e.g., Methods 70XX) is an alternate analytical technique for many of these elements. Graphite furnace AAS (e.g., 7102 for Be, 7105 for Pb) is more sensitive.

REAGENTS:

1. Nitric acid (HNO_3), conc., ultra pure.
2. Perchloric acid ($HClO_4$), conc., ultra pure.*
3. Ashing acid: 4:1 (v/v) HNO_3:$HClO_4$. Mix 4 volumes conc. HNO_3 with 1 volume conc. $HClO_4$.
4. Calibration stock solutions, 1000 µg/mL. Commercially available, or prepared per instrument manufacturer's recommendation (see step 12).
5. Dilution acid, 4% HNO_3, 1% $HClO_4$. Add 50 mL ashing acid to 600 mL water; dilute to 1 L.
6. Argon.
7. Distilled,deionized water.

* See SPECIAL PRECAUTIONS.

EQUIPMENT:

1. Sampler: cellulose ester membrane filter, 0.8-µm pore size; or polyvinyl chloride membrane, 5.0-µm pore size; 37-mm diameter, in cassette filter holder.
2. Personal sampling pump, 1 to 4 L/min, with flexible connecting tubing.
3. Inductively coupled plasma-atomic emission spectrometer, equipped as specified by the manufacturer for analysis of elements of interest.
4. Regulator, two-stage, for argon.
5. Beakers, Phillips, 125-mL, or Griffin, 50-mL, with watchglass covers.**
6. Volumetric flasks, 10-, 25-,100-mL., and 1-L**
7. Assorted volumetric pipets as needed.**
8. Hotplate, surface temperature 150 °C.

** Clean all glassware with conc. nitric acid and rinse thoroughly in distilled water before use.

SPECIAL PRECAUTIONS: All perchloric acid digestions are required to be done in a perchloric acid hood. When working with concentrated acids, wear protective clothing and gloves.

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. Sample at an accurately known flow rate between 1 and 4 L/min for a total sample size of 200 to 2000 L (see Table 1) for TWA measurements. Do not exceed a filter loading of approximately 2 mg total dust.

SAMPLE PREPARATION:

3. Open the cassette filter holders and transfer the samples and blanks to clean beakers.
4. Add 5 mL ashing acid. Cover with a watchglass. Let stand 30 min at room temperature.
   NOTE: Start a reagent blank at this step.
5. Heat on hotplate (120 °C) until ca. 0.5 mL remains.
   NOTE 1: Recovery of lead from some paint matrices may require other digestion techniques. See Method 7082 (Lead by Flame AAS) for an alternative hotplate digestion procedure or Method 7302 for a microwave digestion procedure.
   NOTE 2: Some species of Al, Be, Co, Cr, Li, Mn, Mo, V, and Zr will not be completely solubilized by this procedure. Alternative solubilization techniques for most of these elements can be found elsewhere [5-10]. For example, aqua regia may be needed for Mn [6,12].
6. Add 2 mL ashing acid and repeat step 5. Repeat this step until the solution is clear.
7. Remove watchglass and rinse into the beaker with distilled water.
8. Increase the temperature to 150 °C and take the sample to near dryness (ca. 0.5 mL).
9. Dissolve the residue in 2 to 3 mL dilution acid.
10. Transfer the solutions quantitatively to 25-mL volumetric flasks.
11. Dilute to volume with dilution acid.
    NOTE: If more sensitivity is required, the final sample volume may be held to 10 mL.

CALIBRATION AND QUALITY CONTROL:

12. Calibrate the spectrometer according to the manufacturers recommendations.
    NOTE: Typically, an acid blank and 1.0 µg/mL multielement working standards are used. The following multielement combinations are chemically compatible in 4% HNO_3/1% $HClO_4$:
    a. Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, La, In, Na
    b. Ag, K, Li, Mg, Mn, Ni, P, Pb, Se, Sr, Tl, V, Y, Zn, Sc
    c. Mo, Sb, Sn, Te, Ti, W, Zr
    d. Acid blank
13. Analyze a standard for every ten samples.
14. Check recoveries with at least two spiked blank filters per ten samples.

MEASUREMENT:

15. Set spectrometer to conditions specified by manufacturer.
16. Analyze standards and samples.
    NOTE: If the values for the samples are above the range of the standards, dilute the solutions with dilution acid, reanalyze and apply the appropriate dilution factor in the calculations.

CALCULATIONS:

17. Obtain the solution concentrations for the sample, C_s (µg/mL), and the average media blank, C_b (µg/mL), from the instrument.
18. Using the solution volumes of sample, V_s (mL), and media blank, V_b (mL), calculate the concentration, C (mg/m^3), of each element in the air volume sampled, V (L):

$$C = \frac{CsVs - CbVb}{V}, mg/m^3$$

NOTE: µg/L ≡ mg/m^3

EVALUATION OF METHOD:

Issues 1 and 2
Method, 7300 was originally evaluated in 1981 [2,3]. The precision and recovery data were determined at 2.5 and 1000 µg of each element per sample on spiked filters. The measurements used for the method evaluation in Issues 1 and 2 were determined with a Jarrell-Ash Model 1160 Inductively Coupled Plasma Spectrometer operated according to manufacturer's instructions.

Issue 3
In this update of NIOSH Method 7300, the precision and recovery data were determined at approximately 3x and 10x the instrumental detection limits on commercially prepared spiked filters [12] using 25.0 mL as the final sample volume. Tables 3 and 4 list the precision and recovery data, instrumental detection limits, and analytical wavelengths for mixed cellulose ester (MCE) and polyvinyl chloride (PVC) filters. PVC Filters which can be used for total dust measurements and then digested for metals measurements were tested and found to give good results. The values in Tables 3 and 4 were determined with a Spectro Analytical Instruments Model End On Plasma (EOP)(axial) operated according to manufacturer's instructions.

REFERENCES:

[1] Millson M, Andrews R [2002]. Backup data report, Method 7300, unpublished report, NIOSH/DART.
[2] Hull RD [1981]. Multielement Analysis of Industrial Hygiene Samples, NIOSH Internal Report, presented at the American Industrial Hygiene Conference, Portland, Oregon.
[3] NIOSH [1982]. NIOSH Manual of Analytical Methods, 2nd ed., V. 7, P&CAM 351 (Elements by ICP), U.S. Department of Health and Human Services, Publ. (NIOSH) 82-100.
[4] NIOSH [1994]. Elements by ICP: Method 7300, Issue 2. In: Eller PM, Cassinelli ME, eds., NIOSH Manual of Analytical Methods, 4th ed. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 94-113.
[5] NIOSH [1994]. Lead by FAAS: Method 7082. In: Eller PM, Cassinelli ME, eds., NIOSH Manual of Analytical Methods, 4th ed. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 94-113.
[6] NIOSH [1977]. NIOSH Manual of Analytical Methods, 2nd ed., V. 2, S5 (Manganese), U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-B.
[7] NIOSH [1994]. Tungsten, soluble/insoluble: Method 7074. In: Eller PM, Cassinelli ME, eds., NIOSH Manual of Analytical Methods, 4th ed. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 94-113.
[8] NIOSH [1979]. NIOSH Manual of Analytical Methods, 2nd ed., V. 5, P&CAM 173 (Metals by Atomic Absorption), U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 79-141.
[9] NIOSH [1977]. NIOSH Manual of Analytical Methods, 2nd ed., V. 3, S183 (Tin), S185 (Zirconium), and S376 (Molybdenum), U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-C.
[10] ISO [2001]. Workplace air - Determination of metals and metalloids in airborne particulate matter by inductively coupled plasma atomic emission spectrometry - Part 2: Sample preparation. International Organization for Standardization. ISO 15202-2:2001(E).
[11] ASTM [1985]. 1985 Annual Book of ASTM Standards, Vol. 11.01; Standard Specification for Reagent Water; ASTM, Philadelphia, PA, D1193-77 (1985).
[12] Certification Inorganic Ventures for spikes.

METHOD REVISED BY:

Mark Millson and Ronnee Andrews, NIOSH/DART.

Method originally written by Mark Millson, NIOSH/DART, and R. DeLon Hull, Ph.D., NIOSH/DSHEFS, James B. Perkins, David L. Wheeler, and Keith Nicholson, DataChem Labortories, Salt Lake City, UT.

TABLE 1. PROPERTIES AND SAMPLING VOLUMES

Element (Symbol)	Properties: Atomic Weight	Properties: MP, °C	Air Volume, L @ OSHA PEL: MIN	Air Volume, L @ OSHA PEL: MAX
Silver (Ag)	107.87	961	250	2000
Aluminum (Al)	26.98	660	5	100
Arsenic (As)	74.92	817	5	2000
Barium (Ba)	137.34	710	50	2000
Beryllium (Be)	9.01	1278	1250	2000
Calcium (Ca)	40.08	842	5	200
Cadmium (Cd)	112.40	321	13	2000
Cobalt (Co)	58.93	1495	25	2000
Chromium (Cr)	52.00	1890	5	1000
Copper (Cu)	63.54	1083	5	1000
Iron (Fe)	55.85	1535	5	100
Potassium (K)	39.10	63.65	5	1000
Lanthanum	138.91	920	5	1000
Lithium (Li)	6.94	179	100	2000
Magnesium (Mg)	24.31	651	5	67
Manganese (Mn)	54.94	1244	5	200
Molybdenum (Mo)	95.94	651	5	67
Nickel (Ni)	58.71	1453	5	1000
Phosphorus (P)	30.97	44	25	2000
Lead (Pb)	207.19	328	50	2000
Antimony (Sb)	121.75	630.5	50	2000
Selenium (Se)	78.96	217	13	2000
Tin (Sn)	118.69	231.9	5	1000
Strontium (Sr)	87.62	769	10	1000
Tellurium (Te)	127.60	450	25	2000
Titanium (Ti)	47.90	1675	5	100
Thallium (Tl)	204.37	304	25	2000
Vanadium (V)	50.94	1890	5	2000
Tungsten (W)	183.85	3410	5	1000
Yttrium (Y)	88.91	1495	5	1000
Zinc (Zn)	65.37	419	5	200
Zirconium (Zr)	91.22	1852	5	200

TABLE 2. EXPOSURE LIMITS, CAS #, RTECS

Element (Symbol)	CAS #	RTECS	Exposure Limits, mg/m³ (Ca = carcinogen) OSHA	NIOSH	ACGIH
Silver (Ag)	7440-22-4	VW3500000	0.01 (dust, fume, metal)	0.01 (metal, soluble)	0.1 (metal) 0.01 (soluble)
Aluminum (Al)	7429-90-5	BD0330000	15 (total dust) 5 (respirable)	10 (total dust) 5 (respirable fume) 2 (salts, alkyls)	10 (dust) 5 (powders, fume) 2 (salts, alkyls)
Arsenic (As)	7440-38-2	CG0525000	varies	C 0.002, Ca	0.01, Ca
Barium (Ba)	7440-39-3	CQ8370000	0.5	0.5	0.5
Beryllium (Be)	7440-41-7	DS1750000	0.002, C 0.005	0.0005, Ca	0.002, Ca
Calcium (Ca)	7440-70-2	--	varies	varies	varies
Cadmium (Cd)	7440-43-9	EU9800000	0.005	lowest feasible, Ca	0.01 (total), Ca 0.002 (respir.), Ca
Cobalt (Co)	7440-48-4	GF8750000	0.1	0.05 (dust, fume)	0.02 (dust, fume)
Chromium (Cr)	7440-47-3	GB4200000	0.5	0.5	0.5
Copper (Cu)	7440-50-8	GL5325000	1 (dust, mists) 0.1 (fume)	1 (dust) 0.1 (fume)	1 (dust, mists) 0.2 (fume)
Iron (Fe)	7439-89-6	NO4565500	10 (dust, fume)	5 (dust, fume)	5 (fume)
Potassium (K)	7440-09-7	TS6460000	--	--	--
Lanthanum	7439-91-0	--	–	–	--
Lithium (Li)	7439-93-2	--	--	--	--
Magnesium (Mg)	7439-95-4	OM2100000	15 (dust) as oxide 5 (respirable)	10 (fume) as oxide	10 (fume) as oxide
Manganese (Mn)	7439-96-5	OO9275000	C 5	1; STEL 3	5 (dust) 1; STEL 3 (fume)
Molybdenum (Mo)	7439-98-7	QA4680000	5 (soluble) 15 (total insoluble)	5 (soluble) 10 (insoluble)	5 (soluble) 10 (insoluble)
Nickel (Ni)	7440-02-0	QR5950000	1	0.015, Ca	0.1 (soluble) 1 (insoluble, metal)
Phosphorus (P)	7723-14-0	TH3500000	0.1	0.1	0.1
Lead (Pb)	7439-92-1	OF7525000	0.05	0.05	0.05
Antimony (Sb)	7440-36-0	CC4025000	0.5	0.5	0.5
Selenium (Se)	7782-49-2	VS7700000	0.2	0.2	0.2
Tin (Sn)	7440-31-5	XP7320000	2	2	2
Strontium (Sr)	7440-24-6	–	–	–	--
Tellurium (Te)	13494-80-9	WY2625000	0.1	0.1	0.1
Titanium (Ti)	7440-32-6	XR1700000	--	--	--
Thallium (Tl)	7440-28-0	XG3425000	0.1 (skin) (soluble)	0.1 (skin) (soluble)	0.1 (skin)
Vanadium (V)	7440-62-2	YW240000	--	C 0.05	--
Tungsten	7440-33-7	–	5	5 10 (STEL)	5 10 (STEL)
Yttrium (Y)	7440-65-5	ZG2980000	1	N/A	1
Zinc (Zn)	7440-66-6	ZG8600000	–	--	--
Zirconium (Zr)	7440-67-7	ZH7070000	5	5, STEL 10	5, STEL 10

TABLE 3. MEASUREMENT PROCEDURES AND DATA [1].
Mixed Cellulose Ester Filters (0.45 µm)

Element (a)	wavelength nm	Est. LOD µg/ Filter	LOD ng/mL	Certified 3x LOD (b)	% Recovery (c)	Percent RSD (N=25)	Certified 10x LOD (b)	% Recovery (c)	Percent RSD (N=25)
Ag	328	0.042	1.7	0.77	102.9	2.64	3.21	98.3	1.53
Al	167	0.115	4.6	1.54	105.4	11.5	6.40	101.5	1.98
As	189	0.140	5.6	3.08	94.9	2.28	12.9	93.9	1.30
Ba	455	0.005	0.2	0.31	101.8	1.72	1.29	97.7	0.69
Be	313	0.005	0.2	0.31	100.0	1.44	1.29	98.4	0.75
Ca	317	0.908	36.3	15.4	98.7	6.65	64.0	100.2	1.30
Cd	226	0.0075	0.3	0.31	99.8	1.99	1.29	97.5	0.88
Co	228	0.012	0.5	0.31	100.8	1.97	1.29	98.4	0.90
Cr	267	0.020	0.8	0.31	93.4	16.3	1.29	101.2	2.79
Cu	324	0.068	2.7	1.54	102.8	1.47	6.40	100.6	0.92
Fe	259	0.095	3.8	1.54	103.3	5.46	6.40	98.0	0.95
K	766	1.73	69.3	23.0	90.8	1.51	96.4	97.6	0.80
La	408	0.048	1.9	0.77	102.8	2.23	3.21	100.1	0.92
Li	670	0.010	0.4	0.31	110.0	1.91	1.29	97.7	0.81
Mg	279	0.098	3.9	1.54	101.1	8.35	6.40	98.0	1.53
Mn	257	0.005	0.2	0.31	101.0	1.77	1.29	94.7	0.73
Mo	202	0.020	0.8	0.31	105.3	2.47	1.29	98.6	1.09
Ni	231	0.020	0.8	0.31	109.6	3.54	1.29	101.2	1.38
P	178	0.092	3.7	1.54	84.4	6.19	6.40	82.5	4.75
Pb	168	0.062	2.5	1.54	109.4	2.41	6.40	101.7	0.88
Sb	206	0.192	7.7	3.08	90.2	11.4	12.9	**41.3**	32.58
Se	196	0.135	5.4	2.3	87.6	11.6	9.64	84.9	4.78
Sn	189	0.040	1.6	0.77	90.2	18.0	3.21	**49**	21.79
Sr	407	0.005	0.2	0.31	101.0	1.55	1.29	97.3	0.65
Te	214	0.078	3.1	1.54	102.0	2.67	6.40	97.4	1.24
Ti	334	0.050	2.0	0.77	98.4	2.04	3.21	93.4	1.08
Tl	190	0.092	3.7	1.54	100.9	2.48	6.40	99.1	0.80
V	292	0.028	1.1	0.77	103.2	1.92	3.21	98.3	0.84
W	207	0.075	3.0	1.54	**72.2**	10.1	6.40	**57.6**	14.72
Y	371	0.012	0.5	0.31	100.5	1.80	1.29	97.4	0.75
Zn	213	0.310	12.4	4.60	102.2	1.87	19.3	95.3	0.90
Zr	339	0.022	0.9	0.31	88.0	19.4	1.29	**25**	57.87

(a) Bold values are qualitative only because of low recovery.
(b) Values are certified by Inorganic Ventures INC. at 3x and 10x the approximate instrumental LOD
(c) Values reported were obtained with a Spectro Analytical Instruments EOP ICP; performance may vary with instrument and should be independently verified.

TABLE 4. MEASUREMENT PROCEDURES AND DATA [1].
Polyvinyl Chloride Filter (5.0 µm)

Element (c)	wavelength nm	Est. LOD µg per filter	LOD ng/mL	Certified 3x LOD (b)	% Recovery (a)	Percent RSD (N=25)	Certified[17] 10x LOD (b)	% Recovery (a)	Percent RSD (N=25)
Ag	328	0.042	1.7	0.78	104.2	8.20	3.18	81.8	18.9
Al	167	0.115	4.6	1.56	77.4	115.24	6.40	92.9	20.9
As	189	0.140	5.6	3.10	100.7	5.13	12.70	96.9	3.2
Ba	455	0.005	0.2	0.31	102.4	3.89	1.270	99.8	2.0
Be	313	0.005	0.2	0.31	106.8	3.53	1.270	102.8	2.1
Ca	317	0.908	36.3	15.6	**68.1**	12.66	64.00	96.8	5.3
Cd	226	0.0075	0.3	0.31	105.2	5.57	1.27	101.9	2.8
Co	228	0.012	0.5	0.31	109.3	4.67	1.27	102.8	2.8
Cr	267	0.020	0.8	0.31	109.4	5.31	1.27	103.4	4.1
Cu	324	0.068	2.7	1.56	104.9	5.18	6.40	101.8	2.4
Fe	259	0.095	3.8	1.56	88.7	46.82	6.40	99.1	9.7
K	766	1.73	69.3	23.4	96.4	4.70	95.00	99.2	2.2
La	408	0.048	1.9	0.78	**45.5**	4.19	3.18	98.8	2.6
Li	670	0.010	0.4	0.31	107.7	4.80	1.27	110.4	2.7
Mg	279	0.098	3.9	1.56	**54.8**	20.59	6.40	**64.5**	5.7
Mn	257	0.005	0.2	0.31	101.9	4.18	1.27	99.3	2.4
Mo	202	0.020	0.8	0.31	106.6	5.82	1.27	98.1	3.8
Ni	231	0.020	0.8	0.31	111.0	5.89	1.27	103.6	3.2
P	178	0.092	3.7	1.56	101.9	17.82	6.40	86.5	10.4
Pb	168	0.062	2.5	1.56	109.6	6.12	6.40	103.2	2.9
Sb	206	0.192	7.7	3.10	**64.6**	22.54	12.70	**38.1**	30.5
Se	196	0.135	5.4	2.30	83.1	26.23	9.50	76.0	17.2
Sn	189	0.040	1.6	0.78	85.7	27.29	3.18	**52.0**	29.4
Sr	407	0.005	0.2	0.31	**71.8**	4.09	1.27	81.2	2.7
Te	214	0.078	3.1	1.56	109.6	7.49	6.40	97.3	3.8
Ti	334	0.050	2.0	0.78	101.0	9.46	3.18	92.4	5.5
Tl	190	0.092	3.7	1.56	110.3	4.04	6.40	101.9	2.0
V	292	0.028	1.1	0.78	108.3	3.94	3.18	102.5	2.6
W	207	0.075	3.0	1.56	**74.9**	15.79	6.40	**44.7**	19.6
Y	371	0.012	0.5	0.31	101.5	3.63	1.27	101.4	2.5
Zn	213	0.310	12.4	4.70	91.0	68.69	19.1	101.0	9.6
Zr	339	0.022	0.9	0.31	**70.7**	54.20	1.27	**40.4**	42.1

(a) Values reported were obtained with a Spectro Analytical Instruments EOP ICP; performance may vary with instrument and should be independently verified.
(b) Values are certified by Inorganic Ventures INC. at 3x and 10x the approximate instrumental LOD [12].
(c) Bold values are qualitative only because of low recovery. Other digestion techniques may be more appropriate for these elements and their compounds.

PARTICULATES NOT OTHERWISE REGULATED, TOTAL 0500

DEFINITION: total aerosol mass CAS: NONE RTECS: NONE

METHOD: 0500, Issue 2 **EVALUATION: FULL** **Issue 1: 15 February 1984**
Issue 2: 15 August 1994

OSHA : 15 mg/m^3
NIOSH: no REL
ACGIH: 10 mg/m^3, total dust less than 1% quartz

PROPERTIES: contains no asbestos and quartz less than 1%

SYNONYMS: nuisance dusts; particulates not otherwise classified

SAMPLING

SAMPLER: FILTER (tared 37-mm, 5-µm PVC filter)

FLOW RATE: 1 to 2 L/min

VOL-MIN: 7 L @ 15 mg/m^3
-MAX: 133 L @ 15 mg/m^3

SHIPMENT: routine

SAMPLE STABILITY: indefinitely

BLANKS: 2 to 10 field blanks per set

BULK SAMPLE: none required

ACCURACY

RANGE STUDIED: 8 to 28 mg/m^3

BIAS: 0.01%

OVERALL PRECISION ($\hat{S}_{rT}$): 0.056 [1]

ACCURACY: ± 11.04%

MEASUREMENT

TECHNIQUE: GRAVIMETRIC (FILTER WEIGHT)

ANALYTE: airborne particulate material

BALANCE: 0.001 mg sensitivity; use same balance before and after sample collection

CALIBRATION: National Institute of Standards and Technology Class S-1.1 weights or ASTM Class 1 weights

RANGE: 0.1 to 2 mg per sample

ESTIMATED LOD: 0.03 mg per sample

PRECISION ($\hat{S}_r$): 0.026 [2]

APPLICABILITY: The working range is 1 to 20 mg/m^3 for a 100-L air sample. This method is nonspecific and determines the total dust concentration to which a worker is exposed. It may be applied, e.g., to gravimetric determination of fibrous glass [3] in addition to the other ACGIH particulates not otherwise regulated [4].

INTERFERENCES: Organic and volatile particulate matter may be removed by dry ashing [3].

OTHER METHODS: This method is similar to the criteria document method for fibrous glass [3] and Method 5000 for carbon black. This method replaces Method S349 [5]. Impingers and direct-reading instruments may be used to collect total dust samples, but these have limitations for personal sampling.

EQUIPMENT:

1. Sampler: 37-mm PVC, 2- to 5-µm pore size membrane or equivalent hydrophobic filter and supporting pad in 37-mm cassette filter holder.
2. Personal sampling pump, 1 to 2 L/min, with flexible connecting tubing.
3. Microbalance, capable of weighing to 0.001 mg.
4. Static neutralizer: e.g., Po-210; replace nine months after the production date.
5. Forceps (preferably nylon).
6. Environmental chamber or room for balance (e.g., 20 °C ± 1 °C and 50% ± 5% RH).

SPECIAL PRECAUTIONS: None.

PREPARATION OF FILTERS BEFORE SAMPLING:

1. Equilibrate the filters in an environmentally controlled weighing area or chamber for at least 2 h.
   NOTE: An environmentally controlled chamber is desirable, but not required.
2. Number the backup pads with a ballpoint pen and place them, numbered side down, in filter cassette bottom sections.
3. Weigh the filters in an environmentally controlled area or chamber. Record the filter tare weight, W_1 (mg).
   a. Zero the balance before each weighing.
   b. Handle the filter with forceps. Pass the filter over an antistatic radiation source. Repeat this step if filter does not release easily from the forceps or if filter attracts balance pan. Static electricity can cause erroneous weight readings.
4. Assemble the filter in the filter cassettes and close firmly so that leakage around the filter will not occur. Place a plug in each opening of the filter cassette. Place a cellulose shrink band around the filter cassette, allow to dry and mark with the same number as the backup pad.

SAMPLING:

5. Calibrate each personal sampling pump with a representative sampler in line.
6. Sample at 1 to 2 L/min for a total sample volume of 7 to 133 L. Do not exceed a total filter loading of approximately 2 mg total dust. Take two to four replicate samples for each batch of field samples for quality assurance on the sampling procedure.

SAMPLE PREPARATION:

7. Wipe dust from the external surface of the filter cassette with a moist paper towel to minimize contamination. Discard the paper towel.
8. Remove the top and bottom plugs from the filter cassette. Equilibrate for at least 2 h in the balance room.
9. Remove the cassette band, pry open the cassette, and remove the filter gently to avoid loss of dust.
   NOTE: If the filter adheres to the underside of the cassette top, very gently lift away by using the dull side of a scalpel blade. This must be done carefully or the filter will tear.

CALIBRATION AND QUALITY CONTROL:

10. Zero the microbalance before all weighings. Use the same microbalance for weighing filters before and after sample collection. Maintain and calibrate the balance with National Institute of Standards and Technology Class S-1.1 or ASTM Class 1 weights.

11. The set of replicate samples should be exposed to the same dust environment, either in a laboratory dust chamber [7] or in the field [8]. The quality control samples must be taken with the same equipment, procedures and personnel used in the routine field samples. The relative standard deviation calculated from these replicates should be recorded on control charts and action taken when the precision is out of control [7].

MEASUREMENT:

12. Weigh each filter, including field blanks. Record the post-sampling weight, W_2 (mg). Record anything remarkable about a filter (e.g., overload, leakage, wet, torn, etc.)

CALCULATIONS:

13. Calculate the concentration of total particulate, C (mg/m^3), in the air volume sampled, V (L):

$$C = \frac{(W_2 - W_1) - (B_2 - B_1) \cdot 10^3}{V}, \ mg/m^3.$$

where: W_1 = tare weight of filter before sampling (mg)
W_2 = post-sampling weight of sample-containing filter (mg)
B_1 = mean tare weight of blank filters (mg)
B_2 = mean post-sampling weight of blank filters (mg)

EVALUATION OF METHOD:

Lab testing with blank filters and generated atmospheres of carbon black was done at 8 to 28 mg/m^3 [2,6]. Precision and accuracy data are given on page 0500-1.

REFERENCES:

[1] NIOSH Manual of Analytical Methods, 3rd ed., NMAM 5000, DHHS (NIOSH) Publication No. 84-100 (1984).
[2] Unpublished data from Non-textile Cotton Study, NIOSH/DRDS/EIB.
[3] NIOSH Criteria for a Recommended Standard ... Occupational Exposure to Fibrous Glass, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-152, 119-142 (1977).
[4] 1993-1994 Threshold Limit Values and Biological Exposure Indices, Appendix D, ACGIH, Cincinnati, OH (1993).
[5] NIOSH Manual of Analytical Methods, 2nd ed., V. 3, S349, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-C (1977).
[6] Documentation of the NIOSH Validation Tests, S262 and S349, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-185 (1977).
[7] Bowman, J.D., D.L. Bartley, G.M. Breuer, L.J. Doemeny, and D.J. Murdock. Accuracy Criteria Recommended for the Certification of Gravimetric Coal Mine Dust Personal Samplers. NTIS Pub. No. PB 85-222446 (1984).
[8] Breslin, J.A., S.J. Page, and R.A. Jankowski. Precision of Personal Sampling of Respirable Dust in Coal Mines, U.S. Bureau of Mines Report of Investigations #8740 (1983).

METHOD REVISED BY:

Jerry Clere and Frank Hearl, P.E., NIOSH/DRDS.

ASBESTOS and OTHER FIBERS by PCM 7400

Various MW: Various CAS: Various RTECS: Various

METHOD: 7400, Issue 2 **EVALUATION: FULL** **Issue 1: Rev. 3 on 15 May 1989**
Issue 2: 15 August 1994

OSHA : 0.1 asbestos fiber (> 5 µm long)/cc; 1 f/cc/30 min excursion; carcinogen
MSHA: 2 asbestos fibers/cc
NIOSH: 0.1 f/cc (fibers > 5 µm long)/400 L; carcinogen
ACGIH: 0.2 crocidolite; 0.5 amosite; 2 chrysotile and other asbestos, fibers/cc; carcinogen

PROPERTIES: solid, fibrous, crystalline, anisotropic

SYNONYMS [CAS #]: actinolite **[77536-66-4]** or ferroactinolite **[15669-07-5]**; amosite **[12172-73-5]**; anthophyllite **[77536-67-5]**; chrysotile **[12001-29-5]**; serpentine **[18786-24-8]**; crocidolite **[12001-28-4]**; tremolite **[77536-68-6]**; amphibole asbestos **[1332-21-4]**; refractory ceramic fibers **[142844-00-6]**; fibrous glass.

SAMPLING

SAMPLER: FILTER (0.45- to 1.2-µm cellulose ester membrane, 25-mm; conductive cowl on cassette)

FLOW RATE*: 0.5 to 16 L/min

VOL-MIN*: 400 L @ 0.1 fiber/cc
-MAX*: (step 4, sampling)
*Adjust to give 100 to 1300 fiber/mm^2

SHIPMENT: routine (pack to reduce shock)

SAMPLE STABILITY: stable

BLANKS: 2 to 10 field blanks per set

ACCURACY

RANGE STUDIED: 80 to 100 fibers counted

BIAS: See EVALUATION OF METHOD

OVERALL PRECISION ($\hat{S}_{rT}$): 0.115 to 0.13 [1]

ACCURACY: See EVALUATION OF METHOD

MEASUREMENT

TECHNIQUE: LIGHT MICROSCOPY, PHASE CONTRAST

ANALYTE: fibers (manual count)

SAMPLE PREPARATION: acetone - collapse/triacetin - immersion

COUNTING RULES: described in previous version of this method as "A" rules [1,3]

EQUIPMENT:
1. positive phase-contrast microscope
2. Walton-Beckett graticule (100-µm field of view) Type G-22
3. phase-shift test slide (HSE/NPL)

CALIBRATION: HSE/NPL test slide

RANGE: 100 to 1300 fibers/mm^2 filter area

ESTIMATED LOD: 7 fibers/mm^2 filter area

PRECISION ($\bar{S}_r$): 0.10 to 0.12 [1]; see EVALUATION OF METHOD

APPLICABILITY: The quantitative working range is 0.04 to 0.5 fiber/cc for a 1000-L air sample. The LOD depends on sample volume and quantity of interfering dust, and is <0.01 fiber/cc for atmospheres free of interferences. The method gives an index of airborne fibers. It is primarily used for estimating asbestos concentrations, though PCM does not differentiate between asbestos and other fibers. Use this method in conjunction with electron microscopy (e.g., Method 7402) for assistance in identification of fibers. Fibers < ca. 0.25 µm diameter will not be detected by this method [4]. This method may be used for other materials such as fibrous glass by using alternate counting rules (see Appendix C).

INTERFERENCES: If the method is used to detect a specific type of fiber, any other airborne fiber may interfere since all particles meeting the counting criteria are counted. Chain-like particles may appear fibrous. High levels of non-fibrous dust particles may obscure fibers in the field of view and increase the detection limit.

OTHER METHODS: This revision replaces Method 7400, Revision #3 (date 5/15/89).

REAGENTS:

1. Acetone,* reagent grade.
2. Triacetin (glycerol triacetate), reagent grade.

* See SPECIAL PRECAUTIONS.

EQUIPMENT:

1. Sampler: field monitor, 25-mm, three-piece cassette with ca. 50-mm electrically conductive extension cowl and cellulose ester filter, 0.45- to 1.2-µm pore size, and backup pad.
   NOTE 1: Analyze representative filters for fiber background before use to check for clarity and background. Discard the filter lot if mean is ≥5 fibers per 100 graticule fields. These are defined as laboratory blanks. Manufacturer-provided quality assurance checks on filter blanks are normally adequate as long as field blanks are analyzed as described below.
   NOTE 2: The electrically conductive extension cowl reduces electrostatic effects. Ground the cowl when possible during sampling.
   NOTE 3: Use 0.8-µm pore size filters for personal sampling. The 0.45-µm filters are recommended for sampling when performing TEM analysis on the same samples. However, their higher pressure drop precludes their use with personal sampling pumps.
   NOTE 4: Other cassettes have been proposed that exhibit improved uniformity of fiber deposit on the filter surface, e.g., bellmouthed sampler (Envirometrics, Charleston, SC). These may be used if shown to give measured concentrations equivalent to sampler indicated above for the application.
2. Personal sampling pump, battery or line-powered vacuum, of sufficient capacity to meet flow-rate requirements (see step 4 for flow rate), with flexible connecting tubing.
3. Wire, multi-stranded, 22-gauge; 1", hose clamp to attach wire to cassette.
4. Tape, shrink- or adhesive-.
5. Slides, glass, frosted-end, pre-cleaned, 25 x 75-mm.
6. Cover slips, 22- x 22-mm, No. 1-1/2, unless otherwise specified by microscope manufacturer.
7. Lacquer or nail polish.
8. Knife, #10 surgical steel, curved blade.
9. Tweezers.

EQUIPMENT:

10. Acetone flash vaporization system for clearing filters on glass slides (see ref. [5] for specifications or see manufacturer's instructions for equivalent devices).
11. Micropipets or syringes, 5-µL and 100- to 500-µL.
12. Microscope, positive phase (dark) contrast, with green or blue filter, adjustable field iris, 8 to 10X eyepiece, and 40 to 45X phase objective (total magnification ca. 400X); numerical aperture = 0.65 to 0.75.
13. Graticule, Walton-Beckett type with 100-µm diameter circular field (area = 0.00785 mm2) at the specimen plane (Type G-22). Available from Optometrics USA, P.O. Box 699, Ayer, MA 01432 [phone (508)-772-1700], and McCrone Accessories and Components, 850 Pasquinelli Drive, Westmont, IL 60559 [phone (312) 887-7100].
    NOTE: The graticule is custom-made for each microscope. (see APPENDIX A for the custom-ordering procedure).
14. HSE/NPL phase contrast test slide, Mark II. Available from Optometrics USA (address above).
15. Telescope, ocular phase-ring centering.
16. Stage micrometer (0.01-mm divisions).

SPECIAL PRECAUTIONS: Acetone is extremely flammable. Take precautions not to ignite it. Heating of acetone in volumes greater than 1 mL must be done in a ventilated laboratory fume hood using a flameless, spark- free heat source.

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. To reduce contamination and to hold the cassette tightly together, seal the crease between the cassette base and the cowl with a shrink band or light colored adhesive tape. For personal sampling, fasten the (uncapped) open-face cassette to the worker's lapel. The open face should be oriented downward.
    NOTE: The cowl should be electrically grounded during area sampling, especially under conditions of low relative humidity. Use a hose clamp to secure one end of the wire (Equipment, Item 3) to the monitor's cowl. Connect the other end to an earth ground (i.e., cold water pipe).
3. Submit at least two field blanks (or 10% of the total samples, whichever is greater) for each set of samples. Handle field blanks in a manner representative of actual handling of associated samples in the set. Open field blank cassettes at the same time as other cassettes just prior to sampling. Store top covers and cassettes in a clean area (e.g., a closed bag or box) with the top covers from the sampling cassettes during the sampling period.
4. Sample at 0.5 L/min or greater [6]. Adjust sampling flow rate, Q (L/min), and time, t (min), to produce a fiber density, E, of 100 to 1300 fibers/mm^2 ($3.85 \cdot 10^4$ to $5 \cdot 10^5$ fibers per 25-mm filter with effective collection area A_c= 385 mm^2) for optimum accuracy. These variables are related to the action level (one-half the current standard), L (fibers/cc), of the fibrous aerosol being sampled by:

$$t = \frac{A_c \cdot E}{Q \cdot L \cdot 10^3}, \text{ min.}$$

NOTE 1: The purpose of adjusting sampling times is to obtain optimum fiber loading on the filter. The collection efficiency does not appear to be a function of flow rate in the range of 0.5 to 16 L/min for asbestos fibers [7]. Relatively large diameter fibers (>3 µm) may exhibit significant aspiration loss and inlet deposition. A sampling rate of 1 to 4 L/min for 8 h is appropriate in atmospheres containing ca. 0.1 fiber/cc in the absence of significant amounts of non-asbestos dust. Dusty atmospheres require smaller sample volumes (≤400 L) to obtain countable samples. In such cases take short, consecutive samples and average the results over the total collection time. For documenting episodic exposures, use high flow rates (7 to 16 L/min) over shorter sampling times. In relatively clean atmospheres, where targeted fiber concentrations are much less than 0.1 fiber/cc, use larger sample volumes (3000 to 10000 L) to achieve quantifiable loadings. Take care, however, not to overload the filter with background dust. If ≥ 50% of the filter surface is covered with particles, the filter may be too overloaded to count and will bias the measured fiber concentration.

NOTE 2: OSHA regulations specify a minimum sampling volume of 48 L for an excursion measurement, and a maximum sampling rate of 2.5 L/min [3].

5. At the end of sampling, replace top cover and end plugs.
6. Ship samples with conductive cowl attached in a rigid container with packing material to prevent jostling or damage.
   NOTE: Do not use untreated polystyrene foam in shipping container because electrostatic forces may cause fiber loss from sample filter.

SAMPLE PREPARATION:

NOTE 1: The object is to produce samples with a smooth (non-grainy) background in a medium with refractive index ≤1.46. This method collapses the filter for easier focusing and produces permanent (1 - 10 years) mounts which are useful for quality control and interlaboratory comparison. The aluminum "hot block" or similar flash vaporization techniques may be used outside the laboratory [2]. Other mounting techniques meeting the above criteria may also be used (e.g., the laboratory fume hood procedure for generating acetone vapor as described in Method 7400 - revision of 5/15/85, or the non-permanent field mounting technique used in P&CAM 239 [3,7,8,9]). Unless the effective filtration area is known, determine the area and record the information referenced against the sample ID number [1,9,10,11].

NOTE 2: Excessive water in the acetone may slow the clearing of the filter, causing material to be washed off the surface of the filter. Also, filters that have been exposed to high humidities prior to clearing may have a grainy background.

7. Ensure that the glass slides and cover slips are free of dust and fibers.
8. Adjust the rheostat to heat the "hot block" to ca. 70 °C [2].
   NOTE: If the "hot block" is not used in a fume hood, it must rest on a ceramic plate and be isolated from any surface susceptible to heat damage.
9. Mount a wedge cut from the sample filter on a clean glass slide.
   a. Cut wedges of ca. 25% of the filter area with a curved-blade surgical steel knife using a rocking motion to prevent tearing. Place wedge, dust side up, on slide.
      NOTE: Static electricity will usually keep the wedge on the slide.

b. Insert slide with wedge into the receiving slot at base of "hot block". Immediately place tip of a micropipet containing ca. 250 µL acetone (use the minimum volume needed to consistently clear the filter sections) into the inlet port of the PTFE cap on top of the "hot block" and inject the acetone into the vaporization chamber with a slow, steady pressure on the plunger button while holding pipet firmly in place. After waiting 3 to 5 sec for the filter to clear, remove pipet and slide from their ports.
   CAUTION: Although the volume of acetone used is small, use safety precautions. Work in a well-ventilated area (e.g., laboratory fume hood). Take care not to ignite the acetone. Continuous use of this device in an unventilated space may produce explosive acetone vapor concentrations.
c. Using the 5-µL micropipet, immediately place 3.0 to 3.5 µL triacetin on the wedge. Gently lower a clean cover slip onto the wedge at a slight angle to reduce bubble formation. Avoid excess pressure and movement of the cover glass.
   NOTE: If too many bubbles form or the amount of triacetin is insufficient, the cover slip may become detached within a few hours. If excessive triacetin remains at the edge of the filter under the cover slip, fiber migration may occur.
d. Mark the outline of the filter segment with a glass marking pen to aid in microscopic evaluation.
e. Glue the edges of the cover slip to the slide using lacquer or nail polish [12]. Counting may proceed immediately after clearing and mounting are completed.
   NOTE: If clearing is slow, warm the slide on a hotplate (surface temperature 50 °C) for up to 15 min to hasten clearing. Heat carefully to prevent gas bubble formation.

CALIBRATION AND QUALITY CONTROL:

10. Microscope adjustments. Follow the manufacturers instructions. At least once daily use the telescope ocular (or Bertrand lens, for some microscopes) supplied by the manufacturer to ensure that the phase rings (annular diaphragm and phase-shifting elements) are concentric. With each microscope, keep a logbook in which to record the dates of microscope cleanings and major servicing.
    a. Each time a sample is examined, do the following:
       (1) Adjust the light source for even illumination across the field of view at the condenser iris. Use Kohler illumination, if available. With some microscopes, the illumination may have to be set up with bright field optics rather than phase contract optics.
       (2) Focus on the particulate material to be examined.
       (3) Make sure that the field iris is in focus, centered on the sample, and open only enough to fully illuminate the field of view.
    b. Check the phase-shift detection limit of the microscope periodically for each analyst/microscope combination:
       (1) Center the HSE/NPL phase-contrast test slide under the phase objective.
       (2) Bring the blocks of grooved lines into focus in the graticule area.
          NOTE: The slide contains seven blocks of grooves (ca. 20 grooves per block) in descending order of visibility. For asbestos counting the microscope optics must completely resolve the grooved lines in block 3 although they may appear somewhat faint, and the grooved lines in blocks 6 and 7 must be invisible when centered in the graticule area. Blocks 4 and 5 must be at least partially visible but may vary slightly in visibility between microscopes. A microscope which fails to meet these requirements has resolution either too low or too high for fiber counting.
       (3) If image quality deteriorates, clean the microscope optics. If the problem persists, consult the microscope manufacturer.
11. Document the laboratory's precision for each counter for replicate fiber counts.
    a. Maintain as part of the laboratory quality assurance program a set of reference slides to be used on a daily basis [13]. These slides should consist of filter preparations including a range of loadings and background dust levels from a variety of sources including both field and reference samples (e.g., PAT, AAR, commercial samples). The Quality Assurance Officer

should maintain custody of the reference slides and should supply each counter with a minimum of one reference slide per workday. Change the labels on the reference slides periodically so that the counter does not become familiar with the samples.

b. From blind repeat counts on reference slides, estimate the laboratory intra- and intercounter precision. Obtain separate values of relative standard deviation (S_r) for each sample matrix analyzed in each of the following ranges: 5 to 20 fibers in 100 graticule fields, >20 to 50 fibers in 100 graticule fields, and >50 to 100 fibers in 100 graticule fields. Maintain control charts for each of these data files.

NOTE: Certain sample matrices (e.g., asbestos cement) have been shown to give poor precision [9]

12. Prepare and count field blanks along with the field samples. Report counts on each field blank.
    NOTE 1: The identity of blank filters should be unknown to the counter until all counts have been completed.
    NOTE 2: If a field blank yields greater than 7 fibers per 100 graticule fields, report possible contamination of the samples.
13. Perform blind recounts by the same counter on 10% of filters counted (slides relabeled by a person other than the counter). Use the following test to determine whether a pair of counts by the same counter on the same filter should be rejected because of possible bias: Discard the sample if the absolute value of the difference between the square roots of the two counts (in fiber/mm^2) exceeds 2.77 (X)S_r', where X = average of the square roots of the two fiber counts

    (in fiber/mm^2) and $S_r' = \frac{S_r}{2}$, where S_r is the intracounter relative standard deviation for the

    appropriate count range (in fibers) determined in step 11. For more complete discussions see reference [13].
    NOTE 1: Since fiber counting is the measurement of randomly placed fibers which may be described by a Poisson distribution, a square root transformation of the fiber count data will result in approximately normally distributed data [13].
    NOTE 2: If a pair of counts is rejected by this test, recount the remaining samples in the set and test the new counts against the first counts. Discard all rejected paired counts. It is not necessary to use this statistic on blank counts.
14. The analyst is a critical part of this analytical procedure. Care must be taken to provide a non-stressful and comfortable environment for fiber counting. An ergonomically designed chair should be used, with the microscope eyepiece situated at a comfortable height for viewing. External lighting should be set at a level similar to the illumination level in the microscope to reduce eye fatigue. In addition, counters should take 10-to-20 minute breaks from the microscope every one or two hours to limit fatigue [14]. During these breaks, both eye and upper back/neck exercises should be performed to relieve strain.
15. All laboratories engaged in asbestos counting should participate in a proficiency testing program such as the AIHA-NIOSH Proficiency Analytical Testing (PAT) Program for asbestos and routinely exchange field samples with other laboratories to compare performance of counters.

MEASUREMENT:

16. Center the slide on the stage of the calibrated microscope under the objective lens. Focus the microscope on the plane of the filter.
17. Adjust the microscope (Step 10).
    NOTE: Calibration with the HSE/NPL test slide determines the minimum detectable fiber diameter (ca. 0.25 µm) [4].
18. Counting rules: (same as P&CAM 239 rules [1,10,11]: see examples in APPENDIX B).
    a. Count any fiber longer than 5 µm which lies entirely within the graticule area.
        (1) Count only fibers longer than 5 µm. Measure length of curved fibers along the curve.
        (2) Count only fibers with a length-to-width ratio equal to or greater than 3:1.
    b. For fibers which cross the boundary of the graticule field:
        (1) Count as 1/2 fiber any fiber with only one end lying within the graticule area, provided that the fiber meets the criteria of rule a above.

(2) Do not count any fiber which crosses the graticule boundary more than once.
(3) Reject and do not count all other fibers.

c. Count bundles of fibers as one fiber unless individual fibers can be identified by observing both ends of a fiber.
d. Count enough graticule fields to yield 100 fibers. Count a minimum of 20 fields. Stop at 100 graticule fields regardless of count.

19. Start counting from the tip of the filter wedge and progress along a radial line to the outer edge. Shift up or down on the filter, and continue in the reverse direction. Select graticule fields randomly by looking away from the eyepiece briefly while advancing the mechanical stage. Ensure that, as a minimum, each analysis covers one radial line from the filter center to the outer edge of the filter. When an agglomerate or bubble covers ca. 1/6 or more of the graticule field, reject the graticule field and select another. Do not report rejected graticule fields in the total number counted.

NOTE 1: When counting a graticule field, continuously scan a range of focal planes by moving the fine focus knob to detect very fine fibers which have become embedded in the filter. The small-diameter fibers will be very faint but are an important contribution to the total count. A minimum counting time of 15 seconds per field is appropriate for accurate counting.

NOTE 2: This method does not allow for differentiation of fibers based on morphology. Although some experienced counters are capable of selectively counting only fibers which appear to be asbestiform, there is presently no accepted method for ensuring uniformity of judgment between laboratories. It is, therefore, incumbent upon all laboratories using this method to report total fiber counts. If serious contamination from non-asbestos fibers occurs in samples, other techniques such as transmission electron microscopy must be used to identify the asbestos fiber fraction present in the sample (see NIOSH Method 7402). In some cases (i.e., for fibers with diameters >1 µm), polarized light microscopy (as in NIOSH Method 7403) may be used to identify and eliminate interfering non-crystalline fibers [15].

NOTE 3: Do not count at edges where filter was cut. Move in at least 1 mm from the edge.

NOTE 4: Under certain conditions, electrostatic charge may affect the sampling of fibers. These electrostatic effects are most likely to occur when the relative humidity is low (below 20%), and when sampling is performed near the source of aerosol. The result is that deposition of fibers on the filter is reduced, especially near the edge of the filter. If such a pattern is noted during fiber counting, choose fields as close to the center of the filter as possible [5].

NOTE 5: Counts are to be recorded on a data sheet that provides, as a minimum, spaces on which to record the counts for each field, filter identification number, analyst's name, date, total fibers counted, total fields counted, average count, fiber density, and commentary. Average count is calculated by dividing the total fiber count by the number of fields observed. Fiber density (fibers/mm^2) is defined as the average count (fibers/field) divided by the field (graticule) area (mm^2/field).

CALCULATIONS AND REPORTING OF RESULTS

20. Calculate and report fiber density on the filter, E (fibers/mm^2), by dividing the average fiber count per graticule field, F/n_f, minus the mean field blank count per graticule field, B/n_b, by the graticule field area, A_f (approx. 0.00785 mm^2):

$$E = \frac{\left(\frac{F}{n_f} - \frac{B}{n_b}\right)}{A_f}, \text{ fibers/mm}^2.$$

NOTE: Fiber counts above 1300 fibers/mm^2 and fiber counts from samples with >50% of filter area covered with particulate should be reported as "uncountable" or "probably biased." Other fiber counts outside the 100-1300 fiber/mm^2 range should be reported as having "greater than optimal variability" and as being "probably biased."

21. Calculate and report the concentration, C (fibers/cc), of fibers in the air volume sampled, V (L), using the effective collection area of the filter, A_c (approx. 385 mm^2 for a 25-mm filter):

$$C = \frac{(E)(A_c)}{V \cdot 10^3}.$$

NOTE: Periodically check and adjust the value of A_c, if necessary.

22. Report intralaboratory and interlaboratory relative standard deviations (from Step 11) with each set of results.

NOTE: Precision depends on the total number of fibers counted [1,16]. Relative standard deviation is documented in references [1,15-17] for fiber counts up to 100 fibers in 100 graticule fields. Comparability of interlaboratory results is discussed below. As a first approximation, use 213% above and 49% below the count as the upper and lower confidence limits for fiber counts greater than 20 (Fig. 1).

EVALUATION OF METHOD:

A. This method is a revision of P&CAM 239 [10]. A summary of the revisions is as follows:

1. Sampling:
   The change from a 37-mm to a 25-mm filter improves sensitivity for similar air volumes. The change in flow rates allows for 2-m^3 full-shift samples to be taken, providing that the filter is not overloaded with non-fibrous particulates. The collection efficiency of the sampler is not a function of flow rate in the range 0.5 to 16 L/min [10].
2. Sample Preparation Technique:
   The acetone vapor-triacetin preparation technique is a faster, more permanent mounting technique than the dimethyl phthalate/diethyl oxalate method of P&CAM 239 [2,4,10]. The aluminum "hot block" technique minimizes the amount of acetone needed to prepare each sample.
3. Measurement:
   a. The Walton-Beckett graticule standardizes the area observed [14,18,19].
   b. The HSE/NPL test slide standardizes microscope optics for sensitivity to fiber diameter [4,14].
   c. Because of past inaccuracies associated with low fiber counts, the minimum recommended loading has been increased to 100 fibers/mm^2 filter area (a total of 78.5 fibers counted in 100 fields, each with field area = .00785 mm^2.) Lower levels generally result in an overestimate of the fiber count when compared to results in the recommended analytical range [20]. The recommended loadings should yield intracounter S_r in the range of 0.10 to 0.17 [21,22,23].

B. Interlaboratory comparability:
   An international collaborative study involved 16 laboratories using prepared slides from the asbestos cement, milling, mining, textile, and friction material industries [9]. The relative standard deviations (S_r) varied with sample type and laboratory. The ranges were:

	Intralaboratory S_r	Interlaboratory S_r	Overall S_r
AIA (NIOSH A Rules)*	0.12 to 0.40	0.27 to 0.85	0.46
Modified CRS (NIOSH B Rules)**	0.11 to 0.29	0.20 to 0.35	0.25

* Under AIA rules, only fibers having a diameter less than 3 µm are counted and fibers attached to particles larger than 3 µm are not counted. NIOSH A Rules are otherwise similar to the AIA rules.
** See Appendix C.

A NIOSH study conducted using field samples of asbestos gave intralaboratory S_r in the range 0.17 to 0.25 and an interlaboratory S_r of 0.45 [21]. This agrees well with other recent studies [9,14,16].

At this time, there is no independent means for assessing the overall accuracy of this method. One measure of reliability is to estimate how well the count for a single sample agrees with the mean count from a large number of laboratories. The following discussion indicates how this estimation can be carried out based on measurements of the interlaboratory variability, as well as showing how the results of this method relate to the theoretically attainable counting precision and to measured intra- and interlaboratory S_r. (NOTE: The following discussion does not include bias estimates and should not be taken to indicated that lightly loaded samples are as accurate as properly loaded ones).

Theoretically, the process of counting randomly (Poisson) distributed fibers on a filter surface will give an S_r that depends on the number, N, of fibers counted:

$$S_r = 1/(N)^{1/2} \qquad (1)$$

Thus S_r is 0.1 for 100 fibers and 0.32 for 10 fibers counted. The actual S_r found in a number of studies is greater than these theoretical numbers [17,19,20,21].

An additional component of variability comes primarily from subjective interlaboratory differences. In a study of ten counters in a continuing sample exchange program, Ogden [15] found this subjective component of intralaboratory S_r to be approximately 0.2 and estimated the overall S_r by the term:

$$\frac{[N + (0.2 \cdot N)^2]^{1/2}}{N} \qquad (2)$$

Ogden found that the 90% confidence interval of the individual intralaboratory counts in relation to the means were +2 S_r and - 1.5 S_r. In this program, one sample out of ten was a quality control sample. For laboratories not engaged in an intensive quality assurance program, the subjective component of variability can be higher.

In a study of field sample results in 46 laboratories, the Asbestos Information Association also found that the variability had both a constant component and one that depended on the fiber count [14]. These results gave a subjective interlaboratory component of S_r (on the same basis as Ogden's) for field samples of ca. 0.45. A similar value was obtained for 12 laboratories analyzing a set of 24 field samples [21]. This value falls slightly above the range of S_r (0.25 to 0.42 for 1984-85) found for 80 reference laboratories in the NIOSH PAT program for laboratory-generated samples [17].

A number of factors influence S_r for a given laboratory, such as that laboratory's actual counting performance and the type of samples being analyzed. In the absence of other information, such as from an interlaboratory quality assurance program using field samples, the value for the subjective component of variability is chosen as 0.45. It is hoped that the laboratories will carry out the recommended interlaboratory quality assurance programs to improve their performance and thus reduce the S_r.

The above relative standard deviations apply when the population mean has been determined. It is more useful, however, for laboratories to estimate the 90% confidence interval on the mean count from a single sample fiber count (Figure 1). These curves assume similar shapes of the count distribution for interlaboratory and intralaboratory results [16].

For example, if a sample yields a count of 24 fibers, Figure 1 indicates that the mean interlaboratory count will fall within the range of 227% above and 52% below that value 90% of the time. We can apply these percentages directly to the air concentrations as well. If, for instance, this sample (24 fibers counted) represented a 500-L volume, then the measured concentration is 0.02 fibers/mL (assuming 100 fields counted, 25-mm filter, 0.00785 mm^2 counting field area). If this same sample were counted by a group of laboratories, there is a 90% probability that the mean would fall between 0.01 and 0.08 fiber/mL. These limits should be reported in any comparison of results between laboratories.

Note that the S_r of 0.45 used to derive Figure 1 is used as an estimate for a random group of laboratories. If several laboratories belonging to a quality assurance group can show that their interlaboratory S_r is smaller, then it is more correct to use that smaller S_r. However, the estimated S_r of 0.45 is to be used in the absence of such information. Note also that it has been found that S_r can be higher for certain types of samples, such as asbestos cement [9].

Quite often the estimated airborne concentration from an asbestos analysis is used to compare to a regulatory standard. For instance, if one is trying to show compliance with an 0.5 fiber/mL standard using a single sample on which 100 fibers have been counted, then Figure 1 indicates that the 0.5 fiber/mL standard must be 213% higher than the measured air concentration. This indicates that if one measures a fiber concentration of 0.16 fiber/mL (100 fibers counted), then the mean fiber count by a group of laboratories (of which the compliance laboratory might be one) has a 95% chance of being less than 0.5 fibers/mL; i.e., 0.16 + 2.13 x 0.16 = 0.5.

It can be seen from Figure 1 that the Poisson component of the variability is not very important unless the number of fibers counted is small. Therefore, a further approximation is to simply use +213% and -49% as the upper and lower confidence values of the mean for a 100-fiber count.

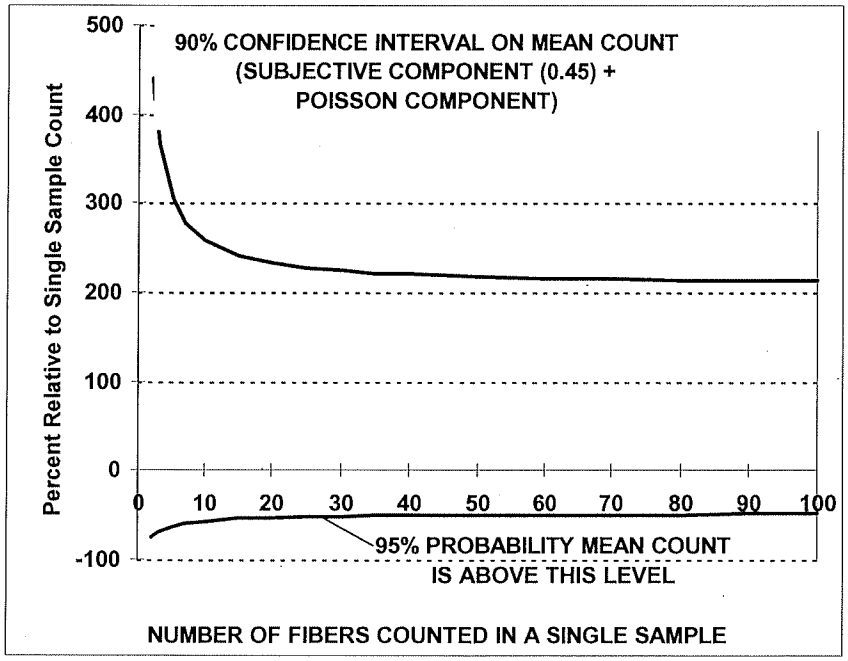


Figure 1. Interlaboratory Precision of Fiber Counts

The curves in Figures 1 are defined by the following equations:

$$UCL = \frac{2X + 2.25 + [(2.25 + 2X)^2 - 4(1 - 2.25 S_r^2) X^2]^{1/2}}{2(1 - 2.25 S_r^2)} \quad (3)$$

$$LCL = \frac{2X + 4 - [(4 + 2X)^2 - 4(1 - 4 S_r^2) X^2]^{1/2}}{2(1 - 4 S_r^2)} \quad (4)$$

where S_r = subjective interlaboratory relative standard deviation, which is close to the total interlaboratory S_r when approximately 100 fibers are counted.
X = total fibers counted on sample
LCL = lower 95% confidence limit.
UCL = upper 95% confidence limit.
Note that the range between these two limits represents 90% of the total range.

REFERENCES:

[1] Leidel, N. A., S. G. Bayer, R. D. Zumwalde, and K. A. Busch. USPHS/NIOSH Membrane Filter Method for Evaluating Airborne Asbestos Fibers, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 79-127 (1979).

[2] Baron, P. A. and G. C. Pickford. "An Asbestos Sample Filter Clearing Procedure," Appl. Ind. Hyg., 1:169-171, 199 (1986).

[3] Occupational Safety and Health Administration, U.S. Department of Labor, Occupational Exposure to Asbestos, Tremolite, Anthophyllite, and Actinolite Asbestos; Final Rules, 29 CFR Part 1910.1001 Amended June 20, 1986.

[4] Rooker, S. J., N. P. Vaughn, and J. M. LeGuen. "On the Visibility of Fibers by Phase Contrast Microscopy," Amer. Ind. Hyg. Assoc. J., 43, 505-515 (1982).

[5] Baron, P. and G. Deye, "Electrostatic Effects in Asbestos Sampling," Parts I and II Amer. Ind. Hyg. Assoc. J., 51, 51-69 (1990).

[6] Johnston, A. M., A. D. Jones, and J. H. Vincent. "The Influence of External Aerodynamic Factors on the Measurement of the Airborne Concentration of Asbestos Fibers by the Membrane Filter Method," Ann. Occup. Hyg., 25, 309-316 (1982).

[7] Beckett, S.T., "The Effects of Sampling Practice on the Measured Concentration of Airborne Asbestos," Ann. Occup. Hyg., 21, 259-272 (1980).

[8] Jankovic, J. T., W. Jones, and J. Clere. "Field Techniques for Clearing Cellulose Ester Filters Used in Asbestos Sampling," Appl. Ind. Hyg., 1, 145-147 (1986).

[9] Crawford, N. P., H. L. Thorpe, and W. Alexander. "A Comparison of the Effects of Different Counting Rules and Aspect Ratios on the Level and Reproducibility of Asbestos Fiber Counts," Part I: Effects on Level (Report No. TM/82/23), Part II: Effects on Reproducibility (Report No. TM/82/24), Institute of Occupational Medicine, Edinburgh, Scotland (December, 1982).

[10] NIOSH Manual of Analytical Methods, 2nd ed., Vol. 1., P&CAM 239, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-A (1977).

[11] Revised Recommended Asbestos Standard, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-169 (1976); as amended in NIOSH statement at OSHA Public Hearing, June 21, 1984.

[12] Asbestos International Association, AIA Health and Safety Recommended Technical Method #1 (RTMI). "Airborne Asbestos Fiber Concentrations at Workplaces by Light Microscopy" (Membrane Filter Method), London (1979).

[13] Abell, M., S. Shulman and P. Baron. The Quality of Fiber Count Data, Appl. Ind. Hyg., 4, 273-285

(1989).
[14] "A Study of the Empirical Precision of Airborne Asbestos Concentration Measurements in the Workplace by the Membrane Filter Method," Asbestos Information Association, Air Monitoring Committee Report, Arlington, VA (June, 1983).
[15] McCrone, W., L. McCrone and J. Delly, "Polarized Light Microscopy," Ann Arbor Science (1978).
[16] Ogden, T. L. "The Reproducibility of Fiber Counts," Health and Safety Executive Research Paper 18 (1982).
[17] Schlecht, P. C. and S. A. Schulman. "Performance of Asbestos Fiber Counting Laboratories in the NIOSH Proficiency Analytical Testing (PAT) Program," Am. Ind. Hyg. Assoc. J., 47, 259-266 (1986).
[18] Chatfield, E. J. Measurement of Asbestos Fiber Concentrations in Workplace Atmospheres, Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario, Study No. 9, 180 Dundas Street West, 22nd Floor, Toronto, Ontario, CANADA M5G 1Z8.
[19] Walton, W. H. "The Nature, Hazards, and Assessment of Occupational Exposure to Airborne Asbestos Dust: A Review," Ann. Occup. Hyg., 25, 115-247 (1982).
[20] Cherrie, J., A.D. Jones, and A.M. Johnston. "The Influence of Fiber Density on the Assessment of Fiber Concentration Using the membrane filter Method." Am. Ind. Hyg. Assoc. J., 47(8), 465-74 (1986).
[21] Baron, P. A. and S. Shulman. "Evaluation of the Magiscan Image Analyzer for Asbestos Fiber Counting." Am. Ind. Hyg. Assoc. J., (in press).
[22] Taylor, D. G., P. A. Baron, S. A. Shulman and J. W. Carter. "Identification and Counting of Asbestos Fibers," Am. Ind. Hyg. Assoc. J. 45(2), 84-88 (1984).
[23] "Potential Health Hazards of Video Display Terminals," NIOSH Research Report, June 1981.
[24] "Reference Methods for Measuring Airborne Man-Made Mineral Fibers (MMMF)," WHO/EURO Technical Committee for Monitoring an Evaluating Airborne MMMF, World Health Organization, Copenhagen (1985).
[25] Criteria for a Recommended Standard...Occupational Exposure to Fibrous Glass, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-152 (1977).

METHOD WRITTEN BY:

Paul A. Baron, Ph.D., NIOSH/DPSE.

APPENDIX A: CALIBRATION OF THE WALTON-BECKETT GRATICULE:

Before ordering the Walton-Beckett graticule, the following calibration must be done to obtain a counting area (D) 100 µm in diameter at the image plane. The diameter, d_c (mm), of the circular counting area and the disc diameter must be specified when ordering the graticule.

1. Insert any available graticule into the eyepiece and focus so that the graticule lines are sharp and clear.
2. Set the appropriate interpupillary distance and, if applicable, reset the binocular head adjustment so that the magnification remains constant.
3. Install the 40 to 45X phase objective.
4. Place a stage micrometer on the microscope object stage and focus the microscope on the graduated lines.
5. Measure the magnified grid length of the graticule, L_o (µm), using the stage micrometer.
6. Remove the graticule from the microscope and measure its actual grid length, L_a (mm). This can best be accomplished by using a stage fitted with verniers.
7. Calculate the circle diameter, d_c (mm), for the Walton-Beckett graticule:

$$d_c = \frac{L_a}{L_o} \times D. \qquad (5)$$

Example: If L_o = 112 µm, L_a = 4.5 mm and D = 100 µm, then d_c = 4.02 mm.

8. Check the field diameter, D (acceptable range 100 µm ± 2 µm) with a stage micrometer upon receipt of the graticule from the manufacturer. Determine field area (acceptable range 0.00754 mm^2 to 0.00817 mm^2).

APPENDIX B: COMPARISON OF COUNTING RULES:

Figure 2 shows a Walton-Beckett graticule as seen through the microscope. The rules will be discussed as they apply to the labeled objects in the figure.

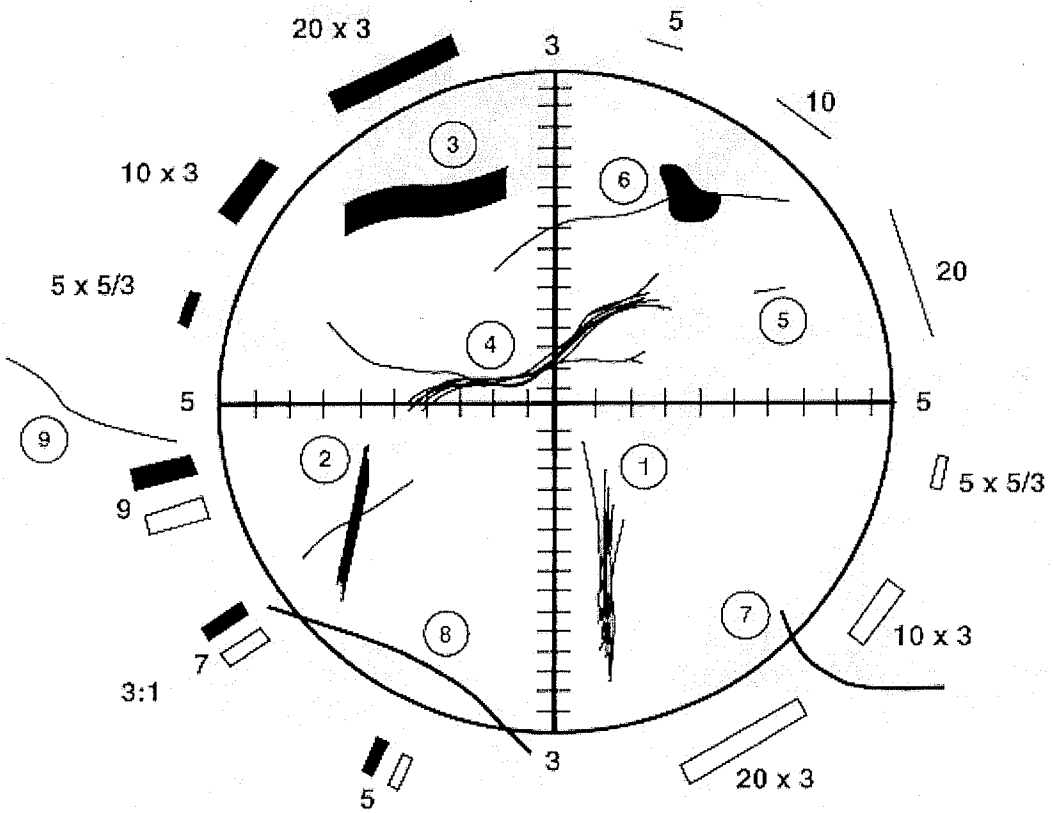


Figure 2. Walton-Beckett graticule with fibers.

These rules are sometimes referred to as the "A" rules.

FIBER COUNT

Object	Count	DISCUSSION
1	1 fiber	Optically observable asbestos fibers are actually bundles of fine fibrils. If the fibrils seem to be from the same bundle the object is counted as a single fiber. Note, however, that all objects meeting length and aspect ratio criteria are counted whether or not they appear to be asbestos.
2	2 fiber	If fibers meeting the length and aspect ratio criteria (length >5 µm and length-to-width ratio >3 to 1) overlap, but do not seem to be part of the same bundle, they are counted as separate fibers.
3	1 fiber	Although the object has a relatively large diameter (>3 µm), it is counted as fiber under the rules. There is no upper limit on the fiber diameter in the counting rules. Note that fiber width is measured at the widest compact section of the object.
4	1 fiber	Although long fine fibrils may extend from the body of a fiber, these fibrils are considered part of the fiber if they seem to have originally been part of the bundle.
5	Do not count	If the object is ≤5 µm long, it is not counted.
6	1 fiber	A fiber partially obscured by a particle is counted as one fiber. If the fiber ends emanating from a particle do not seem to be from the same fiber and each end meets the length and aspect ratio criteria, they are counted as separate fibers.
7	1/2 fiber	A fiber which crosses into the graticule area one time is counted as 1/2 fiber.
8	Do not count	Ignore fibers that cross the graticulate boundary more than once. count
9	Do not count	Ignore fibers that lie outside the graticule boundary.

APPENDIX C. ALTERNATE COUNTING RULES FOR NON-ASBESTOS FIBERS

Other counting rules may be more appropriate for measurement of specific non-asbestos fiber types, such as fibrous glass. These include the "B" rules given below (from NIOSH Method 7400, Revision #2, dated 8/15/87), the World Health Organization reference method for man-made mineral fiber [24], and the NIOSH fibrous glass criteria document method [25]. The upper diameter limit in these methods prevents measurements of non-thoracic fibers. It is important to note that the aspect ratio limits included in these methods vary. NIOSH recommends the use of the 3:1 aspect ratio in counting fibers.

It is emphasized that hybridization of different sets of counting rules is not permitted. Report specifically which set of counting rules are used with the analytical results.

"B" COUNTING RULES:

1. Count only ends of fibers. Each fiber must be longer than 5 µm and less than 3 µm diameter.
2. Count only ends of fibers with a length-to-width ratio equal to or greater than 5:1.
3. Count each fiber end which falls within the graticule area as one end, provided that the fiber meets rules 1 and 2 above. Add split ends to the count as appropriate if the split fiber segment also meets the criteria of rules 1 and 2 above.
4. Count visibly free ends which meet rules 1 and 2 above when the fiber appears to be attached to another particle, regardless of the size of the other particle. Count the end of a fiber obscured by another particle if the particle covering the fiber end is less than 3 µm in diameter.
5. Count free ends of fibers emanating from large clumps and bundles up to a maximum of 10 ends (5 fibers), provided that each segment meets rules 1 and 2 above.
6. Count enough graticule fields to yield 200 ends. Count a minimum of 20 graticule fields. Stop at 100 graticule fields, regardless of count.
7. Divide total end count by 2 to yield fiber count.

APPENDIX D. EQUIVALENT LIMITS OF DETECTION AND QUANTITATION

	fiber density on filter*		fiber concentration in air, f/cc	
	fibers per 100 fields	fibers/mm^2	400-L air sample	1000-L air sample
	200	255	0.25	0.10
	100	127	0.125	0.05
LOQ	80	102	0.10	0.04
	50	64	0.0625	0.025
	25	32	0.03	0.0125
	20	25	0.025	0.010
	10	12.7	0.0125	0.005
	8	10.2	0.010	0.004
LOD	5.5	7	0.00675	0.0027

* Assumes 385 mm^2 effective filter collection area, and field area = 0.00785 mm^2, for relatively "clean" (little particulate aside from fibers) filters.

Area 1, Phase 1
Head Maintenance System and Transfer Station Construction Contingency Plan

Baltimore Works Site
Baltimore, Maryland

August 2013

By:
Environmental Resources Management, Inc.
Harbor Point Development LLC

For:
U.S. Environmental Protection Agency – Region III
Maryland Department of the Environment

TABLE OF CONTENTS

1.0	*INTRODUCTION*	*1*
2.0	*GENERAL SYSTEM OPERATION DESCRIPTION*	*2*
3.0	*POTENTIAL IMPACTS*	*3*
4.0	*LEVEL I CONTINGENCY PLAN*	*5*
5.0	*LEVEL II CONTINGENCY PLAN*	*8*
6.0	*PARTS SOURCING*	*10*
7.0	*DISTRIBUTORS OF REPLACEMENT EQUIPMENT*	*12*
8.0	*POST CONSTRUCTION*	*14*

1.0 INTRODUCTION

The Baltimore Works Treatment facility will undergo a period of demolition and construction commencing in late 2013. The proposed construction presents potential impacts from dust, vibration and construction activities which could potentially impact the conveyance, electrical, monitoring and control systems of the facility. The following plan discusses the preparation of the existing system, workaround details and other contingencies with the intent of maintaining operation of the Head Maintenance System (HMS) and Transfer Station (TS) with minimal service interruptions.

The Contingency Plan is divided into two levels: Level I consists of preparing the existing systems and making minor modifications to the existing system in anticipation of dust and vibration that may cause equipment, electrical and control system failure; Level II addresses more advanced modifications to mitigate potential interruptions to the operations systems and control network. The Contingency Plan is cumulative in that all Level I elements are required at all times and Level II elements may be selected and implemented on an as needed basis. Aspects of the Contingency Plan involving the Transfer Station are described on Drawing DDP–EN1.02. Level I and Level 2 Contingency Plan details are presented in Drawings DDP-EN1.03 and DDP-EN1.04, respectively.

The Level II plan includes the requirements to completely isolate the HMS controls and the diversion of all impacted groundwater from the existing TS to a Temporary Transfer Station (TTS) in the event the existing TS would become inoperable. The plan narrative focuses primarily on critical system components such as the Master Supervisory System (MSS) controls and the Compressed Air System (CAS). The MSS is critical to recording and documenting system operation and compliance with the Groundwater Gradient Monitoring Plant (GGWP). The CAS is critical to the TS system for maintaining HMS operations (See Compressed Air P&ID detailed on Drawing DDP-EN1.08). The Contingency Plan includes a list of required and recommended materials and equipment necessary to maximize readiness. Supplier and vendor contact information is provided in order to provide quick reference and access to both critical and non-critical system components.

2.0 GENERAL SYSTEM OPERATION DESCRIPTION

The following is an overview of the existing system and is not intended to be comprehensive. The reader is advised to refer to the Honeywell Operation and Maintenance (O&M) Plan prepared by Black & Veatch, May 2002, for a more detailed description of current general system operations. For detailed information on the modified controls network and current operations, refer to the Baltimore Inner Harbor Site Master Supervisory System/HMS RIC Operations Manual, May 2002, prepared by Roher Systems International, Inc.

The pumping operation within each Head Maintenance System (HMS) vault (e.g. precast vault V1) is controlled by a local Programmable Logic Controller (PLC) control panel, also known as a Remote Intelligent Control (RIC or "node"). The RIC monitors the inbound and outbound piezometer water levels and controls the pneumatic extraction well pumps through a 3-way solenoid valve. Each HMS extraction vault node transmits piezometer and extraction well level data back to the MSS, also known as a Human-Machine Interface (HMI), located in the TS, for monitoring and compliance reporting purposes. Flow data is also transmitted from each extraction vault. The electric sump pumps contained in each well vault are controlled by level floats.

Water is pumped from both the "deep" and "shallow" extraction wells through a common header. Each extraction well riser is equipped with an air relief valve to release built up air in the line. The conveyance piping system consists of three headers: Header A, Header B, and Header C. Header A and B are used for extraction well conveyance. Header B serves as a backup to Header A. Header C serves the sump pumps. Each vault contains control valving to direct flow to any of the Headers as necessary to maintain system operation.

The TS PLC monitors tank water levels and provides high level alarms for system shutdown at the plant level; which includes the CAS and external HMS system. The main process controls to the HMS are provided remotely, over a data-network by the RICs that can be isolated from the TS PLC without interruption of HMS data logging. More detailed discussion is provided in the sections below.

3.0 POTENTIAL IMPACTS

The potential for dust emissions and vibration to be created by the proposed construction presents the following risks that will be addressed as part of this plan:

- Water damage;
- Exposure;
- Electrical shorts;
- Wire breakage;
- Conveyance pipe breakage;
- Airline breakage;
- Controls power interruptions;
- Motor failure;
- Fire;
- Weakening of mounting hardware;
- Damage to the control systems.

A natural gas and potable water line run directly through the Electrical/Mechanical Room. ERM assumes that all water and gas utilities will be shut off and properly prepared for construction. ERM recommends the replacement of the existing natural gas unit heaters in the Tank Room with electric unit heaters as specified on DDP-EN-1.02 in order to eliminate natural gas lines to the TS. Please note that the existing fire suppression system only served the existing TS office space slated for demolition. However, the existing water main is routed through the Electrical Mechanical room and poses a significant risk to those systems if damaged during construction.

Concentric steel piles will be driven and concrete pile caps will be constructed for the Exelon Trading Floors and Garage buildings. Foundations are to be installed adjacent to the Tank Room and the Electrical/Mechanical Room, which are to remain in place (Drawing DDP-EN1.01). The Programmable Logic Controller (PLC) and Motor Control

Center (MCC), located in the Electrical/Mechanical Room, are rated to withstand periods of vibration; however, vibration and visual monitoring will be required during these construction activities to ensure uninterrupted operations.

A pile load test was performed in May 2013 in the test areas east of the existing soil bentonite slurry wall and in proximity to the outboard shallow piezometer, OSP-1, and outboard deep piezometer, OP-1. The test produced a marked response in the water level at OSP-1 and a minor response at OP-1. The TS Operator will need to monitor water level spikes and adjust pneumatic on/off setpoints and other operating protocols as necessary to maintain proper operating and reporting protocols as detailed in the O&M Plan and GGMP. The TS Operator shall be responsible for communicating any operational issues to the Developer's field representative. The Developer's Construction Contractor (Construction Contractor) shall adjust operations based on HMS and TS conditions and shall stop work in the event there is a direct conflict to the TS/HMS operations. The Construction Contractor shall notify the TS Operator and Developer's field representative immediately in the event that the TS/HMS is damaged in anyway. The Developer's field representative and the TS Operator will assess the operability of the system and determine what aspects of the Contingency Plan to implement.

4.0 LEVEL I CONTINGENCY PLAN

The following items are required as part of the Level I Contingency Plan:

- Keep the existing TS PLC and RICs in-place without modification: This will prevent the costly reverse-engineering of the PLC programming and avoid rerouting controls wiring;

- Backup the existing PLC programming in the TS and HMS systems: The existing PLC consists of Siemens type Simatic-200 in both the TS and the HMS vaults. All components for these systems are available and replaceable. The Developer's field representative will back-up the existing programs in the event that any PLC component is damaged and need to be replaced. This ensures that the controls system can be re-established quickly. The Developer's field representative will also employ a hard-drive imaging strategy periodically during construction to ensure the operator terminal maintains data-integrity throughout the work schedule. This measure will avoid the costly and time intensive process of reprogramming and configuring of the MSS Wonderware terminal in the event that the hard drive were to become corrupted.

- Relocate the existing Wonderware MSS/HMI computer system to a field office: This system configuration is shown as Scenario 1 on Drawing DDP-EN1.02 and involves the use of a wireless Ethernet Network Switch (ENS) at the existing 8 port hardline ENS. A second wireless ENS will be placed in a temporary field office (See Drawing EN 1.01) in order to connect the field HMI to the existing controls system. The location of the temporary field house, however, is subject to change based on construction progress. The location of the temporary field house, however, is subject to change based on construction progress. The control computer, BAW-1, will be relocated to the temporary field office. The backup control computer BAW-2 shall be located within the remaining portion of the TS (actual location to be determined at time of construction) and placed in a hardened console (See Section 6.0 below). The Contractor shall provide power, portable air conditioning unit, hard wiring or any other appurtenances necessary to relocate BAW-2 within the remaining TS. The HMI relocation will allow the TS Operator to be safely out of the existing Transfer Station/Tank Area during construction, and allows 24/7 monitoring of the process. This will allow for immediate notification in case of component failure or wire breakage. The Developer's field representative will reference the Wonderware HMI to troubleshoot

affected instrumentation and controls without having to stop work to enter the construction zone or control room. It should be noted that any wireless networking equipment shall be secured using the following: hidden SSID, 256-bit AES-2 encryption and strong password(s) (utilizing mixed case, numeric and ASCII symbols).

- Provide dust control: The Electrical/Mechanical Room is particularly sensitive to dust. In order to mitigate this issue, the Contractor will need to place the Electrical/Mechanical Room under a minimum positive pressure of 0.1 inch W.C. during construction. Placing the room under positive pressure will require isolating the sections of the HVAC ductwork specific to the Electrical/Mechanical Room and feeding air into the room with a portable blower equipped with a particulate filter, preferably upstream of the blower. Fan EF-203 (See Subproject 6 drawings TM-2 and TM-7) will need to be taken offline. Other materials and equipment should be protected to the extent possible using tarps or plastic.

- Provide backup power supply: Power Interruption can cause damage to the PLCs or the RICs. American Power Conversion (APC) 3000VA USB & Serial 120V Smart-Uninterruptible Power Supply (UPS) capable of handling the sensitive PLC, power supply and Input/Output components for over four (4) hours. In conjunction with an on-site generator, these should provide smooth power support during the construction. The Wonderware HMI computer and monitor and wireless link(s) will also be plugged into a UPS system for smooth power delivery.

- Perform regular inspections of TS and HMS systems: It is anticipated that downtime will be scheduled with the Contractor to allow the Operator to access the TS and HMS vaults to maintain and inspect the existing system. The Operator will check alarms, general system conditions and inspect lines for leaks and general system issues. All control cabinets and enclosures will be inspected on a regular schedule in between construction work. The Developer's field representative will monitor the dust and moisture in the control room periodically.

- Relocate air receiver: The existing air receiver (i.e. the pressurized air tank of the compressed air system) is currently located in the corner of the existing loading dock and will need to be relocated during construction. The air receiver will be relocated to its permanent location in the Maintenance Room during construction in order to install a temporary airline connection between the

existing after-cooler and air dryer to the temporary air receiver location. Being in proximity to the existing lines will minimize piping to and from the existing system and maintain air system operations through the existing air lines that are routed through the existing vault V1 penetration. Any controls associated with the air receiver will also need to be re-located and rewired to the TS PLC.

5.0 LEVEL II CONTINGENCY PLAN

The following items will be performed in addition to the Level I Contingency Plan as required to maintain system operations:

- Provide wireless telemetry: It is anticipated that some wire breakage will occur between each HMS vault during construction. All health and safety issues associated with this work (such as breakage of a high voltage line) shall be considered in the Construction Contractor's health and safety plan. The HMS controls network consists of daisy-chained LAN lines connected by ENSs in each vault. The ENS in each vault boost the control signal between each vault and contains open Ethernet ports for connecting additional wireless ENSs. In the event that a signal wire is severed between vaults, wireless ENSs will be installed at each effected HMS vault in order to maintain the data signal as represented by Scenario 2 on Drawing DDP-EN1.03. Any broken network link(s) must be repaired before back-filling or before other above-grade construction ceases. It should be noted that any wireless networking equipment shall be secured using the following: hidden SSID, 256-bit AES-2 encryption and strong password(s) (utilizing mixed case, numeric and ASCII symbols). The field representative and control support personnel shall field test wireless operations with the TS/HMS operator after the HM1 is relocated by simulating a severed line.

- Isolate the entire HMS control system: The individual well vaults are linked together with an Ethernet network. Wireless telemetry can be quickly established to re-link damaged RIC network node to the HMI. As represented by the scenario 3 control detail on Drawing DDP-EN1.03, an ENS will be installed within V1 and V2 in order to establish a data link with the wireless field HMI ENS.

- Divert impacted groundwater: In the event that the tanks are damaged or the impacted groundwater needs to be routed away from the TS, the piping in vault V1 will be modified to divert all flow from V1 to one of two double-walled water storage tanks as detailed on Drawing DDP-EN1.04. The piping outside of V1 will be flex pipe with secondary containment. The pipe will be heat traced during the colder months of the year as necessary. An area with the proper tanker turning radius to access each of the two tanks will be provided in order to maintain a temporary loading dock with secondary containment at all times. Line drainage shall be accomplished by routing the pipe volume to the sump inside V1.

- Install Wireless I/O and Instrumentation: Temporary wireless I/O (receiver/transmitter/transceiver) will be installed as necessary to maintain communications with individual pieces of equipment (for data logging or controls). The wireless transceivers will be necessary if an individual data/control line is severed (e.g. the transducer line at a piezometer is severed) or a temporary system is placed into operation (e.g. a temporary wireless pressure transmitter relaying Compressed Air System pressure to the HMI). The field representative and controls support personnel shall field test the wireless I/O with the TS/HMS operator prior to construction. In the case of a severed signal line, the Contractor will repair the severed line as soon as possible to minimize the use of battery and maximize the availability of wireless I/Os for other system repairs. The wireless I/O devices act as a "repeater" of discrete or analog (4-20ma) signals. Both Transmitter and Receiver need to be DC powered and fitted with appropriate antennas for communication.

6.0 PARTS SOURCING

The Developer's field representative will source the following items pre-construction to support the Level 1 contingency plan detailed above:

- Uninterruptible Power Supply (3,000 kva or better) for PLC
- Uninterruptible Power Supply (3,000 kva or better) for HMI and Computer
- Wireless G routers for PLC and HMI
- High-Gain Antennas for wireless routers
- Appropriate cabling (power, signal, data) to support remote HMI
- Ethernet-to-serial adapter to connect wireless HMI to PLC
- Developer's field representative One Master Input/Output telemetry radio and antenna
- One Slave Input/Output telemetry radio and antenna
- Siemens Simatic PLC Programming Cable
- Siemens Simatic PLC Programming Software
- Stock of signal cable to connect instrument(s) to wireless telemetry
- Backup Hard Drive to image Wonderware HMI Computer System;
- Hardened Console for BAW-2

The Developer's field representative will source the following parts during construction on an as-needed basis to support the Level II contingency plan as described above:

- Siemens Simatic I/O card(s)
- Fuses
- Terminal Blocks

- Wire and Cable

- Instrument(s) (to replace damaged piezometer for instance)

The Developer's field representative will work with a site electrician to assist with components of the MCC, but it is up to the electrical contractor to repair any issues with high-voltage equipment (> 220/240 volts AC).

7.0 DISTRIBUTORS OF REPLACEMENT EQUIPMENT

- General Equipment – Tyco – P: (800) 289-2647. http://www.tyco.com.
- General Equipment – Jobe and Company, Inc., 7677 Canton Center Drive, Baltimore, MD, 21224, (410) 288-0560. http://www.jobeandcompany.com/.
- Siemens Simatic PLC, Control Panel supplies (fuses, terminal blocks, etc.) – Wesco, 1710 Edison Hwy Baltimore, MD 21213. (410) 563-8200. http://www.wesco.com/.
- MSS/HMI Operator Interface Software –Wonderware North (Invensys) 425 Caredean Drive Horsham, PA 19044. P: (877) 900-4996. http://wonderware.com.
- Wire and Cable, select instrumentation and solenoid valves, general equipment – Grainger, 2100 Haines St. Baltimore, MD. P: (410) 391-9000. http://www.grainger.com.
- Additional Instrumentation and Controls – Dwyer Inc. – 102 Indiana Hwy. 212 Michigan City, IN 46361. http://www.dwyer-inst.com.
- Computer Components, Wired (Ethernet) and Wireless Networking Equipment – Newegg – 9997 Rose Hills Road Whittier, CA 90601. http://www.newegg.com.
- Hardened Console: (http://www.armagard.com/ip54/computer-enclosure.html).
- Pneumatic Pumps - Geo Pump - 213 State Street, Medina, NY 14103. P: (800)-645-7654. www.geopump.com.
- Well Drillers - SGS North America Inc. - 5712 Erdman Ave., Baltimore, Maryland. P: (410) 483-2200. www.sgsgroup.us.com.
- Compressed Air System Rentals – Aggreko Rentals - 124 N. Langley Road, Glen Burnie, MD 21060. P: (410) 689-1514, www.aggreko.com/northamerica - Contact John Sibiski: john.sibiski@aggreko.com.
- Heavy Duty Cable Protector – Cable Ties and More - 1623 Central Ave, Suite 3 Cheyenne, WY 82001, UPS shipping Buffalo, N.Y. 14225. http://www.cabletiesandmore.com.

- Collapsible Secondary Containment for Frac Tank – New Pig, One Pork Avenue, PO Box 304, Tipton, PA 16684-0304. http://www.newpig.com/pig/US/.
- Frac Tank – Adler Tank Rentals, 260 Mack Place South Plainfield, NJ 07080. P: (908) 462-9800. http://www.adlertankrentals.com/home.aspx.
- Self-Priming Pump for Secondary Containment – Home Depot, 6315 Eastern Ave, Baltimore, MD 21224. P: (410) 631-4440. http://www.homedepot.com/.
- Flexworks Double Containment Pipe – OPW, 3701 Commerce Dr. #108 Baltimore, Maryland 21227; 443-833-1565. http://www.opwglobal.com/.

8.0 POST CONSTRUCTION

Ultimately, the controls system will be re-wired to its original state post-construction so the measures outlined above are for the duration of construction only. The HMS and TS systems will operate as originally designed.

Upon completing construction, the existing Contingency Plan included in the Owner's existing Operations and Maintenance (O&M) Plan will be used to address any emergency situations.

Area 1 Phase 1
Health and Safety Plan

Baltimore Works Site
Baltimore, Maryland

August 2013

By:
Environmental Resources Management, Inc.
Harbor Point Development LLC

For:
U.S. Environmental Protection Agency – Region III
Maryland Department of the Environment

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 PURPOSE 1

1.2 BACKGROUND 2

2.0 PROJECT PERSONNEL AND RESPONSIBILITIES 4

3.0 SITE CONTROL MEASURES 5

4.0 PERSONNEL TRAINING 6

5.0 MEDICAL MONITORING 7

6.0 HAZARD IDENTIFICATION CONTROL 8

6.1 HAZARD IDENTIFICATION PROCESS 8

6.2 CHEMICAL HAZARDS 8

6.3 SOIL CONDITIONS 8

6.4 GROUNDWATER CONDITIONS 9

7.0 FIELD ACTIVITIES 10

8.0 SITE PERSONNEL 11

9.0 PERSONAL PROTECTIVE EQUIPMENT 12

10.0 RESPIRATORY PROTECTION 16

11.0 DECONTAMINATION PROCEDURES 17

11.1 EQUIPMENT DECONTAMINATION 17

11.2 PERSONNEL DECONTAMINATION 18

12.0 ACTION LEVELS 19

13.0 THERMAL STRESS 22

13.1 HEAT STRESS 22

13.2 COLD STRESS 27

13.2.1 Frostbite 27
13.2.2 Hypothermia 27
13.2.3 Control Measures for Cold Stress 28

14.0 SAFE WORK PRACTICES AND STANDARD OPERATING PROCEDURES 31

14.1 GENERAL SAFE PROVISIONS 31

14.1.1 Smoking and Eating Areas 32
14.1.2 Sanitation and Potable Water 32
14.1.3 Temporary Facilities 32
14.1.4 First Aid Station 33
14.1.5 Eye Wash Stations 33

15.0 STANDARD OPERATING PROCEDURES 34

16.0 SAFE WORK PRACTICES 35

16.1 PRE-EXCAVATION 35

16.2 FALL PROTECTION 35

16.3 WEATHER-RELATED EVENTS 36

16.3.1 Lightning Safety for Outdoor Workers 36
16.3.2 Noise 37

17.0 CONFINED SPACE ENTRY PROCEDURES 38

18.0 SPILL CONTAINMENT PROGRAM 39

19.0 SITE COMMUNICATION 40

20.0 COMMUNICATION AND REVIEW OF SITE-SPECIFIC HASP PLAN (HAZARD COMMUNICATION) 41

21.0 EMERGENCY RESPONSE PLAN 42

21.1 PERSONNEL ROLES AND LINES OF AUTHORITY 42

21.2 EVACUATION ROUTES AND PROCEDURES 42

21.3 ASSEMBLY POINTS 42

22.0 EMERGENCY RESPONSE *43*

22.1 NOTIFICATION OF SITE EMERGENCIES *43*

22.2 DIRECTIONS TO THE NEAREST HOSPITAL *43*

23.0 EVACUATION PROCEDURES *44*

24.0 INCIDENT REPORTING PROCEDURE *45*

25.0 INCIDENT INVESTIGATIONS *46*

26.0 CERTIFICATION OF FAMILIARITY WITH PLAN BY SITE PERSONNEL *47*

LIST OF FIGURES

1 Site Location Map

LIST OF APPENDICES

A Map to Hospital

B Job Hazard Analysis Form

C Material Safety Data Sheets

D Daily Safety Meeting Form

1.0 INTRODUCTION

This Health and Safety Guidance ("HSG") has been prepared for inclusion with the Detailed Development Plan (DDP) for Harbor Point Area 1 Development ("Site"). For Phase 1 construction in Area 1, the primary chemical of concern is hexavalent chromium in soil and groundwater, or on debris below the MMC synthetic layers. Lead and PNAs are identified as potential contaminants of concern in Areas 2 and 3.

Harbor Point is located on a peninsula in the Northwest Branch of the Patapsco River located in Baltimore, Maryland (Figure 1). The peninsula joins the mainland at the east side of the site, bounded by South Caroline Street and the Baltimore Inner Harbor. The main site area is referred to as Area 1, and the Southeast Quadrant is referred to as Area 2. Additionally, the property located midway between Wills Street and South Caroline Street North of Philpot Street is referred to as Area 3.

The approved Environmental Remediation System (ERS) is operated and maintained by Honeywell International Inc. ("Honeywell") pursuant to the Consent Decree dated April 27, 1989, as amended, among Honeywell, EPA and MDE, to contain chromium contaminated groundwater and minimize the possibility of exposure to impacted soil. The ERS consists of the Multimedia Cap (MMC), Hydraulic Barrier, Head Maintenance System (HMS) and Outboard Embankment.

1.1 PURPOSE

Harbor Point Development (HPD) is developing this site which is currently owned and maintained by Honeywell International. Environmental Resources Management, Inc. (ERM) has prepared this HSG to be used, as appropriate, by Contractors engaged in preparing and implementing Contractor-Specific Health and Safety Plans (HASP) for Area 1 development. This HSG is intended to address worker safety related to potential exposure to environmental constituents of concern, e.g., chromium, and not health and safety, OSHA or other regulations pertaining to general construction activities.

This HSG does not supersede the *Final Master Health and Safety Plan for Honeywell Baltimore Inner Harbor*, dated August 2002 and revised June 2007.

This Health and Safety guidance document is not intended to be and shall not be used as a Contractor-Specific HASP. Also, this document is not intended to be inclusive of all health and safety conditions that may be encountered at the Site, such as those associated with general construction activities. Rather, this document is solely intended to provide guidance to Contractors to identify and address contaminated environmental media that may affect their work and, at a minimum, must be included in their HASP. It is the sole responsibility of Contractors to prepare and implement their own HASP in accordance with all applicable federal, state and local regulations and standards of care.

All Contractor-Specific HASPs will provide Site-specific health and safety requirements that are pertinent to their own anticipated activities. It is the responsibility of the Contractor to review the project documents to make its own determination as to the appropriate level of personnel protection based on the task being performed.

In the event that a conflict in procedures or requirements exists between this HSG and a Contractor-Specific HASP, the procedures or requirements that are most protective of human health will be applied. HPD, or its representative, will review all Contractor-Specific HASPs, but will not be responsible for approving the completeness or measures specified.

1.2 BACKGROUND

The Site has been divided into Areas 1, 2, and 3. Area 1 is the principal site of Honeywell's (formerly AlliedSignal) Baltimore Works Facility (Figure 1). Chromium ore was processed in Area 1 from 1845 to 1985. The former manufacturing processes resulted in chromium impacts to soil and groundwater. An Environmental Remediation System (ERS) is maintained and operated by Honeywell International Inc. (Honeywell) to contain CrVI-impacted groundwater in Area 1 and control the potential for human exposure to affected soil. The ERS consists of a Multimedia cap (MMC), Hydraulic barrier, Head Maintenance System (HMS), a groundwater storage and transfer system, and Outboard Embankment. The HMS maintains an inward groundwater gradient to mitigate the migration of chromium-impacted groundwater from the Site.

Area 2 was mainly used for coal and raw chromium ore storage. In addition, a fertilizer warehousing and supply company operated in this area for many years.

Area 3 consists of five separate properties all with a history of industrial activity. This industrial activity included brass casing, oil blending and storage, lumber storage and coating/plastics production.

Honeywell purchased all of these properties by 1993 at which time all manufacturing was halted and subsequently all buildings and tanks were removed from these sites.

2.0 PROJECT PERSONNEL AND RESPONSIBILITIES

Contractors shall designate and assign appropriately trained and qualified personnel to fulfill the following responsibilities for implementation of its HASP. These titles and the names of the individuals assigned should be included in the written HASP:

- Project Manager (PM) – The Project Manager will serve as the Contractor's principal point of contact for project-related decisions and communication;

- Project Health and Safety Coordinator (HSC) – the HSC will be responsible for preparing and overseeing implementation of the Contractor-Specific HASP, as well as updating the HASP as conditions warrant. The HSC will be consulted by the Contractor's PM or field personnel whenever site conditions may require modification to the Contractor's HASP.

- Site Safety Officer (SSO) – The SSO or designee will be responsible for ensuring that the Contractor's HASP is properly implemented by contractor's employees and subcontractors. The SSO will serve as the primary point of contact for communications between field personnel and management. The SSO will be responsible for notifying the PM and the HSC of field conditions that may require modification to the HASP. It is the responsibility of the SSO or designee to ensure that site personnel are in conformance with the level of personal protection equipment (PPE) specified by the Contractor's HASP. It is incumbent upon the SSO to establish and maintain direct lines of communication with the Owner and/or its representative.

3.0 SITE CONTROL MEASURES

The Contractor's written HASP must describe how site control will be maintained. The Contractor should ensure through the assigned SSO that site control is maintained by establishing egress and ingress points for work activities and modifying them, as appropriate, as the project and work areas progress. The Contractor's HASP should ensure that the site is properly secured at all times to restrict unauthorized access by visitors or other personnel.

The Contractor must ensure that visitors not engaged in site work will be provided with the appropriate level of PPE and escorted at all times while onsite by the SSO or designee. The Contractor should implement controls for all on-site personnel such that smoking, eating, drinking, or other activities which promote hand to mouth contact are only permitted in designated clean area(s), the locations of which will be determined by the SSO.

4.0 PERSONNEL TRAINING

The Contractor's HASP must describe what training is necessary to safely conduct the specific job and what types of employees receive training. The Contractor will distribute its HASP to appropriate employees and subcontractors involved in the project. Prior to commencing with the fieldwork, the Contractor's SSO should discuss the contents of the HASP with Contractor's workers and subcontractor employees. The SSO shall maintain documentation of specialty training provided for his role and the Contractor's employees based on their specific work task and responsibility. These documents shall be made available to the Owner or Owner's representative if requested.

It is the responsibility of the Contractor to ensure that its employees and subcontractors engaged in implementation of project activities comply with the applicable OSHA regulations in 29 CFR 1910 and 29 CFR 1926. It is required that employees who may come into contact with subsurface soils and groundwater during performance of the work comply with the training specified in 29 CFR 1910.120(e. It is the Contractor's responsibility to determine which employees may potentially be in contact with contaminated subsurface soils and groundwater. It is anticipated that the workers with the following job descriptions may potentially come into contact with contaminated media and must have the appropriate health and safety training:

- Backhoe Operators
- Vacuum Truck or Pump Operators
- Truck Drivers
- Laborers/Spotters

Workers on site only occasionally for a specific limited task (such as, but not limited to, groundwater monitoring, land surveying, or geophysical surveying) should also comply with the training specified in 29 CFR 1910.120(e).

5.0 MEDICAL MONITORING

Personnel involved in site operations with the potential for encountering contaminated media must have undergone medical surveillance with their employer, to include initial and periodic examinations, prior to performing field work at the site. Each employer's occupational health physician determines frequency of examinations based on a variety of factors. The Contractor is responsible for the Contractor's employees involved in field activities associated with the project would be required, as appropriate, to adhere to the medical monitoring requirements of 29 CFR 1910.120(f). Project personnel will utilize the services of a licensed occupational health physician with knowledge and/or experience in the hazards associated with the project to provide the medical examinations and surveillance specified herein. Medical "fit-for-duty" certifications shall be maintained on Site for all HAZWOPER workers.

6.0 HAZARD IDENTIFICATION CONTROL

6.1 HAZARD IDENTIFICATION PROCESS

Prior to initiating any new project activity or when there is a change in site conditions, the SSO will assist project team members in completing and documenting a Job Hazard Analysis (JHA). A copy of the JHA form that may be used by the Contractor is located in Appendix B.

6.2 CHEMICAL HAZARDS

Chromium, hexavalent chromium, lead and polynuclear aromatics (PNAs) may be present at the Site. For Phase 1 construction in Area 1, the primary chemical of concern is hexavalent chromium in soil and groundwater, or on debris below the MMC synthetic layers. Lead and PNAs may be present in Areas 2 and 3. Chemicals may be introduced into the body by ingestion, inhalation, or absorption through the skin. Since not all chemicals have the same level of toxicity, the length of time for the exposure and the concentration of the chemical are important in determining the potential risk to onsite workers. Inhalation and skin contact are the most common routes of entry for the type of work that is contemplated for this site. Chemicals can be introduced into the body by ingestion when chemicals present on the hands are transferred to food or cigarettes.

6.3 SOIL CONDITIONS

The uppermost material encountered in all of the soil borings collected on this site is fill material, ranging in thickness from about 7 to 30 feet. The fill consists of medium compact to loose, gray and brown fine to coarse sand, with some silt, trace to some gravel, trace clay, and with variable amounts of brick, concrete fragments, cinders and wood and likely contain materials impacted by hexavalent or trivalent chromium. COPR was not land filled at the site; however, soil containing elevated concentrations of chromium can be expected to be encountered. Lead and PNAs may also be encountered in soil in Area 2.

6.4 GROUNDWATER CONDITIONS

Elevated concentrations of hexavalent chromium have been reported in shallow groundwater. Shallow ground water levels have not been recorded above elevation +3 feet mean sea level (msl).

7.0 FIELD ACTIVITIES

The following activities are anticipated to be performed during construction of the Area 1, Phase 1 development.

- Continuous operation of the Transfer Station and HMS including the storage and transfer contaminated groundwater;
- Installation of erosion and sediment controls;
- Demolition of concrete structures and asphalt paving;
- Selective demolition of the Transfer Station;
- Exposing portions of the MMC synthetic materials;
- Excavation, temporary storage and transportation of clean and contaminated soils and water;
- Pile driving;
- Concrete forming;
- Installation of clean fill, aggregates, and synthetic materials;
- Installation of utilities in clean fill;
- Backfill and surface grading;
- Vibration monitoring; and
- Environmental media monitoring.

8.0 SITE PERSONNEL

Workers with the following job descriptions will be engaged in activities conducted in at the site:

- Heavy Equipment Operators
- Vacuum Truck or Pump Operators
- Truck Drivers
- Laborers/Spotters
- Technical Personnel

Other visitors to the site, not directly involved in proposed work activities, will be considered in the HASP as technical personnel listed above.

9.0 PERSONAL PROTECTIVE EQUIPMENT

Level D is the expected level of protection for this construction work. However, it is the responsibility of the Contractor to review the project documents in order to make its own determination as to the appropriate level of PPE for its personnel and subcontractors, as well as applicable action levels for use of more protective PPE. At a minimum, Level D PPE consists of the following:

- Coveralls or long sleeve shirts and long pants, unless otherwise directed by the SSO;
- Outer protective work gloves at a minimum for all hazardous or potentially hazardous material handling activities that may occur during site activities;
- As a conservative measure, workers that may routinely come into contact with groundwater (e.g., workers in the trench making the utility line connections) should be in poly-coated Tyvek, (Modified Level D) or similar chemical resistant suit, outer water and chemical resistant gloves and boots;
- Steel-toed work boots;
- Hard Hat, where appropriate;
- Safety Glasses; and
- High visibility outer ware or safety vest.
- Options, as required;
    - Disposable outer boots;
    - Hearing protection; and
    - Chemical Resistant gloves.

Contractors performing intrusive operations into known or potential chromium impacted areas must address specific air/personal air monitoring requirements for hexavalent chromium in accordance with either 29 CFR 1910.1026 or 1926.1126. Prior to initiating any new project activity or when there is a change in site conditions, an additional JHA will be completed. A copy of the JHA form is located in Appendix B.

Personal Protective Equipment requirements are provided in Table 9-1, below.

Table 9-1. Personal Protection Equipment Requirements

PPE Level	Ensemble Components	Anticipated Use
Level D Should be worn only as a work uniform and not in any area with respiratory or skin hazards. It provides minimal protection against chemical hazards.	• Long pants and shirt with sleeves. • Safety-toed footwear. • Safety glasses with molded side shields. • Hard hat. • Work gloves • Hearing protection if hazard is present	• Demolition of concrete structures and asphalt paving. • Excavation, temporary stock pile and transportation of soils. • Installation of clean fill, aggregates, and synthetic materials. • Installation of utilities in clean fill area. • Air monitoring. • Backfill and surface grading. • Pile driving. • Concrete forming. • Dewatering.

PPE Level	Ensemble Components	Anticipated Use
Modified Level D	Level D and the following: • Disposal poly-coated Tyvek coveralls. • Safety-toed rubber boots or disposal boot covers over shoes. • Thin nitrile gloves. • Green nitrile gloves over thin nitrile gloves when primary gloves may tear or puncture.	Any of the above-referenced tasks in which there is moderate potential for skin contact with chromium impacted soil and/or water and for all activities involving direct contact with chromium impacted soils located beneath the multimedia cap.
Level C Should be worn when the criteria for using air-purifying respirators are met, and a lesser level of skin protection is needed.	Level D or Modified Level D and the following: • Full-face air purifying respirator with combination dust organic vapor cartridges at least rated N-100 or better. If second action level surpassed • Half-face air purifying respirator with combination dust organic vapor cartridges at least rated N-100 or better. If first action level surpassed	Any of the above-referenced tasks in which there is moderate potential for skin contact with chromium soil and air monitoring data indicate a need for respiratory protection.

PPE Level	Ensemble Components	Anticipated Use
Level B Should be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection is needed.	Not anticipated to be required	Tasks requiring Level B PPE are not anticipated during this project. If Level B PPE is needed, as determined by the SSO and/or the Project Health and Safety Coordinator, the HASP will be revised.
Level A Should be worn when the highest level of respiratory, skin, and eye protection is needed.	Not anticipated to be required	Tasks requiring Level A PPE are not anticipated during this project. If Level A PPE is needed, as determined by the SSO and/or the Project Health and Safety Coordinator, the HASP will be revised.

10.0 RESPIRATORY PROTECTION

The type of respiratory protection required will be based on the results of ambient air monitoring, the results of any models used to predict ambient air concentrations, and the professional judgment of either the SSO or the Project Health and Safety Coordinator (HSC). Respiratory protection requirements are outlined on Table 9-1.

As required by 29 CFR 1910.134, *Respiratory Protection*, a cartridge change-out schedule will be developed based on either the results of ambient air monitoring, the results of any models used to predict ambient air concentration or the professional judgment of the Project HSC. The Site-specific dust action levels utilized for this HASP were developed from the data collected during the Pre-Construction Air Monitoring Study, conducted from 23 April through 22 June 2013.

The Site soil data indicates that the soil CrVI concentration presents conditions requiring exposure monitoring for the project. As such, the action level triggering upgrading to Level C is based on the Site-specific dust action level, as provided in Section 12 and the Site-specific Air Monitoring Plan. The Site-specific dust action levels are more conservative that the OSHA requirements and as such are protective of both perimeter receptors and those workers involved in intrusive work on the Site.

11.0 DECONTAMINATION PROCEDURES

Decontamination involves the orderly controlled removal of contaminants from both personnel and equipment. The purpose of decontamination procedures is to prevent the spreading of contaminated materials into uncontaminated areas. All site personnel should limit contact with contaminated soil, groundwater or equipment in order to reduce the need for extensive decontamination. Decontamination only applies to site personnel and equipment that contact contaminated media.

11.1 EQUIPMENT DECONTAMINATION

All contaminated tools and equipment will be decontaminated on site using appropriate methods. Dry decontamination procedures will consist of thoroughly brushing or wiping down tools and equipment. Wet decontamination will consist of thoroughly scrubbing and cleaning tools with a designated cleaning solution. All wipes, pads or towels will be containerized. All decontamination fluids will be drummed for disposal.

Equipment and materials used in the decontamination process may include the following:

- High pressure/hot water cleaning using only potable water/fire water;
- Phosphate-free detergent;
- Five-gallon bucket;
- Potable water;
- Distilled water;
- Paper towels; and
- Brushes.

11.2 PERSONNEL DECONTAMINATION

Decontamination is required for all workers exiting a contaminated area. Personnel may re-enter the Support Zone only after undergoing the decontamination procedures. Personnel shall remove all contaminated PPE and containerize it in drums. All work boots are to be decontaminated using a secured boot brush mounted over disposable plastic sheeting. All personnel shall remove any inner clothing that is contaminated and redress. All personnel must wash face and hands before taking breaks, eating and at the end of the work shift. All PPE and wash water drums will be disposed properly.

Emergency decontamination for a life threatening medical emergency will consist of removal of the victim's outer protective clothing or equipment to the extent where life saving procedures/medical treatment can be performed. Final decontamination can be postponed until emergency medical attention is received. The emergency medical personnel must be advised of the potential contamination.

12.0 ACTION LEVELS

The potential exposure pathway of concern is incidental inhalation, ingestion or dermal contact with CrVI, lead and polynuclear aromatics from soil/debris/dust. Therefore, measures will be followed during soil/debris handling to eliminate the potential exposure pathway. The SSO will routinely conduct real-time air monitoring for total airborne particulate concentrations to demonstrate that the Site-specific dust action level, as provided in the Air Monitoring Plan, is not exceeded during construction. It is expected that such monitoring will be performed throughout the duration of intrusive activities below the MMC synthetic layers and until contaminated media has been completely removed from the Site.

Site-specific background values and action levels have been established based upon the data evaluation presented in the Air Monitoring Plan, as derived from the Preconstruction Air Monitoring program. It is important to note that the Site-specific dust action level (40 $\mu g/M^3$), as established in the Air Monitoring Plan, represents the Upper Tolerance Limit (UTL 99%) background threshold value and is significantly lower than the OSHA Total Particulate Not Otherwise Regulated permissible exposure limit of 15 mg/M^3. Since the Site-specific dust action level is based on the background threshold value for pre-construction ambient air compliance with the plan would result in no increase in particulate born inorganic or organic constituents due to project soil intrusive activities and serves as a real-time surrogate for CrVI as well as other particulate borne constituents including lead and PAHs. Therefore the Site-specific dust action level is significantly protective of potential particulate exposure to workers during intrusive activities.

A correlation between total airborne particulate concentrations and CrVI concentrations has been established for the site based upon the results of the Preconstruction Air Monitoring Study as presented in the Air Monitoring Plan. Based upon this correlation, it is extremely improbable that either the OSHA action levels for total particulates or CrVI will be exceeded given the restrictive Site-specific dust action level and response actions, including stopping work potentially contributing to elevated particulate concentrations (See Table 12-1). To meet the OSHA and Site-specific monitoring requirements, CrVI air sampling will be initiated should the Site-specific dust level be exceeded, as described in the Air Monitoring Plan. Air sampling will continue for 5 consecutive days to document CrVI airborne concentrations. Confirmation that the Site-specific dust levels are serving as a surrogate for the OSHA action level, will be accomplished by comparing laboratory analytical results utilizing

OSHA Method ID 215 to the OSHA action level (0.25 µg/M^3). While highly unlikely, if the OSHA CrVI action level is exceeded, reassessment of the response actions will be taken and changes made to reduce potential dust emitting activities.

Real-time aerosol monitors (RAM, DustTrak™ DRX 8534 will be utilized at four (4) perimeter air monitoring (PAM) stations to continuously monitor total particulate concentrations as the surrogate for CrVI. The PAM stations will continuously monitor and record total particulate concentrations at 1-minute averages operating at approximately 2 liters per minute (lpm), 24 hours per day, seven days per week.

Work Zone (WZ) monitoring will be performed utilizing two (2) RAMs; one positioned upwind and the other positioned downwind of the intrusive activity area. The WZ stations will continuously monitor and record total particulate concentrations at 1-minute averages operating at approximately 2 liters per minute (lpm) during work hours.

The DustTrak™ DRX 8534 total particulate concentration audible alarm shall be set at to the Site-specific dust action level of 40 µg/M^3. Real-time and sampling pump instrumentation will be calibrated daily per manufacturer's instructions and have adequate and redundant power-supplies to ensure constant operation. All documentation regarding real-time results, monitoring times, dates, duration and monitoring locations shall be available to the Owner or Owner's representative upon request.

Table 12-1 outlines the steps to be taken by the SSO when the Site-specific action levels of the various contaminants are exceeded. Respiratory protection is selected based on occupational exposure limits of the constituents at the site and the potential for exposure to vapors and dust from site activities.

Table 12-1. Action Levels and Response Actions Requirements

Chemical (Method)	Site-Specific Action Level	Response Actions
Dust Real-time Aerosol Monitor (RAM) and NIOSH Analytical Method 500	Greater than 40 µg/M^3 sustained in the work zone for 15 minutes	• Contact PM and Project Health and Safety Coordinator. • Evaluate work practices and assess engineering controls to reduce airborne concentrations. • Continue to monitor RAM dust concentration level. • Implement dust suppression. • If readings are less than 40 µg/M^3 for 15 minutes, resume work.
	Greater than 40 µg/M^3 sustained in the work zone for 30 minutes	• If readings are 40 µg/M^{3}or greater for more than 15 minutes, initiate air sampling at PAM and WZ stations.
	Greater than 40 µg/M^3 sustained in the work zone for 1 hour	• If readings are 40 µg/M^3 or greater for more than one hour, STOP work and contact the Owner or its representative. • Continue RAM monitoring and air sample collection for one, 24-hour duration after the RAM level has stabilized.
Chemical (Method)	**Regulatory Action Level**	**Response Actions**
Hexavalent Chromium (OSHA Analytical Method ID 215)	OSHA Action Level: 0.25 µg/M^3	Site-specific dust action levels are serving as a real-time surrogate for this requirement. If the Site-specific dust action level is exceeded for more than 1 hour follow the response actions above and don respiratory protection. CrVI analyses will be used to confirm the protectiveness of the surrogate.

13.0 THERMAL STRESS

13.1 HEAT STRESS

Heat stress is caused by a combination of factors such as temperature, humidity, type of work being performed, and use of personal protective equipment including protective clothing. Heat stress tends to increase body temperature, heart rate, and sweating. The key to preventing heat stress is education of personnel relative to the hazards associated with working in the heat and implementation of proper controls and work practices. Table 13-1 summarizes heat stress disorders and prevention/first aid issues.

When the temperature is above 80^{o} Fahrenheit (F), the SSO will monitor both the temperature and the humidity throughout the day in order to determine the Heat Index. The National Weather Service has developed a Heat Index that combines the ambient temperature and humidity into value that reflects how hot it really feels. This Heat Index can be used to determine the risk associated with working outdoors during the hot months of the year. To use the heat index chart (Table 13-2), read the temperature at the left and humidity across the top, the Heat Index is where the two intersect. For example, with a temperature of 96 and a humidity of 50%, the Heat Index is 108.

The SSO will also inform site workers when the Heat Index Risk Level, as defined on Table 13-3, reaches Danger and/or Extreme Danger; the following additional precautions may be implemented at the discretion of the SSO based on factors such as use of Tyvek coveralls and the physical activity associated with each task. The following actions or work practices will be implemented, as practical, as part of the Heat Stress Management Program.

- Designated areas will be used for site workers to take breaks and for eating;

- If possible, physically demanding and strenuous tasks may be scheduled for the cooler parts of the day;

- Site workers will be required to drink 6-8 ounces of cool water or electrolyte replacement drinks every 60 minutes. Diabetics should use caution when using electrolyte replacement drinks to replenish fluids as these drinks may have high sugar content;

- Site workers taking prescription medications should check with their doctor or other medical professional regarding the interaction between working in hot environments and their medications;

- SSO will more closely observe site workers, especially those working in Tyvek coveralls or performing strenuous job tasks;

- Implement worker rotation during strenuous or physically demanding job tasks; and

- SSO will implement a work-rest cycle.

Table 13-1. Heat Stress Disorders

Disorder	Symptoms	Cause	Prevention/First Aid
Heat Rash or Prickly Heat	♦Rash ♦Itching	♦Hot, humid conditions ♦Sweat doesn't evaporate easily ♦Sweat ducts become clogged	♦Ointments ♦Keep skin clean and dry ♦Good daily personal hygiene
Heat Cramps	♦Sudden onset of muscle cramps usually in legs or arms ♦Hot, moist skin ♦Normal pulse ♦Normal or slightly elevated temperature	♦Loss of water (sweating) ♦Loss of electrolytes ♦Replacing water but not electrolytes	♦Move into shade ♦Loosen clothing ♦Drink tepid electrolyte drinks or water ♦Seek medical assistance if conditions persist

Disorder	Symptoms	Cause	Prevention/First Aid
Heat Exhaustion	♦ Pale, clammy skin ♦ Profuse perspiration ♦ Thirst from dehydration ♦ Weakness ♦ Headache ♦ Nausea ♦ Loss of coordination	♦ Overexertion ♦ Excessive loss of water and electrolytes	♦ Move into shade ♦ Remove PPE ♦ Loosen street clothing ♦ Cool by applying damp cool compresses or ice packs ♦ Drink tepid electrolyte drinks or water ♦ Summon medical assistance
Heat Stroke	♦ Elevated temperature (>103F) ♦ Flushed, hot, dry skin ♦ Absence of sweating ♦ Delirious ♦ Rapid pulse ♦ Nausea ♦ Headache ♦ Dizziness ♦ Unconsciousness	♦ Failure of body's cooling (sweating) mechanism	♦ **Summon medical assistance immediately** ♦ Move to shade ♦ Remove PPE ♦ Loosen street clothing ♦ Cool by fanning or applying damp compress or ice packs

Table 13-2. Heat Index Chart

Relative Humidity (%)														
Temperature (F)		40	45	50	55	60	65	70	75	80	85	90	95	100
	110	136												
	108	130	137											
	106	124	130	137										
	104	119	124	131	137									
	102	114	119	124	130	137								
	100	109	114	118	124	129	136							
	98	105	109	113	117	123	128	134						
	96	101	104	108	112	116	121	126	132					
	94	97	100	102	106	110	114	119	124	129	136			
	92	94	96	99	101	105	108	112	116	121	126	131		
	90	91	93	95	97	100	103	106	109	113	117	122	127	132
	88	88	89	91	93	95	98	100	103	106	110	113	117	121
	86	85	87	88	89	91	93	95	97	100	102	106	108	112
	84	83	84	85	86	88	89	90	92	94	96	98	100	103
	82	81	82	83	84	84	85	86	88	89	90	91	93	95
	80	80	80	81	81	82	82	83	84	84	85	86	86	87

Table 13-3. Heat Index Risk Level and Associated Health Effects

Heat Index	Associated Risk
>130	*Extreme Danger* Heat stroke highly likely with continued exposure
105-130	*Danger* Heat exhaustion and heat cramps likely and heat stroke possible with prolonged exposure and/or physical activity
90-105	*Extreme Caution* Heat cramps and heat exhaustion possible with prolonged exposure and/or physical activity
80-90	*Caution* Fatigue possible with prolonged exposure and/or physical activity

Notes:

- Heat Index values were devised for shady, light wind conditions. Exposure to full sun may increase these values by up to 15°.
- Heat Index values were devised for the general public wearing typical lightweight summer clothing. Acclimatized workers may be able to work under conditions with a slightly higher Heat Index.
- The use of personal protective equipment, including clothing increases the heat stress load on the body.

The work-rest cycle outlined below may be implemented based on the professional judgment of the SSO and/or the Project Health and Safety Coordinator.

Heat Index	Risk Level	Work-Rest Cycle
> 130	Extreme Danger	15 minute break every 30 minutes
105-130	Danger	15 minute break every 60 minutes
90-105	Extreme Caution	15 minute break every 90 minutes
80-90	Caution	15 minute break every 120 minutes

13.2 COLD STRESS

Cold stress situations may be encountered at the site. If lower than normal temperatures (i.e., less than 35°F) are forecasted the following information will be utilized. Most cold related worker fatalities have resulted from failure to escape low environmental air temperatures, or from immersion in low temperature water. The two most prominent adverse effects from exposure to cold temperatures are frostbite and hypothermia. A person qualified in first aid or a professional medical provider should administer treatment for cold related injuries. The single most important aspect of life-threatening hypothermia is a drop in the deep-core body temperature. Response to cold stress will be based on Cold Stress section of the ACGIH TLV booklet.

13.2.1 Frostbite

Frostbite occurs when the extremities do not get sufficient heat from the central body stores. The fluids around the cells of the body tissues freeze from exposure to low temperatures. This condition can result in damage to, and loss of, tissue. The most vulnerable areas are the nose, cheeks, ears, fingers, and toes. Damage from frostbite can occur in either the outer layers of skin or in the tissue beneath these layers and can be serious, resulting in scarring, tissue death, permanent loss of movement, or amputation.

13.2.2 Hypothermia

This is the most severe form of cold stress and results from a drop in the body's core temperature. Hypothermia can occur in relatively mild temperatures if there is a wind and the person's clothing becomes wet. The symptoms of hypothermia are:

- First, uncontrollable shivering and the sensation of the cold;
- Heartbeat slows and may become irregular;
- Pulse weakens and blood pressure changes;
- As the body's core temperature drops, other signs may include cool skin, slow irregular breathing, and apparent exhaustion;

- When core temperatures are in the mid-range, the victim may become listless, confused, exhibit severe shivering, or develop severe pain in the extremities; and

- Final signs are a significant drop in blood pressure, fatigue, and shallow respiration.

13.2.3 Control Measures for Cold Stress

Worker comfort will be monitored and increased layers of PPE or modesty clothing worn under the PPE may be required to minimize cold stress for those persons working inside a building. For those workers performing tasks outside a building when ambient temperature falls below 36°F, the following guidelines should be used:

- If wind chill is a factor, shielding the work area or providing employees an outer windbreak layer garment will reduce the cooling effect of the wind;

- Extremities, ears, toes, and nose will be protected from extreme cold by protective clothing;

- Employees performing light work and whose clothing may become wet will wear an outer layer of clothing that is impermeable to water;

- Employees performing moderate to heavy work and whose clothing may become wet will wear an outer layer of clothing that is water repellent; and

- Outer garments must provide for ventilation to prevent wetting of inner clothing by sweat.

Workers who become immersed in water or whose clothing becomes wet will immediately be provided a change of clothing and be treated for hypothermia if necessary. If the clothing becomes wet from sweating, the employees may finish the task that caused the sweating before changing into dry clothes. Metal handles of tools and control bars will be covered by thermal insulating materials when temperatures fall below 30°F. Whenever a site becomes covered with snow or ice, eye wear providing employees' protection against ultraviolet light, glare, and blowing ice crystals shall be worn.

When conducting work in air temperatures below 35° F, the following practices shall be followed:

- If the clothing of an employee is expected to become wet, the outer layers of clothing must be impermeable to water;

- If an employee's underclothing becomes wet it must be changed immediately. If the clothing becomes wet from sweating, the employee may finish the task that caused the sweating before changing into dry clothing;

- Employees will be provided a warm area (65° F or above) to change from work clothing into street clothing and for breaks;

- Hot liquids, such as soups, warm drinks, etc. shall be provided in the break area. The intake of caffeine containing products shall be discouraged due to their diuretic and circulatory effects;

- If appropriate, approved space heaters may be provided in the work area to warm the hands, feet, etc;

- The buddy system shall be practiced. Any employee observed with signs of cold stress shall immediately proceed to the break area;

- Employees will be reminded to layer their clothing, i.e., wear thinner, lighter clothing next to the body with heavier clothing layered outside the inner clothing;

- Avoid overdressing when going into warm areas or when performing activities that are strenuous. This could potentially lead to heat stress situations;

- Auxiliary heated versions of hand wear, footwear, etc., can be used in lieu of mittens, insulated socks, etc. if extremely cold conditions exist;

- Employees handling liquids with high evaporation rates (gasoline, hexane, alcohol, etc.) shall take special precautions to avoid soaking of clothing with the liquids because of the added danger of cold injury caused by evaporative cooling;

- Work shall be arranged in such a way that sitting still or standing for long periods is minimized; and

- If the air temperature is 20° F or below the hands shall be protected by mittens or gloves prior to contact with cold surfaces such as metal, etc.

Air temperature is not the only factor to be considered while evaluating cold stress situations. Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed the greater the risk of experiencing cold related injuries. For exposed skin, continuous exposure should not be permitted when the air speed and temperature result in an equivalent chill temperature of –25° F or less.

14.0 SAFE WORK PRACTICES AND STANDARD OPERATING PROCEDURES

14.1 GENERAL SAFE PROVISIONS

For Contractor's convenience, key regulations (including construction-related regulations) that may apply to the project activities are listed below. Contractors are responsible for ensuring that their HASPs address the issues and regulations applicable to their respective scopes of work for the project.

- Hazardous Waste Site Operations (29 CFR 1910.120);
- Construction Activities (29 CFR 1926);
- Hazard Communication (29 CFR 1910.1200 & 29 CFR 1926.59);
- Personal Protective Equipment (29 CFR 1920.132 & 29 CFR 1926.95)
- Fire Protection (29 CFR 1910.39 & 29 CFR 1926.150);
- Excavations (29 CFR 1926 Subpart P);
- Powered Hand Tools (29 CFR 1910.242 & 29 CFR 1926.301);
- Electrical Safety (29 CFR Subpart S & 29 CFR 1926.400-449);
- Fall Protection (29 CFR 1926 Subpart M);
- Walking Working Surfaces (29 CFR 1910.22)'
- Welding (29 CFR 1910.251 & 29 CFR 1926.350-354);
- Earthmoving Equipment (29 CFR 1926.602);
- Hazardous Energy Control (29 CFR 1910.147);
- Sanitation (29 CFR 1926.51);
- Scaffolding (29 CFR 1910.28 &29 CFR 1926.450-454);
- Confined Space Entry (29 CFR 1910.146):
- Respiratory Protection (29 CFR 1910.134).

14.1.1 Smoking and Eating Areas

Smoking will only be allowed in designated areas. Upon mobilization at the site, the SSO will establish smoking areas per site-specific or client-specific requirements. Individuals caught smoking outside the designated smoking areas will be subject to disciplinary action up to and including immediate termination.

Upon mobilization at the site, the SSO will establish eating and break areas per site-specific or client-specific requirements. Eating will only be allowed in the designated areas and the areas will be maintained in a clean and sanitary condition.

14.1.2 Sanitation and Potable Water

Containers used for drinking water will be equipped with a tap and capable of being tightly closed. In addition, the container will be labeled as "Drinking Water" or "Potable Water." Disposal cups will be stored in a sanitary condition and a receptacle for disposing of the cups will be near-by.

Potable and non-potable water containers and portable toilets (if used) will comply with OSHA 29 CFR 1910.141 requirements.

14.1.3 Temporary Facilities

All temporary facilities will be maintained in a clean and sanitary condition to discourage the entrance of rodents or vermin. If rodents or vermin become an issue, the SSO will be responsible for implementing an extermination program per site-specific or client-specific guidelines.

Trailers and other temporary structures used as field offices or for storage will be anchored with rods and cables or by steel straps to ground anchors. The anchor system will be designed to withstand winds and must meet applicable state or local regulations for the anchoring of mobile trailer homes. Use of standard anchoring systems to anchor structures is not permitted in Area 1 due to potential damage to the MMC. Methods designed to avoid impacting the MMC should be used to secure structures.

14.1.4 First Aid Station

A designated area must be readily accessible to employees. Signs shall be posted indicating the location for the first aid station and name of designated first aid provider(s). The sign should be in the form of a symbol that does not require workers to have language skills to understand it.

14.1.5 Eye Wash Stations

The location of each eyewash station should be identified with a highly visible sign. The sign should be in the form of a symbol that does not require workers to have language skills to understand it. Eye wash stations must be inspected monthly.

15.0 STANDARD OPERATING PROCEDURES

The following standard operating procedures will be adhered to at all times:

- All personnel entering the site must check in with the SSO.
- All individuals entering the site must demonstrate to the SSO that they have been adequately trained as defined in Section 4.
- All individuals must be familiar with emergency communication methods and how to summon emergency assistance.
- Use of alcoholic beverages before, during operations, or immediately after hours is absolutely forbidden. Alcohol can reduce the ability to detoxify compounds absorbed into the body as the result of minor exposures and may have negative effects with exposure to other chemicals. In addition, alcoholic beverages will dehydrate the body and intensify the effects of heat stress.
- Horseplay of any type is forbidden.
- All unsafe conditions will be immediately reported to the SSO, who will document such conditions in the field log. The SSO will be responsible for ensuring that the unsafe condition is correctly as quickly as possible.
- No smoking, eating, chewing gum or tobacco, taking medication, or applying cosmetics in the Contamination Reduction Zone or the Exclusion Zone. Wash hands and face thoroughly prior to conducting the activities in the Support Zone.
- Smoking, matches, and lighters are only allowed in the designated smoking area.
- Avoid contact with potentially contaminated substances. Avoid, whenever possible, kneeling on the ground, or leaning or sitting on trucks, equipment or the ground. Do not place equipment on potentially contaminated surfaces.
- If PPE becomes torn or saturated with contaminated material, immediately leave the Exclusion Zone, go through the decontamination steps, and replace the affected PPE. Additionally, wash any exposed skin thoroughly with soap and water.

16.0 SAFE WORK PRACTICES

16.1 PRE-EXCAVATION

Prior to mobilizing to the field, the Project Manger will be responsible for ensuring a Subsurface Clearance Checklist is followed, including verifying that the following issues have been adequately addressed.

- Contacting the State's One Call or equivalent utility locator service to identify underground pipelines, utility lines, and fiber optic cable;
- Contacting appropriate municipality to identify underground water and sewer lines;
- Contacting posted pipeline companies; and
- Contacting client to identify underground pipelines or other obstructions.

16.2 FALL PROTECTION

In the event that project team members and/or subcontractors are working more than six feet above grade and are not protected by handrails, complete floor decking or working on approved access ways, fall protection equipment will be required.

The distance above grade is measured from the employee's feet to the grade or approved work surface. Fall protection equipment will consist of an ANSI-approved full-body harness and shock-absorbing (or retractable) lanyard with double-locking d-rings.

Acceptable anchor points to which the lanyard may be attached includes, but are not limited to, the following:

- Structural beams at least six-inches in depth for one or more persons in a completed structure;
- Pipes at least four-inches in diameter for one person;
- Pipes at least six-inches in diameter for two people;
- Nozzles at least three-inches for one person;

- Nozzles greater than three-inches for two people; and
- Permanent platform handrail post below mid-rail for one person.

16.3 WEATHER-RELATED EVENTS

Weather-related events that may impact field work include, but are not limited to, rain, thunder, lightning, flash flooding, high winds and tornados. The SSO will be responsible for determining what site work can be performed safely in the rain and at what point work will cease due to either quality or safety issues. In the event of thunder and/or lightning, all work will be suspended until 15 minutes have elapsed from the last clap of thunder or flash of lightning.

16.3.1 Lightning Safety for Outdoor Workers

Safety and productivity are not mutually compatible, so one must be chosen over the other. Easy choice: SAFETY FIRST! Lightning has visited most all outdoor work environments. Anticipate a high-risk situation and move to a low-risk location.

Lightning safety awareness is a priority at every outdoor facility and operation. Education is the single most important means to achieving lightning safety. The following steps are suggested:

- Monitor weather conditions in the early morning hours. Local weather forecasts -- from The Weather Channel or NOAA Weather Radio or other notably reliable source -- should be noted 24 hours prior to scheduled activities. An inexpensive portable weather radio is recommended for obtaining timely storm data.
- Suspension and resumption of work activities should be planned in advance. Understanding of SAFE shelters is essential. SAFE evacuation sites include:
    - Fully enclosed metal vehicles with windows up;
    - Substantial buildings;
    - Low ground -- seek cover in clumps of bushes; and
    - Trees of uniform height, such as a forest.

- UNSAFE SHELTER AREAS include all outdoor metal objects, like power poles, fences and gates, high mast light poles, metal bleachers, electrical equipment, mowing and road machinery. AVOID solitary trees. AVOID water. AVOID open fields. AVOID high ground and caves.

- Lightning's distance from you is easy to calculate: If you hear thunder, the associated lightning is within audible range ... about 6-8 miles away. The distance from Strike A to Strike B also can be 6-8 miles. Suspend activities, allowing sufficient time to get to shelter. Of course, different distances to safety will determine different times to suspend activities. A good lightning safety motto is:

- *If you can see it (lightning), flee it; if you can hear it (thunder), clear it.*

- If you feel your hair standing on end, and/or hear "crackling noises," you are in lightning's electric field. If caught outside during close-in lightning, immediately remove metal objects (including baseball cap), place your feet together, duck your head, and crouch down low in baseball catcher's stance with hands on knees.

- Wait a minimum of 30 minutes from the last observed lightning or thunder before resuming activities. Be extra cautious during this phase as the storm may not be over.

- People who have been struck by lightning do not carry an electrical charge and are safe to handle. Apply first aid immediately if you are qualified to do so. Get emergency help promptly.

During rain, lightning and/or thunder events, site workers should seek shelter in either a building or vehicle. In the event of a tornado, site workers should seek shelter in a building, expect trailers, or in a low-lying area.

16.3.2 Noise

Employees performing any noisy task, such as but not limited to, operating heavy equipment, using power tools, or employees working nearby the person performing the task will wear hearing protection consisting of either earplugs or earmuffs. Personnel operating heavy equipment, such as pile driving equipment and excavators with hoe-ram attachments will also wear hearing protection.

17.0 CONFINED SPACE ENTRY PROCEDURES

Entry into existing Site confined spaces is strictly forbidden. Entry into confined spaces is not anticipated in the Harbor Point construction activities. If a project task or activity would involve entry into a permit-required confined space or if there is a question as to whether or not a job task or activity involves a permit-required confined space, the PM or SSO will contact the Project Health and Safety Coordinator for assistance.

18.0 SPILL CONTAINMENT PROGRAM

The spill containment program for this project will involve the use of preventative measures in order to reduce the potential for environmental releases. These preventative measures will include the following:

- Equipment inspection;
- Staging equipment on containment pads;
- Secondary containment for fuel storage tanks; and
- General housekeeping practices; and
- Appropriately sized and stocked spill/release kits/containers.

If project activities involve the use of drums or other containers, the drums or containers will meet the appropriate DOT regulations and will be inspected and their integrity assured prior to being moved. Operations will be organized so as to minimize drum or container movement. Drums or containers that cannot be moved without failure will be over-packed into an appropriate container.

Additionally please refer to the Spill Prevention Control and Countermeasures document.

19.0 SITE COMMUNICATION

Telephones and two-way radios will be used for communication between the project team and the client. Cell phones may be used as part of the communication method. However, cell phones cannot be used while driving any type of vehicle.

20.0 COMMUNICATION AND REVIEW OF SITE-SPECIFIC HASP PLAN (HAZARD COMMUNICATION)

An initial review of the site-specific HASP will be held either prior to mobilization or after mobilization but prior to commencing work at the site to communicate HASP details and answer questions to individuals working at the site. Daily tailgate safety meetings will be held each morning to review work practices for the day and to discuss safety issues. Any new hazard or safety information will be disseminated at the daily tailgate safety meeting or as needed throughout the day.

21.0 EMERGENCY RESPONSE PLAN

This section describes possible contingencies and emergency procedures to be implemented at the site.

21.1 PERSONNEL ROLES AND LINES OF AUTHORITY

The SSO has primary responsibility for site evacuation and notification in the event of an emergency situation. This includes taking appropriate measures to ensure the safety of site personnel and the public. Possible actions may involve the evacuation of personnel from the site area and ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. If the SSO is not available, the Project Health and Safety Coordinator will assume these responsibilities. Subcontractors are responsible for assisting the SSO in their mission within the parameters of their scope of work.

21.2 EVACUATION ROUTES AND PROCEDURES

In the event of an emergency, it is important to be aware of the prevailing wind direction and evacuate upwind or crosswind.

21.3 ASSEMBLY POINTS

The primary Assembly Point is in front of the construction trailer. The secondary Assembly Point is in front of the spill trailer. In the event of an emergency requiring evacuation to an Assembly Point, the SSO will be responsible to account for the presence of all project team members and subcontractors on-site at the time of the emergency.

22.0 EMERGENCY RESPONSE

22.1 NOTIFICATION OF SITE EMERGENCIES

The Contractor must have systems in place for responding to all emergencies. The written HASP should note the potential emergencies associated with this specific project and describe methods anticipated to perform the following:

- Notify appropriate individuals, authorities, and/or health care facilities of the site activities and anticipated duration prior to the mobilization of equipment;

- Ensure that, at a minimum, the following safety and monitoring equipment is available at the site: first aid supplies, fire extinguishers, a non-phosphate soap and water solution and potable water rinse, and potable water for eye washing;

- Ensure that a sufficient number of cellular telephones are present during site activities for emergency response and office communications. If deemed appropriate by the SSO or HSC, two-way radios may also be used on site for communication among workers;

- Have working knowledge of all safety equipment available at the site;

- Ensure that a map, which details the most direct route to the nearest hospital, is readily available with the emergency telephone numbers;

- The Contractor's HASP shall contain a list of emergency response telephone numbers. This list will be maintained at the work site by the SSO or his designee in a readily accessible location for use in case of an emergency.

22.2 DIRECTIONS TO THE NEAREST HOSPITAL

The Contractor's HASP will include a map and written directions to the Johns Hopkins Hospital Emergency Entrance located at 1800 Orleans Street (Appendix A). The SSO will identify site egress routes during the daily briefing prior to commencement of that day's work.

23.0 EVACUATION PROCEDURES

Where site evacuation could possibly be a health and safety consideration, the Contractor's HASP should define the primary evacuation route and also identify an alternate evacuation route based on the scheduled site operations. The two routes will be established independent of each other in the event of an obstruction on a particular route. A system should be in place to ensure that employees can easily evacuate the work area. It is recommended that daily evacuation routes will be reviewed with site workers at the start of each day.

24.0 INCIDENT REPORTING PROCEDURE

In the event that a health and safety incident occurs, it is imperative that specific reporting procedures be followed so that appropriate corrective action can be taken by the HSC and the PM for the duration of the project. The Contractor's HASP must define methods by which accidents are reported, investigated, and prevented in the future. It is recommended that the Contractor's PM and the HSC investigate the facility/site conditions to determine: (1) the severity of the incident; (2) the cause of the incident; (3) the means to prevent the incident from recurring; and, (4) personnel responsible for implementing the corrective action.

The following personnel shall be notified within a reasonable timeframe, but this should be no later than 1 hour after any incident.

- Ken Biles, CH2M Hill, (cell: 443-271-6694);
- Bob Steele, CH2M Hill (cell: 609-625-1780)
- Bill Berlett, CH2M Hill (cell: 847-770-0209)
- Chris French, Honeywell (cell: 973-216-7506)

The Contractor's HASP will include an incident reporting form so that consistent and appropriate information is obtained regarding employee exposures or accidents. The form will be filed at the Contractor's office with the employee's medical and safety records to serve as documentation of the incident and the actions taken.

25.0 INCIDENT INVESTIGATIONS

All safety events, including incidents, will be recorded and documented within 24 hours of an incident. All incidents will be reported to Bill Berlett (see above) and investigated in a timely manner. Incidents will require entry into the Honeywell Event Tracking System by CH2M Hill. The Safety Team will schedule the investigation and include the SSO, the Project Manager, project supervision (subcontractors, and client), the injured/involved employee(s) and the Project Health and Safety Coordinator. Root cause analysis will be performed to assess the apparent cause and identify corrective measures to be implemented to prevent re-occurrence. The last page of the Incident Form is used to document the investigation.

26.0 CERTIFICATION OF FAMILIARITY WITH PLAN BY SITE PERSONNEL

By signing below, signee certifies that they have read, understand and will abide by the contents of this HASP.

Name	Signature	Company	Date

Name	Signature	Company	Date

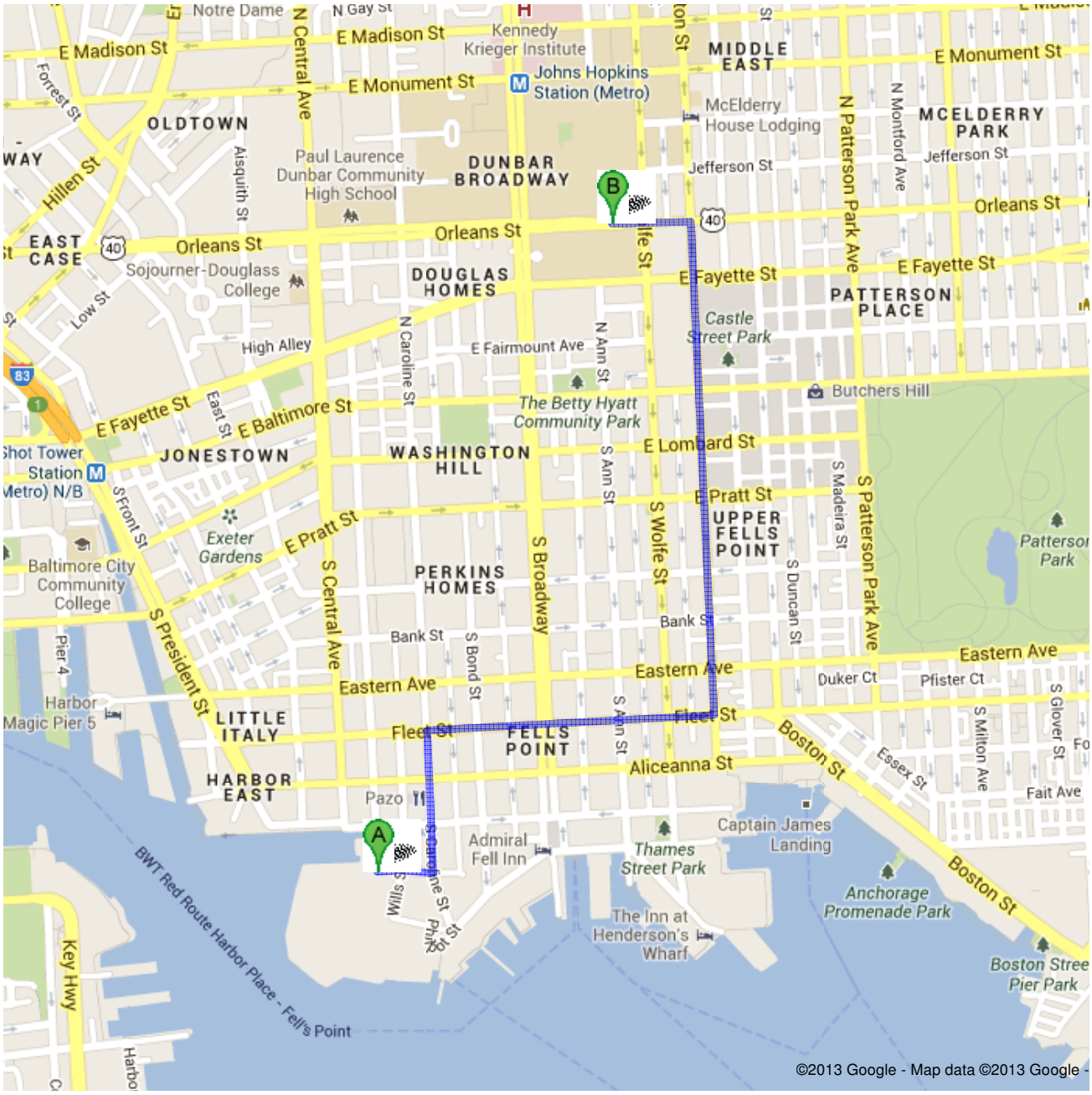
Figures

Figure 1
Site Location Map

Appendix A
Map to Hospital

Google

Directions to 1800 Orleans St, Baltimore, MD 21287
1.6 mi – about **9 mins**



1000 Dock St, Baltimore, MD 21231

1.	Head **east** on **Dock St** toward **Wills St** Restricted usage road	go 443 ft total 443 ft
2.	Take the 1st left onto **S Caroline St** About 1 min	go 0.2 mi total 0.3 mi
3.	Take the 3rd right onto **Fleet St** About 2 mins	go 0.4 mi total 0.7 mi
4.	Turn left onto **S Washington St** About 4 mins	go 0.7 mi total 1.5 mi
5.	Turn left onto **Orleans St** Destination will be on the right About 1 min	go 0.1 mi total 1.6 mi

1800 Orleans St, Baltimore, MD 21287

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2013 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

Appendix B
Job Hazard Analysis Form

JHA
Job Hazard Analysis

Project Number:		Project / Client Name:	
Project Manager:		Location:	
Partner-in-Charge:		Date and Revision Number:	

SPECIFIC TASK:	

Minimum Required PPE for Entire Task:	☐ Hard Hat ☐ Safety-Toe Shoes ☐ Hearing Protection ☐ Goggles ☐ Face Shield ☐ Respirator <enter type and cartridge type> ☐ Other (specify): ☐ Safety Glasses ☐ Reflective Vest ☐ Gloves <enter type here> ☐ PPE clothing <enter type here (eg, Tyvek, FRC, long sleeves)> <enter additional PPE here>		
Additional Task-Step Specific PPE: (as indicated below under Controls)		Equipment / Tools Required:	
Training Required for this Task:		Permits Required for this Task:	
Forms Associated with This Task:			

JHA Developed / Reviewed By:			JHA Review In Field
Name / Job Title:	Name / Job Title:	Name / Job Title:	Field Safety Officer (FSO) to ensure all personnel performing this task have reviewed JHA and agree to follow it. Site-specific changes to this JHA have been made as warranted based on this review. **FSO Signature/Date:**

Task Steps[1]		Potential Hazards & Consequences[2]		Hazard Types[3]	Likelihood[5]	Severity[5]	RISK[5]	Controls to Eliminate or Reduce Risks[4]	
1		1a						1a	
		1b						1b	

Task Steps[1]		Potential Hazards & Consequences[2]		Hazard Types[3]	Likelihood[5]	Severity[5]	RISK[5]	Controls to Eliminate or Reduce Risks[4]	

ONE JHA PER TASK. SUBCONTRACTORS MUST PROVIDE THEIR OWN JHAS. JHAS SHOULD BE WRITTEN IN PLAIN LANGUAGE AND SHOULD BE NO MORE THAN 2-3 PAGES IN LENGTH.
INSERT ADDITIONAL ROWS AS NEEDED ABOVE (MUST MANUALLY COPY AND PASTE FORMULA IN COLUMN H). ROW HEIGHTS MAY NEED TO BE MANUALLY EXPANDED TO VIEW ALL TEXT.
LEAVE SEVERAL BLANK OVERSIZED ROWS TO ALLOW HANDWRITTEN FIELD ADDITIONS. CAN ALSO DELETE UNNEEDED ROWS TO FIT PAGE(S).

1. Each task consists of a set of steps. List and number all the steps in the sequence they are performed. Specify the equipment or other details.

2. List potential hazards and consequences - ONE PER ROW. Use numbers and letters for each hazard/impact listed (1a, 1b, etc). Hazards should be described in terms of their specific origin and negative consequences (e.g., instead of “moving equipment”, write “injury from getting struck by forklift”).

3. For each potential hazard, select the hazard type from the following list:
   - H&S - Health & Safety
   - S - Security
   - E - Environmental
   - PL - Property Loss
   - multiple - multiple hazard types

4. Describe the specific actions or procedures that will be implemented to eliminate or reduce each hazard. Be clear, concise, and specific. Use objective, observable, and quantified terms (e.g., instead of “use good body positioning,” write “don’t bend at waist or reach above head”). Use numbers and letters corresponding to listed hazards.

5. Select the likelihood of occurrence and severity of each hazard, AFTER implementation of the planned control measures (use the Risk Matrix as a guide). The corresponding risk rating should be calculated by multiplying the likelihood and severity [RISK = Likelihood x Severity].
A risk rating of > 15 indicates that work cannot continue without additional control measures and approval of Partner-in-Charge.

WAYS TO ELIMINATE OR REDUCE RISKS (IN ORDER OF PREFERENCE):

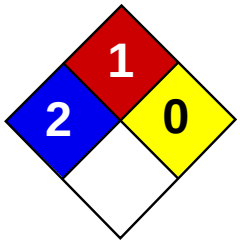
ELIMINATE / AVOID --> SUBSTITUTE / MODIFY --> ISOLATE --> ENGINEER / SAFEGUARD --> TRAINING AND PROCEDURES --> WARNING AND ALERT MECHANISMS --> PPE

Risk Matrix

What could go wrong? What is the worst thing that could happen if something goes wrong?

			Hazard Severity				
			1	2	3	4	5
			INSIGNIFICANT negligible or no injury could result	**MINOR** minor injury requiring only first aid	**MODERATE** Injury resulting in lost time could occur	**HIGH** Serious injury or death could occur	**VERY HIGH** multiple deaths could occur
Likelihood	**1**	**VERY UNLIKELY**	1	2	3	4	5
	2	**UNLIKELY**	2	4	6	8	10
	3	**POSSIBLE**	3	6	9	12	15
	4	**LIKELY**	4	8	12	16	20
	5	**VERY LIKELY**	5	10	15	20	25

Appendix C
Material Safety Data Sheets
(Example)



Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Chromium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chromium

Catalog Codes: SLC4711, SLC3709

CAS#: 7440-47-3

RTECS: GB4200000

TSCA: TSCA 8(b) inventory: Chromium

CI#: Not applicable.

Synonym: Chromium metal; Chrome; Chromium Metal Chips 2" and finer

Chemical Name: Chromium

Chemical Formula: Cr

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chromium	7440-47-3	100

Toxicological Data on Ingredients: Chromium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 580°C (1076°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame. Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence. Pyrophoric chromium unites with nitric oxide with incandescence. Incandescent reaction with nitrogen oxide or sulfur dioxide.

Special Remarks on Explosion Hazards:
Powdered Chromium metal +fused ammonium nitrate may react violently or explosively. Powdered Chromium will explode spontaneously in air.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.5 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 (mg/m3) from OSHA (PEL) [United States] TWA: 0.5 (mg/m3) from NIOSH [United States] TWA: 0.5 (mg/m3) [United Kingdom (UK)] TWA: 0.5 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 52 g/mole

Color: Silver-white to Grey.

pH (1% soln/water): Not applicable.

Boiling Point: 2642°C (4787.6°F)

Melting Point: 1900°C (3452°F) +/- !0 deg. C

Critical Temperature: Not available.

Specific Gravity: 7.14 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Soluble in acids (except Nitric), and strong alkalies.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity: Not available.

Special Remarks on Reactivity:
Incompatible with molten Lithium at 180 deg. C, hydrogen peroxide, hydrochloric acid, sulfuric acid, most caustic alkalies and alkali carbonates, potassium chlorate, sulfur dioxide, nitrogen oxide, bromine pentafluoride. It may react violently or ignite with bromine pentafluoride. Chromium is rapidly attacked by fused sodium hydroxide + potassium nitrate. Potentially hazardous incompatibility with strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause cancer based on animal data. There is no evidence that exposure to trivalent chromium causes cancer in man.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: May cause skin irritation. Eyes: May cause mechanical eye irritation. Inhalation: May cause irritation of the respiratory tract and mucous membranes of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea. Chronic Potential Health Effects: Inhalation: The effects of chronic exposure include irritation , sneezing, reddness of the throat, bronchospasm, asthma, cough, polyps, chronic inflammation, emphysema, chronic bronchitis, pharyngitis, bronchopneumonia, pneumoconoisis. Effects on the nose from chronic chromium exposure include irritation, ulceration, and perforation of the nasal septum. Inflammation and ulceration of the larynx may also occur. Ingestion or Inhalation: Chronic exposure may cause liver and kidney damage.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Chromium Illinois toxic substances disclosure to employee act: Chromium Illinois chemical safety act: Chromium New York release reporting list: Chromium Rhode Island RTK hazardous substances: Chromium Pennsylvania RTK: Chromium Minnesota: Chromium Michigan critical material: Chromium Massachusetts RTK: Chromium Massachusetts spill list: Chromium New Jersey: Chromium New Jersey spill list: Chromium Louisiana spill reporting: Chromium California Director's List of Hazardous Substances: Chromium TSCA 8(b) inventory: Chromium SARA 313 toxic chemical notification and release reporting: Chromium CERCLA: Hazardous substances.: Chromium: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R40- Limited evidence of carcinogenic effect S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:16 PM

Last Updated: 05/21/2013 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET
ERA A Waters Company

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

MANUFACTURER: ERA
ADDRESS: 16341 Table Mountain Parkway
Golden, CO, 80403 U.S.A.

BUSINESS PHONE: 303-431-8454
FAX: 303-421-0159 **EMAIL:** info@eraqc.com
CHEMICAL EMERGENCY PHONE: 352-535-5053 (INFOTRAC)

Product Name(s): Hexavalent Chromium 1000 mg/L
Catalog / Part Number(s): 019, 973, 186004178
MSDS Creation Date: November 22, 2005
Revision Date: July 18, 2012 **MSDS Reference Number:** 019

SECTION 2: HAZARDS IDENTIFICATION

Toxic. Harmful by inhalation. May cause cancer. Risk of cancer depends on duration and level of exposure. The matrix of each standard is a K2Cr2O7/water mixture listed below which is classified as dangerous by Directive 199/45/EC. Use only as directed and in accordance with good laboratory practices.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

				EXPOSURE LIMITS		EU LABEL
CHEMICAL INGREDIENT NAME	CAS NUMBER	EC NUMBER	% BY WT.	OSHA	ACGIH	HAZARD LABEL
Potassium dichromate	7778-50-9	231-906-6	≤0.1	0.1 mg/m3 PEL	0.05 mg/m3	

Notes: This standard is 125 mL of a mixture containing potassium dichromate salt with the balance being ≥99.9% water. Hexavalent chromium is a known human carcinogen. Exposure Limits are 8-Hour TWA (Time Weighted Average) unless designated C (Ceiling) or STEL (Short Term Exposure Limit). Other components considered Non-Hazardous under OSHA 1910.1200 (HazCom) as they are not present in concentrations exceeding 1% (or 0.1% if considered a known or potential carcinogen). Material Use: Analytical reagent or certified reference material used in laboratories. Uses also include research and development.

SECTION 4: FIRST-AID MEASURES

Inhalation: Remove to fresh air.
Skin Contact: Flush with water.
Eye Contact: Immediately flush with water for a minimum of 15 minutes.
Ingestion: Get medical attention
After following first aid measures, seek medical attention.

SECTION 5: FIRE-FIGHTING MEASURES

Flammable Properties: Not flammable.
Extinguishing Media: Dry chemical, carbon dioxide or appropriate foam.
Unique Aspects Contributing To a Fire: None.
Special Fire Fighting Procedures: None.
Note: As in any fire, wear self-contained breathing apparatus, and full protective gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Absorb liquid with spill pillow or other absorbent. Ventilate and wash spill site after material pick up is complete. Place wastes into closed containers for proper disposal.

SECTION 7: HANDLING AND STORAGE

Handle in accordance with good laboratory practices. Store in a dry well-ventilated place. This product is intended for use only by people trained in the safety and handling of chemicals and laboratory preparations.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Handle in accordance with good laboratory practices. Wash thoroughly after handling.
Respiratory Protection: Not normally needed. If exposure limits are exceeded, use approved respirator.
Eye Protection: Safety glasses with side shields or safety goggles
Skin Protection: Neoprene or other chemical resistant gloves.
Engineering Controls: Not normally needed. If exposure limits are exceeded, work in a fume hood.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

DATA FOR MATRIX:

Appearance:	**Clear to yellow**	**Specific Gravity:**	**NA**	**Melting Point:**	**NA**
Physical State:	**Liquid**	**Flash Point:**	**NA**	**Vapor Pressure:**	**NA**
Odor:	**NA**	**Explosion Limits:**	**NA**	**Vapor Density (air=1):**	**NA**
pH:	**NA**	**Boiling Point:**	**NA**	**Solubility in Water:**	**Soluble**

SECTION 10: STABILITY AND REACTIVITY

Hazardous Polymerization Will Not Occur __X__ May Occur____ Stability: Stable __X__ Unstable ____
Hazardous Decomposition/Combustion Products: NA
Conditions and Materials to Avoid: Oxidizing agents.

SECTION 11: TOXICOLOGICAL INFORMATION

Primary Route(s) of Exposure Under Normal Use: Skin contact: may cause skin irritation or be harmful if absorbed through skin. Eye contact: may cause eye irritation. Inhalation: hamful if inhaled, may be irritation to mucous membranes and upper respiratory tract. Ingestion: harmful if swallowed.

Target Organ(s): Lungs, kidneys, blood.

Acute Effects: Harmful by inhalation. May cause sensitization by inhalation and skin contact. Ingestion can cause vomiting.
Potassium dichromate: Oral, child: LDLO=26 mg/kg; Oral, man: LDLO=143 mg/kg; Oral, rat:LD50=25 mg/kg; Skin, rabbit:LD50=14 mg/kg.

Chronic Effects: Carcinogen; Teratogen; May cause heritable gentic damage. Reproductive hazard; May impair fertility. May cause harm to the unborn child.

Other Information: Chemical Ingredient(s) potassium dichromate is classified as carcinogen(s) by OSHA, IARC (Group 1), NTP, ACGIH (A1), or California. California Prop-65: This product is or contains chemicals known to the state of California to cause cancer.

SECTION 12: ECOLOGICAL INFORMATION

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Avoid release into the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

To determine proper disposal, consult applicable federal, state and local environmental control regulations.

SECTION 14: TRANSPORT INFORMATION

Shipment Name/Type: Non-hazardous for transport.
UN Number: NA Shipping/Hazardous Class: NA Packing Group: NA
Shipping regulations are based on combinations of criteria such as quantity, class and packaging according to DOT, IATA and (49) CFR.

SECTION 15: REGULATORY INFORMATION

EU Symbol of Danger: Toxic (T) concentration ≤0.1 C <0.2%
EU Risk Phrases: May cause cancer [R45]; May cause heritable genetic damage [R46]; Harmful by inhalation [R20].

U.S. TSCA: Listed
Canada: This product has been classified according to the hazard criteria of the CPR and this MSDS contains all the information required by the CPR.

SECTION 16: OTHER INFORMATION

United States EPA Regulatory Information:		**NFPA Rating:**	**Health: 3**	**Flammability: 0**	**Reactivity: 0**
SARA 313:	**Yes (0.1% deminimis)**				
CERCLA RQ:	**10 lbs**	**HMIS Rating:**	**Health: 3**	**Flammability: 0**	**Physical Hazard: 0**

NOTE: NA = Data not available, not established, determined or not pertinent.

DISCLAIMER: The information contained herein has been compiled from data presented in various technical sources believed to be accurate. This information is intended to be used only as a guide and does not purport to be complete. ERA makes no warranties and assumes no liability in connection with the use of this information. It is the user's responsibility to determine the suitability of this information and to assure the adoption of necessary precautions.

Appendix D
Daily Safety Meeting Form

Daily Safety Meeting Documentation Form

Project Name: Project Number: Meeting Date & Time: Meeting Leader:

Document Routing	
FSO	Retain copy in site health & safety file.

What work will be conducted on site today and by whom?

Work Task	Conducted By

What overlapping operations/simultaneous operations will occur today?

Any follow-up from previous Major Incidents, Near Misses, Unsafe Acts or Unsafe Conditions discussed today?

List any new / short-service personnel on site today?

Safety Meeting Core Topics – All Site Workers *and* Visitors

- ☐ What PPE is required in order to enter the work zone?
- ☐ What are the potential hazards associated with today's work. How will they be managed?
- ☐ What are the potential impacts of planned activities to: Visitors? Nearby workers? Public?
- ☐ Is everyone aware that they are empowered to stop work if something is questionable or unsafe?
- ☐ What happens and who do you contact if there is an injury or emergency? If working at an active facility, how will you be alerted of an emergency and what will you do?
- ☐ Who do you contact if you have questions, or before deviating from written procedures?
- ☐ Where is fire extinguisher, first aid kit, eyewash, safety shower located?
- ☐ Are any work permits required? Are permits completed and posted in plain view of workers?
- ☐ Have all excavation / borehole locations been cleared of underground utilities/structures, in accordance with ERM and client-specific subsurface clearance procedures?
- ☐ Have all tools / equipment / vehicles been inspected today to ensure safe operating condition?
- ☐ Will a follow-up safety meeting be conducted after lunch?
- ☐ Has anything unexpected or out-of-the-ordinary occurred on this job recently to share?
- ☐ What is the worst that could happen if something goes wrong today?

Daily Safety Meeting Documentation Form

Project Name: Project Number: Meeting Date & Time: Meeting Leader:

Safety Topics Related to ERM 2011/2012 Incident Trends – All Site Workers *and* Visitors

- ☐ What activities occurring today could result in hand injuries? Is everyone aware that the use of fixed open-blade knives is not permitted without cut-resistant gloves?
- ☐ Does the site pose natural hazards to be avoided? Thorny underbrush/ticks/poison ivy?
- ☐ What areas of the site have slip/trip/fall hazards? Are everyone's work boots in good shape?
- ☐ How will the on-site team avoid vehicle accidents? Is everyone aware that taking their eyes off the road for more than 2 seconds (for any reason) leads to vehicle accidents?

Who attended the safety meeting today (employees, subcontractors, visitors)?

Name	Company	Signature	Sign-In Initials*	Sign-Out Initials**

* Initials in this space verify that the employee is fit for performing work.
**Initials in this space verify that the employee was uninjured during the workday.

Who visited the site today but was not involved in work activities?

Name	Company	Arrival Time

Area 1, Phase 1
Material Handling and Management Plan

Baltimore Works Site
Baltimore, Maryland

August 2013

By:
Environmental Resources Management, Inc.
Harbor Point Development LLC

For:
U.S. Environmental Protection Agency – Region III
Maryland Department of the Environment

TABLE OF CONTENTS

1.0 INTRODUCTION *1*

1.1 PURPOSE *1*

1.2 SITE DESCRIPTION *2*

1.3 SITE USE HISTORY *2*

1.4 PRIOR DEVELOPMENT (AREAS 2 AND 3) *3*

1.5 FUTURE DEVELOPMENT (AREA 1) *3*

2.0 ENVIRONMENTAL REQUIREMENTS *4*

3.0 EXELON DEVELOPMENT *5*

3.1 EXISTING CONDITIONS *5*

3.2 EROSION AND SEDIMENT CONTROLS *6*

3.3 EXCAVATION *6*

3.4 DUST CONTROL *7*

4.0 SOIL/DEBRIS HANDLING & MANAGEMENT *8*

4.1 CLEAN SOIL/AGGREGATE SEGREGATION *8*

4.2 CONTAMINATED SOIL SEGREGATION *8*

4.3 CLEAN SOIL/AGGREGATE STORAGE *8*

4.4 BENEFICIAL RE-USE *8*

4.4.1 Below MMC Synthetic Layers *9*

4.4.2 Above MMC Synthetic Layers *9*

4.5 TRANSPORTATION AND OFF-SITE DISPOSAL *9*

5.0 WATER MANAGEMENT 11

5.1 STORM WATER – NON-CONTACT 11

5.2 STORM WATER – CONTACT WATER 11

5.3 GROUNDWATER 12

5.4 25-YEAR STORM EVENT 12

6.0 MATERIAL TESTING 14

6.1 SOIL/DEBRIS 14

6.2 WATER – NON-CONTACT 14

6.3 WATER- CONTACT AND GROUNDWATER 15

6.4 IMPORTED SOIL/AGGREGATES 15

LIST OF FIGURES

1 Site Vicinity Map

LIST OF APPENDICES

A Referenced Documents

1.0 INTRODUCTION

This Material Handling and Management Plan ("Plan") has been prepared for inclusion with the Detailed Development Plan (DDP) for Harbor Point Area 1, Phase 1 Development ("Site"). The principal contaminant of concern (COC) identified at the Site is hexavalent chromium (CrVI).

Harbor Point is located on a peninsula in the Northwest Branch of the Patapsco River located in Baltimore, Maryland (Figure 1). The peninsula joins the mainland at the east side of the site, bounded by South Caroline Street and the Baltimore Inner Harbor. The main site area is referred to as Area 1, and the Southeast Quadrant is referred to as Area 2. Additionally, the property located midway between Wills Street and South Caroline Street North of Philpot Street is referred to as Area 3.

The approved Environmental Remediation System (ERS) is operated and maintained by Honeywell International Inc. ("Honeywell") pursuant to the Consent Decree dated April 27, 1989, as amended, among Honeywell, EPA and MDE, to contain chromium contaminated groundwater and limit exposure to impacted soil. The ERS consists of the Multimedia Cap (MMC), Hydraulic Barrier, Head Maintenance System (HMS) and Outboard Embankment.

1.1 PURPOSE

The Plan addresses the handling and management of solids (asphalt, stone aggregates, concrete and wood debris and soil) and liquids (storm water, decontamination water and groundwater) that may be encountered during the intrusive activities at the Site. For the purpose of this Plan, "intrusive activities" occur any time there is disturbance of the surface immediately below the Multimedia Cap (MMC) synthetic layers in Area 1. This Plan provides a description of the methods to be utilized for material handling, segregating, storing, waste profiling, transporting and disposing waste off-Site. The Plan will be implemented prior to the initiation of intrusive activities and will continue through the completion of all intrusive activities, including restoration of the synthetic layers of the MMC and removal of all controlled material that is disturbed by the installation of the improvements from the Site.

1.2 SITE DESCRIPTION

The Site is located on a peninsula on the northeast shore of the Patapsco River of the Inner Harbor, in the Fells Point section of Baltimore City, Maryland. The former chromium chemical manufacturing facility consisted of chromium processing production buildings and numerous support buildings on an area that covered approximately 14 acres. The Site is surrounded by water on the north, west and south, the Living Classrooms facility to the north and by the Thames Street Wharf Office Building, and parking areas associated with that building to the east.

1.3 SITE USE HISTORY

The Site has been divided into Areas 1, 2, and 3. Area 1 is the principal site of Honeywell's (formerly AlliedSignal) Baltimore Works Facility (Figure 1). Chromium ore was processed in Area 1 from 1845 to 1985. The former manufacturing processes resulted in chromium impacts to soil and groundwater. An Environmental Remediation System (ERS) is maintained and operated by Honeywell International Inc. (Honeywell) to contain CrVI-impacted groundwater in Area 1 and control the potential for human exposure to affected soil. The ERS consists of a Multimedia cap (MMC), Hydraulic barrier, Head Maintenance System (HMS), a groundwater storage and transfer system, and Outboard Embankment. The HMS maintains an inward groundwater gradient to mitigate the migration of chromium-impacted groundwater from the Site.

Area 2 was mainly used for coal and raw chromium ore storage. In addition, a fertilizer warehousing and supply company operated in this area for many years.

Area 3 consists of five separate properties all with a history of industrial activity. This industrial activity included brass casing, oil blending and storage, lumber storage and coating/plastics production.

Honeywell purchased all of these properties by 1993 at which time all manufacturing was halted and subsequently all buildings and tanks were removed from these sites.

1.4 PRIOR DEVELOPMENT (AREAS 2 AND 3)

During the development of the Thames Street Wharf Office Building in Areas 2 and 3, the previously approved Plan (ERM, 2007) was implemented throughout intrusive activities for the period November 2007 through August 2008, and for short durations in late 2009 and early 2010. Off-site waste disposal included Subtitle D, special waste soil (9,500 tons) and Subtitle C, D007 concrete debris (32 tons). There was no off-site disposal of contaminated water.

1.5 FUTURE DEVELOPMENT (AREA 1)

During future development the exposure pathways of concern for CrVI are via potential airborne dust from intrusive activities below the MMC resulting in incidental inhalation, ingestion or dermal contact, including contact with contaminated materials and liquids while handling during construction. The approved Material Handling and Management Plan will be implemented during future Harbor Point development and will be modified, if necessary, as part of the Development Plan approval process.

2.0 ENVIRONMENTAL REQUIREMENTS

The Developer must protect the existing Environmental Remediation System (ERS). The ERS remedial components for Area 1 include the Outboard Embankment and Waterside Perimeter, the Hydraulic Barrier, the Head Maintenance System (HMS) and the Multimedia Cap, including a methane gas venting system. The Developer's design, construction, and finished improvements shall conform to the requirements of the Consent Decree and preserve and protect Honeywell's ability to comply with the Performance Standards defined in a Consent Decree between Honeywell, the USEPA and the MDE.

Specific requirements include, but are not limited to:

- Imported fill shall be clean natural soil that is free of contamination and meets environmental requirements;

- Environmental controls shall be instituted once a Cap is penetrated or removed, including perimeter air monitoring and dust suppression; and

- All Cap components must be repaired or replaced in any disrupted or penetrated area of the Cap, unless otherwise noted on the approved Detailed Development Plan for that development. All repairs must be initiated immediately upon completion of work or discovery of damage.

3.0 EXELON DEVELOPMENT

The development project consists of the Exelon Tower and Trading Floor Garage, the Central Plaza Garage, modifications to the existing Transfer Station, general site development (plaza, streets, and sidewalks) and utilities, foundations, roadways, and other related site development elements. Site access is currently limited to Dock Street. Additional access to the Site will be provided by connecting a new bridge to Central Avenue.

The majority of construction will occur in the northeast region of Area 1, located west of Wills Street and south of Dock Street (Drawing DDP-EN1.01). The new foundations (environmental concentric piles and concrete pile caps) will be constructed above, within and below the MMC (Drawing DDP-F1.60).

3.1 EXISTING CONDITIONS

The existing Environmental Remediation System consists of a multimedia cap (MMC), a hydraulic barrier and head maintenance system (HMS). The MMC is designed (i) to prevent upward migration of contaminants and limit the potential for direct exposure to contaminated soils or groundwater and (ii) to reduce infiltration to the groundwater within Area 1. MMC components are illustrated in Drawing DDP-F1.30 Detail 1.

The groundwater control measures consisting of the hydraulic barrier and HMS were installed prior to the installation of the MMC. The hydraulic barrier was placed at the perimeter of Area 1 to isolate groundwater below Area 1 from Harbor surface water and the surrounding groundwater. The hydraulic barrier reduces the amount of groundwater that must be extracted by the HMS to maintain an inward hydraulic gradient. The HMS withdraws groundwater from within Area 1 to maintain a groundwater level within the hydraulic barrier that is lower than the water table outside of the hydraulic barrier (i.e., maintain an inward groundwater gradient).

According to the Conceptual Geologic Section A:A – Harbor Point Area 1 (Drawing DDP-F1.11), the excavation zone below the MMC synthetic layers is described as fill (Stratum F), ranging in thickness from 5 to 10 feet below ground. The fill consists of medium compact to loose, gray and

brown fine to coarse sand, with some silt, trace to some gravel, trace clay, and with variable amounts of brick, concrete fragments, cinders and wood.

3.2 EROSION AND SEDIMENT CONTROLS

Prior to the initiation of any intrusive activities, the erosion and sediment controls described on Drawing DDP-C8.00 will be installed. Additionally, erosion and sediment controls as detailed on Drawings DDP-F1.22 and F1.30 will be applied to individual excavations made for sheet pile; pipe pile; clean utility corridor; and pile cap and momentum slab installation, including storm water diversion berms to reduce or limit run-on into open excavations.

Erosion and sediment controls will include the construction of temporary decontamination pads for loading excavated soil from below the MMC synthetic layers (Drawing DDP-EN1.01). The erosion and sediment controls also include the construction of a temporary storage area that will include the ability to collect water that could potentially leak from a lined, sealed roll-off container. An asphalt pad and perimeter asphalt berm will be constructed with a shallow perimeter drain to direct run-off to a sealed collection sump installed at the low point in the asphalt surface (Drawing DDP-EN1.06.01).

Run-off water collected in the sealed sump will be pumped to a nearby portable, 16,000-gallon double-wall, closed-top container ("Frac" tank). Further discussion on water handling is provided in Section 5 – Water Management.

3.3 EXCAVATION

The excavation planned for the Exelon Tower moment slab will generate clean soil/aggregate from above the MMC synthetic layers and chromium contaminated soil/debris. The proposed momentum slab excavation will terminate at El. +6 feet mean sea level (msl), approximately four feet below the MMC synthetic layers (DDP-EN1.60). Abandoned, concrete or wood foundation structures have been identified that will be encountered below the MMC during centric, steel pile driving and concrete pile cap construction. The abandoned structures will be removed only to the extent necessary for construction of new foundations. As such, the removed, abandoned structures will be considered contaminated debris requiring off-site disposal.

Direct-loading excavated soil/debris into lined, sealed roll-off containers is the preferred daily excavation and transportation method. However, a controlled, temporary storage area will be constructed, as described above, for use in the event that sealed roll-off containers cannot be transported daily for off-Site disposal. Some events that might prompt the use of this temporary storage area, as a contingency, are:

- Volume limit to the daily capacity of the primary and alternate off-site disposal facilities;
- Off-site disposal facility hours of operation; and
- Limited availability of long-haul trucks.

The storage area will be located in close proximity to the excavation zone required for construction of the momentum slab (west side of Limit of Disturbance) to reduce the distance for moving containers (Drawing DDP-EN1.01). The controlled area will be approximately 5,000 square feet which will provide a storage capacity of 20; 25-cubic yard lined and sealed roll-off containers or approximately 250 cubic yards of containerized soil/debris storage. Further discussion regarding soil/debris transportation and disposal is provided in Section 4 – Soil/Debris Handling and Management.

3.4 DUST CONTROL

Excavation surfaces will be covered by geotextile as soon as practical during the excavation sequence to limit wind-blown caused dust emissions. Other soil sealing materials such as polyethylene plastic sheeting or foam spray-applied to the slopes of excavation zones may also be utilized. The bottom of the excavation zone will be further sealed by installing either clean, aggregate layer and/or mudmat, thereby allowing general construction trade workers to perform work in a clean zone (DDP-F1.30 and DDP-F.131.

Additional dust suppression will be employed by misting the excavation zone with potable water as needed to keep exposed soil surfaces moist until the controls described above are installed. The aerosolized water misting is also effective in precipitating dust emissions.

4.0 SOIL/DEBRIS HANDLING & MANAGEMENT

Materials generated from the centric pile, pile cap, slab and utility excavations will include asphalt, CR-6, 57 stone, clean soil and contaminated soil. Materials will be segregated and managed as described below. Materials may be beneficially re-used on the Site in accordance with requirements as discussed in this section.

4.1 CLEAN SOIL/AGGREGATE SEGREGATION

Clean soil/aggregate removed from above the MMC synthetic layers will be segregated from contaminated soil removed from below the MMC synthetic layers. Clean soil will be temporarily stockpiled within a designated stockpile area (Drawing DDP-EN1.01).

4.2 CONTAMINATED SOIL SEGREGATION

Contaminated soil removed from below the MMC synthetic layers will be segregated from clean soil/aggregate and loaded directly into lined, sealed roll-off containers. Empty and loaded containers that are not transported off-site daily will be sealed prior to temporarily being stored within the designated controlled area (Drawing DDP-EN1.01).

4.3 CLEAN SOIL/AGGREGATE STORAGE

Clean soil/aggregate storage areas will be located west of the Central Plaza footprint. A clean soil stockpile area will be established separate from the temporary controlled storage area. Erosion and sediment controls for these stockpile areas include the installation of a 3-inch thick asphalt pad to separate the existing surface materials from the stockpiled cover soil. Additionally, an asphalt berm will be installed around the clean soil stockpile with a perimeter drain and a collection sump to collect precipitation run-off within the stockpile area.

4.4 BENEFICIAL RE-USE

On-site materials removed from above the MMC synthetic layers may be re-used to either backfill excavations below the MMC synthetic layers or to backfill the foundation structures above the MMC synthetic layers.

4.4.1 Below MMC Synthetic Layers

Aggregates and clean soil removed from above the MMC synthetic layers may be used below the new MMC synthetic layers without laboratory analyses.

4.4.2 Above MMC Synthetic Layers

Aggregates and soil removed from above the MMC synthetic layers will be sampled and analyzed prior to beneficial re-use above the MMC synthetic layers following the MDE Voluntary Cleanup Program (VCP) *Clean Imported Fill Material* guidance document Tables 1 and 2 (Appendix A). The analyses to be performed are the same as those provided in Section 6.4 for Imported Soil/Aggregates.

4.5 TRANSPORTATION AND OFF-SITE DISPOSAL

Based upon the review of the historical analytical soil data and the prior waste profile classification as D007 for materials below the MMC, it is anticipated that contaminated soil/debris generated during excavation will be disposed of at an approved RCRA Landfill. Materials will be transported off-site for disposal following written approval of acceptance from the RCRA landfill facility's representative.

Off-site disposal of soil/debris excavated from below the MMC will be profiled as a RCRA characteristic hazardous waste D007 – Chromium per EPA 40 CFR 261, Subpart C and Code of Maryland Regulations Title 26, Subtitle 13.

Off-site disposal of contact and groundwater removed from below the MMC is also assumed to be profiled as RCRA characteristic hazardous waste D007 – Chromium. Further discussion regarding soil/debris and water sampling for disposal is provided in Section 6.

Honeywell maintains a list of their approved Subtitle C landfill facilities and as such the addition of alternative, proposed disposal facilities must be pre-approved. The following RCRA landfill and treatment facilities are located within reasonable proximity to the Site and be may be considered, as may others with the caveat of Honeywell approval, for off-site disposal:

- Environmental Quality (EQ) [EPA ID: PAD010154045]
  730 Vogelsong Road
  York, PA 17404
  ~ 60 miles

- MAX Environmental Technologies [EPA ID: PAD004835146]
  233 Max Lane
  Yukon, PA 15698
  ~ 200 miles

- Waste Management Solutions [EPA ID: NYD049836679]
  1550 Balmer Road
  Youngstown, NY 14174
  ~ 400 miles

It is the generator's responsibility to make the appropriate waste profile determination as well as ensuring that all activities associated with waste disposal comply with State and Federal regulations. Temporarily stored, containerized soil and debris will be removed from the Site within 90 days of the initial filling of each individual container.

The Developer will be responsible for maintaining and distributing all documentation regarding waste profiles and shipping manifests for off-site disposal facilities to EPA and MDE. The generator's authorized representative will be responsible for reviewing and signing the shipping manifests. The Developer's designee will ensure that the transporter signs a shipping manifest for each load upon leaving the Site; and, ensures that the disposal facility-signed acceptance copy of each manifest is received. A waste disposal tracking log will be maintained utilizing the measured net weight (tons) for each truck or roll-off container load accepted.

Waste disposal documentation including laboratory analyses, if any, Waste Profiles and Waste Acceptance will be forwarded to EPA and MDE prior to commencing off-site disposal operations. A tracking log summarizing the disposal information will be maintained by the generator's representative and will be forwarded to EPA and MDE designees at the completion of intrusive activities.

5.0 WATER MANAGEMENT

As discussed in Section 3.2, erosion and sediment controls will be applied to individual excavations made for sheet pile, pile cap, momentum slab and sheer-wall installation. There are four categories of water anticipated to be managed during intrusive work, including:

- Storm water diverted from contact with contaminated material below the MMC synthetic layers;
- Storm water that comes into contact with contaminated material below the MMC synthetic layers;
- Groundwater from below the MMC; and
- Equipment decontamination water.

5.1 STORM WATER – NON-CONTACT

To minimize the quantity of water to be actively managed and treated off-site, storm water will be diverted from excavation zones by installing the required erosion and sediment controls as shown on Drawings DDP-C8.00, DDP-EN1.01 and DDP-EN1.06.01. Should storm water that has not come into contact with contaminated material below the MMC synthetic layers pond on a controlled surface (e.g., mudmat, geotextile-supported aggregate); the standing water will be pumped to one of two double-walled Frac tanks. This non-contact water will be held for analytical testing results to determined proper disposal (Section 6), if required. Non-contact water may be discharged to Baltimore City sanitary sewer if, and only if, the laboratory results justify this option when compared to City regulatory discharge limits as described in Section 6.

5.2 STORM WATER – CONTACT WATER

Storm water that inadvertently comes in contact with contaminated soil below the MMC synthetic layers, and as a result creates standing water in open excavations within the contamination zone, will be collected in a sealed sump and pumped to one of two separate double-walled Frac tanks. Additionally, storm water collected in the sealed sump from the perimeter drain installed at the temporary storage areas and equipment decontamination water will be pumped to these Frac tanks. This contact

water will be held for analytical testing results to ensure proper off-site disposal at the Honeywell approved EQ York, PA facility.

5.3 GROUNDWATER

As described in Section 3.3 above, the deepest excavation for the Exelon project will be for the shear wall/momentum slab which is planned at Elev. +6 feet mean sea level (msl). According to historical Inside Piezometer (IP) groundwater monitoring data, the groundwater elevation the Site within the hydraulic barrier seldom rises to Elev. +3 feet msl. As such, it is not anticipated that groundwater will be encountered, nor require special handling during intrusive activities. The uninterrupted, continuous operation of the HMS, as required by the Consent Decree, will allow for monitoring and control of the groundwater elevation during construction.

In the event groundwater is encountered during excavation it will be collected and disposed of in a similar manner to contact water. All groundwater will require off-site disposal at the Honeywell approved EQ York, PA facility.

5.4 25-YEAR STORM EVENT

The storm water management plan was examined for the 25-year storm event and 100-year storm event, however the storage requirements were determined based primarily on the 25-year storm event. When a storm event occurs, the entire footprint of the excavation, including the sloped portions, was considered to receive storm water. All water that falls outside of the excavations is treated as surface runoff because it will be diverted away from open excavations by temporary berms. Infiltration through the cover soil into the drainage net was assumed to not occur because the drainage net is sealed at the edge of each excavation. Storm water collected from the bottom of each excavation opened below the MMC synthetic layers will be considered impacted contact water.

A sump will be installed at the lowest elevation point in each excavation to collect storm water to prevent it from rising above the capillary break gravel at the down-slope side of the excavation. The pump(s) required to dewater the excavation zone(s) will be adequately sized to manage storm water during the peak intensity rainfall rate of a 25-year storm event. Contact and non-contact water testing and disposal procedures are described above and in Section 6.

The total volume of impacted water generated by a 25-year storm event over 24 hours has been calculated to be approximately 107,000 gallons, based on the open excavation area computed. This volume will be contained in one 75 ft. x 75 ft. x 4 ft. "modutank" container rated at approximately 168,000 gallons. Considering it takes approximately 24 hours to sample and properly discharge impacted water, two 75 ft. x 75 ft. x 4 ft. tanks will be present to store the volume of impacted water generated as well as any additional surge that may occur during the 25-year storm event. The storage volume provided by a single 168,000-gallon modutank storage container is approximately 57% greater than the volume of impacted water generated during a 25-year storm event, and approximately 22% greater than the volume of impacted water generated during a 100-year storm event.

Two storage containers will provide sufficient storage required to test, sample, and dispose of impacted water during a 24-hour, 25-year or 100-year frequency storm event at the site. A 120 ft. x 205 ft. x 1.5 ft. deep containment berm with 14-inches of filling capacity will provide storage sufficient to handle water stored in a single ModuTank.

6.0 MATERIAL TESTING

6.1 SOIL/DEBRIS

Soil and debris removed from below the MMC synthetic layers is assumed to be RCRA characteristic hazardous waste D007 – Chromium. As such, material removed from below the MMC synthetic layers will not be tested for the purpose of waste profiling. However, the following analyses may be performed per the landfill facility requirements:

- pH
- Moisture
- Ignitability
- Reactivity for Cyanide
- Reactivity for Sulfide

6.2 WATER – NON-CONTACT

The following pollutant limits will be used to determine whether non-contact water can be discharged to Baltimore City sanitary sewer:

Pollutants	**Limits**
Cadmium	0.21 mg/L
Chromium	6.89 mg/L
Copper	6.59 mg/L
Cyanide	1.9 mg/L
Lead	0.01 mg/L
Mercury	0.01 mg/L
Nickel	2.82 mg/L
Silver	1.2 mg/L
Zinc	17.85 mg/L
Fat/Oil	100.0 mg/L
Total Toxic Organics	2.13 mg/L
pH range	6.0 to 10.0 pH units

Non- contact water will be properly disposed of off-site at Environmental Quality should any of the above limits be exceeded.

6.3 WATER- CONTACT AND GROUNDWATER

Contact and groundwater removed from below the MMC synthetic layers is assumed to be RCRA characteristic hazardous waste D007 – Chromium. As such, water removed from below the MMC synthetic layers will not be tested for the purpose of waste profiling unless the treatment facility requires updated analyses.

6.4 IMPORTED SOIL/AGGREGATES

In order to minimize the potential of introducing unacceptable materials onto the Site, it will be necessary to verify through documentation that the material source is appropriate and/or to have the material analyzed for potential contaminants based on the location and history of the source area. It is anticipated that imported materials will be provided by commercial suppliers, only. Commercial suppliers shall provide a certification letter stating the environmentally acceptable historical use(s) of the material source property.

Fill documentation should include detailed information on the previous use of the land from where the fill is taken, whether an environmental site assessment was performed and its findings, and the results of any testing performed as described in the MDE Voluntary Cleanup Program (VCP) *Clean Imported Fill Material* guidance document (Appendix A). If the selected commercial supplier maintains records of the source of the selected materials and has implemented a testing program meeting the requirements of the MDE VCP guidance, a description of the sampling plan and analytical results may be used to meet the imported material requirements of this plan.

If there are no analytical results from testing performed by the commercial supplier, and prior to importing soil from any source, the material will be sampled and tested based on the requirements of the MDE VCP *Clean Imported Fill Material* guidance document Tables 1 and 2 (Appendix A). For example, the testing requirements for residential or acceptable commercial fill source material include:

- VOCs (EPA Method 5035)
- SVOCs (EPA method 8270C)

- TPH (modified EPA method 8015)
- PCBs (EPA method 8082)
- Heavy Metals including lead (EPA methods 6010B and 7471A)
- Hexavalent Chromium: EPA method 3060A.
- Asbestos (OSHA Method ID-191)

The analytical results will be compared to MDE's most current tables of the *Generic Numeric Cleanup Standards for Groundwater and Soil* to determine whether the fill source is acceptable.

Figures

Figure 1
Site Location Map

Appendix A
Referenced Documents

Department of the Environment

Facts About...

VCP - Clean Imported Fill Material

The purpose of the Voluntary Cleanup Program (VCP) is to encourage the cleanup and redevelopment of properties throughout Maryland. In many cases, fill materials are imported onto a property as part of the redevelopment process. As more properties are relying upon the use of imported fill materials, the VCP has prepared this guidance document for assisting participants who anticipate using imported fill material at VCP sites.

Introduction

No one wants to introduce new contamination onto a VCP site through the importation of fill material that is believed to be clean. This document was developed specifically for VCP participants who seek guidance on steps to take to minimize the possibility of importing contaminated fill onto VCP sites.

Overview

Because fill material may come from a variety of sources, it is important to determine that any material brought onto a VCP site not only meets engineering specifications for a particular use, but that it also passes some level of screening to ensure that it is, in fact, clean.

Residential or Commercial / Industrial Scenario

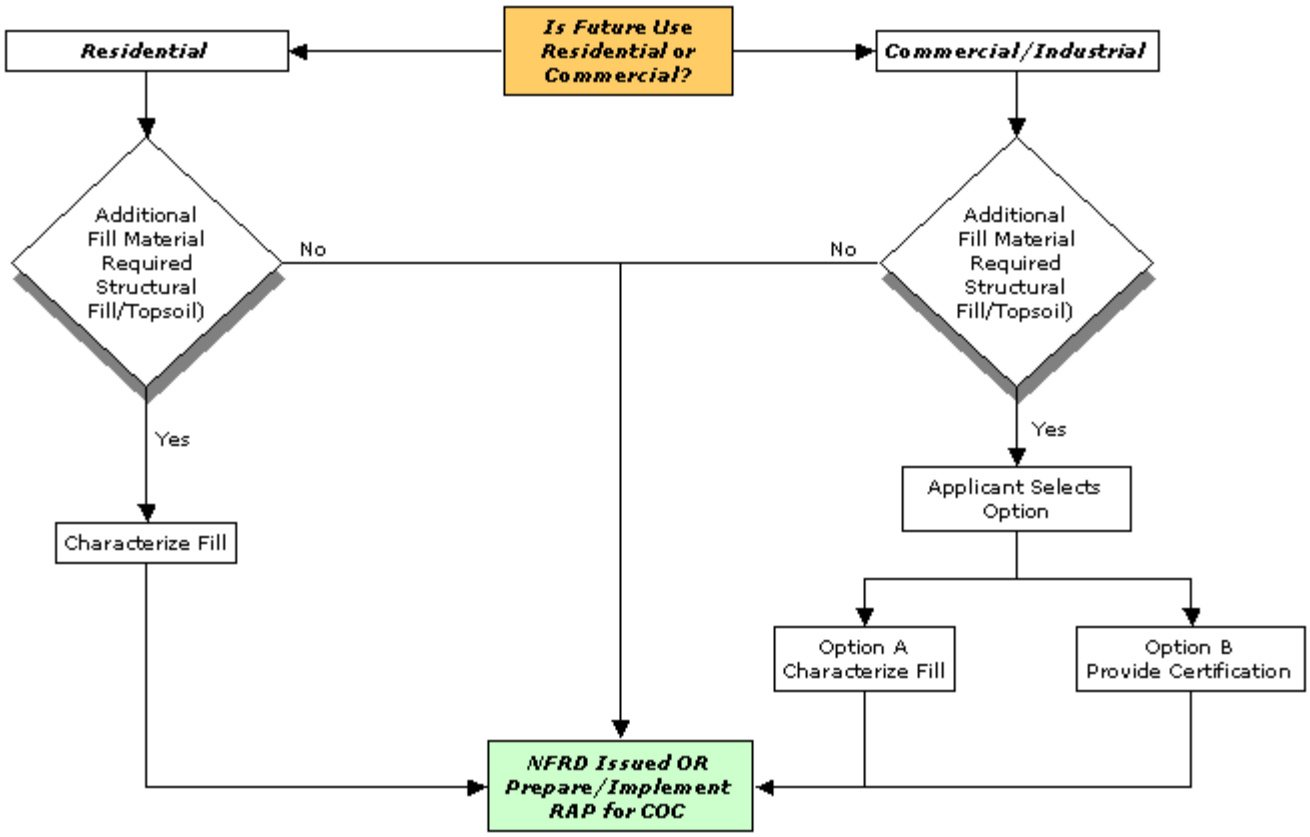
Depending upon the land use scenario, a VCP participant may be required to characterize the fill or provide a certification stating that the imported fill is not contaminated. As indicated in Exhibit 1, all imported fill materials for properties where the land use is determined to be residential must be characterized. In limited circumstances, the VCP may allow a participant to use imported fill material that has not been characterized for areas where no pathway will exist between the fill material and the property's end-users. In such circumstances, a Phase I Environmental Site Assessment conducted within a year from the date of scheduled delivery of fill material documenting that no recognized environmental conditions are present must be submitted to the VCP.

For commercial or industrial land uses, a VCP participant has the option of either characterizing the imported fill material or relying upon an affidavit from the vendor stating that the imported material has not been contaminated by controlled hazardous substances or oil. A template of the affidavit is attached to this guidance.

Selecting Fill Material

In general, the fill source area should be located in non-industrial areas, and not from sites undergoing an environmental cleanup. Non-industrial sites include those that were previously undeveloped, or used solely for residential or agricultural purposes. If the source is from an agricultural area, care should be taken to insure that the fill does not include pesticides, herbicides or metals. Unacceptable sources of fill material include industrial and/or commercial sites where

Exhibit 1: Use of Fill Material for Residential or Commercial/Industrial Decision Tree



hazardous materials were used, handled or stored as part of the business operations, or unpaved parking areas where petroleum hydrocarbons could have been spilled or leaked into the soil. Commercial sites to avoid include former gasoline service stations, retail strip malls that contained dry cleaners or photographic processing facilities, paint stores, auto repair and/or painting facilities, and agricultural supply stores. Industrial facilities to avoid include metal processing shops, manufacturing facilities, aerospace facilities, oil refineries, waste treatment plants, or other similar facilities.

Alternatives to using fill from construction sites include the use of fill material obtained from a commercial supplier of fill material or from soil pits in rural or suburban areas. However, care should be taken to ensure that those materials are also uncontaminated.

Table 1: Potential Contaminants Based on the Fill Source Area	
Fill Source	*Target Compounds/Recommended Analyses**
Land near to an existing highway	• Lead (EPA method 6020 [Rev 0 – 9/9]) • PAHs (EPA method 8270C [Rev 3 – 12/96)
Land near a mining area or rock quarry	• Heavy Metals (EPA method 6020 [Rev 0 – 9/9]) • Asbestos (polarized light microscopy) • pH
Agricultural land	• Pesticides (Organochlorine Pesticides: EPA method 8081A or 8080A; Organophosphorus Pesticides: EPA method 8141A; Chlorinated Herbicides: EPA method 8151A [Rev 1 – 12/96]) • Heavy Metals (EPA method 6020 [Rev 0 – 9/9])
Residential/acceptable commercial land	• VOCs (EPA Method 8260B (Rev 2 - 12/96); Note: The soil and sediment collection method has changed to EPA Method 5035) • SVOCs (EPA method 8270C) • TPH (modified EPA method 8015) • PCBs (EPA method 8082) • Heavy Metals including lead (EPA methods 6010B and 7471A) • Asbestos (OSHA Method ID-191)
*The recommended analyses should be performed in accordance with USEPA SW-846 methods (1996). Other possible analyses include Hexavalent Chromium: EPA method 3060A.	

Documentation and Analysis

In order to minimize the potential of introducing unacceptable fill material onto a site, it is necessary to verify through documentation that the fill source is appropriate and/or to have the fill material analyzed for potential contaminants based on the location and history of the source area. Fill documentation should include detailed information on the previous use of the land from where the fill is taken, whether an environmental site assessment was performed and its findings, and the results of any testing performed. It is recommended that an environmental professional, as defined by ASTM, should sign any such documentation. If such documentation is not available or is inadequate, samples of the fill material should be chemically analyzed. Analysis of the fill material should be based on the source of the fill and knowledge of the prior land use. The Department recommends using the analytical methods in Table 1 to determine whether potential contaminants are present in fill source areas.

Detectable amounts of compounds of concern within the fill material should be evaluated for risk in accordance with the *Soil and Groundwater Cleanup Guidance Document, August 2001*. A standard laboratory data package, including a summary of the QA/QC (Quality Assurance/Quality Control) sample results should also accompany all analytical reports. When possible, representative samples should be collected at the borrow area while the potential fill material is still in place, and analyzed prior to removal from the borrow area. In addition to performing the appropriate analyses of the fill material, an appropriate number of samples should also be determined based on the approximate volume or area of soil to be used as fill material. Table 2 can be used as a guide to determine the number of samples needed to adequately characterize the fill material when sampled at the borrow site.

Alternative Sampling

A Phase I environmental site assessment may be conducted prior to sampling to determine whether the borrow area may have been impacted by previous activities on the property. After the property has been evaluated, any sampling that may be required can be determined during a meeting with MDE. However, if it is not possible to analyze the fill material at the borrow area or determine that it is appropriate for use via a Phase I, it is recommended that the participant use Table 2 to determine the fill material sampling schedule. (See chart on Potential Contaminants Based on the Fill Source Area for appropriate analyses).

This sampling frequency may be modified upon consultation with the MDE if all of the fill material is derived from a common borrow area. However, fill material that is not characterized at the borrow area will need to be stockpiled either on or off-site until the analyses have been completed. In addition, should contaminants exceeding the criteria in *Soil and Groundwater Cleanup Guidance Document, August 2001* be identified in the stockpiled fill material, that material will be deemed unacceptable and new fill material will need to be obtained, sampled and analyzed. Therefore, MDE recommends that all sampling and analyses should be completed prior to delivery to the site to ensure the soil is free of contamination, and to eliminate unnecessary transportation charges for unacceptable fill material.

Composite sampling for fill material characterization may or may not be appropriate, depending on quality and homogeneity of source/borrow area, and compounds of concern. It is not acceptable to composite samples for volatile and semi-volatile constituents. Composite sampling for heavy metals, pesticides, herbicides or PAH's from unanalyzed stockpiled soil is also unacceptable, unless it is stockpiled at the borrow area and originates from the same source area. In addition, if samples are composited, they should be from the same soil layer, and not from different soil layers.

When very large volumes of fill material are anticipated, or when larger areas are being considered as borrow areas, MDE recommends that a Phase I be conducted on the area to ensure that the borrow area has not been impacted by previous activities on the property. After the property has been evaluated, any sampling that may be required can be determined during a meeting with MDE.

Table 2: Recommended Fill Material Sampling Schedule

Area of Individual Borrow Area	*Sampling Requirements*
2 acres or less	Minimum of 4 samples
2 to 4 acres	Minimum of 1 sample every 1/2 acre
4 to 10 acres	Minimum of 8 samples
Greater than 10 acres	Minimum of 8 locations with 4 sub samples per location
Volume of Borrow Area Stockpile	*Samples per Volume*
Up to 1,000 cubic yards	1 sample per 250 cubic yards
1,000 to 5,000 cubic yards	4 samples for first 1000 cubic yards +1 sample per each additional 500 cubic yards
Greater than 5,000 cubic yards	12 samples for first 5,000 cubic yards + 1 sample per each additional 1,000 cubic yards

Area 1, Phase 1
Spill Prevention and Response Plan

Baltimore Works Site
Baltimore, Maryland

August 2013

By:
Harbor Point Development LLC
Environmental Resources Management, Inc.

For:
U.S. Environmental Protection Agency – Region III
Maryland Department of the Environment

TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 BACKGROUND AND PURPOSE 1

1.2 CONSISTENCY WITH OTHER PLANS 2

2.0 GENERAL SITE DESCRIPTION 3

2.1 LOCATION, SITE USE AND LAYOUT 3

2.2 SITE USE 3

3.0 FACILITY CONTACT SUMMARY 4

4.0 LIQUID DISCHARGE PREVENTION 5

5.0 CONSTRUCTION STORAGE AND OPERATION 7

5.1 DISPOSAL OF RECOVERED MATERIALS 10

6.0 DISCHARGE NOTIFICATIONS 11

6.1 PROJECT SPECIFIC EMERGENCY CONTACTS 11

6.2 EMERGENCY NOTIFICATIONS 11

6.3 DISCHARGE RESPONSE PROCEDURES 12

6.4 WRITTEN NOTIFICATIONS 14

7.0 DISCHARGE PREVENTION MEASURES, CONTROLS, AND COUNTERMEASURES POST CONSTRUCTION ACTIVITIES 16

LIST OF FIGURES

1 Site Location Map

LIST OF TABLES

5-1 On site Storage Tanks/Drums 8

6-1 Emergency Contact Information 11

LIST OF ACRONYMS AND ABBREVIATIONS

AST	Aboveground Storage Tank
CFR	Code of Federal Regulations
CrVI	Hexavalent chromium
COC	Contaminant of Concern
COMAR	Code of Maryland Regulations
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
HMS	Head Maintenance System
HPD	Harbor Point Development, LLC
HW	Hazardous waste
MDE	Maryland Department of the Environment
MMC	Multimedia Cap
NPDES	National Pollutant Discharge Elimination System
PE	Professional Engineer
SPCC	Spill Prevention, Control, and Countermeasure
SPRP	Spill Prevention and Response Plan
UST	Underground Storage Tank

1.0 INTRODUCTION

1.1 BACKGROUND AND PURPOSE

This Spill Prevention and Response Plan (SPRP) has been prepared as part of the Detailed Development Plan (DDP) for Harbor Point Area 1, Phase 1 Development (Site) and is meant to be used in conjunction with the Material Handling & Management Plan (MHMP) as well as the Storm Water Pollution Prevention Plan (SWPPP) and Contingency Plan prepared for the Site. This SPRP is applicable to development support activities as described in the DDP.

The approved Environmental Remediation System (ERS) is operated and maintained by Honeywell International Inc. (Honeywell) pursuant to the Consent Decree dated April 27, 1989, as amended, among Honeywell, the U.S. Department of Justice, U.S. Environmental Protection Agency (EPA) and Maryland Department of the Environment (MDE), to contain chromium contaminated groundwater and limit exposure to impacted soil. The ERS consists of the Multimedia Cap (MMC), Hydraulic Barrier, Head Maintenance System (HMS) and Outboard Embankment.

Honeywell currently stores less than 1,320 gallons of aboveground oil storage and less than 42,000 gallons of underground oil storage. Based on these thresholds volumes, Honeywell is not subject to the Spill Prevention, Control, and Countermeasures (SPCC) regulations under 40 CFR 112. Nonetheless, Honeywell maintains a SPCC for activities associated with the operation of the ERS. The Honeywell SPCC will continue to remain in effect for routine ERS operations and maintenance activities conducted outside the footprint of redevelopment.

This Plan is intended to describe the measures to be implemented by Harbor Point Development LLC (HPD) and its Contractors to prevent hazardous material and petroleum product discharges (i.e., spills) from occurring, and mitigate the effects of a discharge, should one occur. Spills are inclusive of solid and liquids.

Solids include, but are not limited to, asphalt, stone aggregates, concrete and wood debris and soil. Liquids include but are not limited to groundwater, seeps, fuel, oil, decontamination liquids, liquids generated from subsurface dewatering activities, liquid that may have come in contact with site soils beneath the existing environmental protections exposed by the work, or liquids that may have come in contact with other potentially contaminated material.

For the purpose of this development project, HPD is considered the "Developer". Contractors are required to notify as soon as possible the Developer's Representative of a spill that occurs and is subject to this SPRP. Examples of spills that could occur that would be subject to this document include the following:

1. Diesel fuel spill from construction equipment or re-fueling tank, either during re-fueling or a fuel line;

2. Hydraulic fluid spill from a hydraulic line break in construction equipment;

3. Soil spill during loading of soil excavated from below the MMC into containers or during on-site transport;

4. Water spill of either chromium-contaminated ground water or surface water in contact with affected soil during transfer into a temporary holding tank or tanker for off-site disposal.

1.2 CONSISTENCY WITH OTHER PLANS

A Materials Management and Handling Plan (MMHP) has been prepared to address the handling and management of solids (asphalt, stone aggregates, concrete and wood debris and soil) and liquids (storm water, decontamination water and groundwater) that may be encountered during the intrusive activities at the Site. A Surface Water Pollution Prevention Plan (SWPPP) has been prepared which presents best management practices for managing storm water runoff during construction activities. The Contingency Plan describes the pre-construction preparation of the existing systems, details and other contingencies designed with the intent of maintaining operation of the HMS and Transfer Station with minimal service interruptions.

2.0 GENERAL SITE DESCRIPTION

2.1 LOCATION, SITE USE AND LAYOUT

The Site is located on a peninsula on the northeast shore of the Patapsco River of the Inner Harbor, in the Fells Point section of Baltimore City, Maryland, on an area that covers approximately 14 acres. The Site is surrounded by water on the north, west and south, the Living Classrooms facility to the north and by the Thames Street Wharf Office Building and its associated parking lots to the east.

2.2 SITE USE

The Site has been divided into Areas 1, 2, and 3. Area 1 is the principal site of Honeywell's (formerly AlliedSignal) Baltimore Works Facility (Figure 1). Chromium ore was processed in Area 1 from 1845 to 1985. The former manufacturing processes resulted in chromium impacts to soil and groundwater. The ERS is maintained and operated by Honeywell to contain ground water impacted by hexavalent chromium (CrVI) in Area 1, and to control the potential for human exposure to affected soil. The ERS consists of the MMC, the Hydraulic Barrier, the HMS, groundwater storage and transfer system, and the Outboard Embankment. The HMS maintains an inward ground water gradient to mitigate the migration of chromium-impacted ground water from the Site.

Area 2 was mainly used for coal and raw chromium ore storage. In addition, a fertilizer warehousing and supply company operated in this area for many years.

Area 3 consists of five separate properties all with a history of industrial activity. This industrial activity included brass casing, oil blending and storage, lumber storage and coating/plastics production.

Honeywell purchased all of these properties by 1993 at which time all manufacturing was halted and subsequently all buildings and tanks were removed.

The Site is the location for the future development project to be conducted by HPD. The development project consists of: the Exelon Tower and Trading Floor Garage; the Central Plaza Garage; modifications to the existing Transfer Station, HMS and MMC; general site development (landscaped plaza, streets, sidewalks, etc.); and utilities, foundations, roadways, and other related site development elements.

3.0 FACILITY CONTACT SUMMARY

Honeywell Contact:	Chris French Honeywell International Inc. 101 Columbia Road, P.O. Box 2105 Morristown, NJ 07962 973-216-7506
Resident Honeywell Site Manager:	Kenneth Biles, CH2M Hill 410-271-6694
Developer:	Jonathan Flesher Beatty Development Group, LLC 1300 Thames Street, Suite 10 Baltimore, MD 21231 443-463-3937

4.0 LIQUID DISCHARGE PREVENTION

Direct discharge of collected liquids to adjacent surface waters or ground surfaces is prohibited. Characterization and proper disposal of captured and stored liquids in accordance with the MHMP is required. Liquids characterized as non-contact water may be discharged to public sewer following the appropriate testing as described in the MHMP.

Surface water will be excluded from the excavations using diversion berms. Surface water originating from disturbed construction areas will be excluded from adjacent areas using containment berms (reference the DDP drawings for berms). Where the cover soils are highly permeable and up-gradient runoff contribution areas are large, a temporary membrane will be used to enhance the berm performance. Suitable excavated cover soil may be used for berm construction. Surface and storm water management are discussed in the projects MHMP and SWPPP.

Two types of fuel storage tanks are anticipated during construction activities at the Site. The two types of storage tanks will likely include a generator and small above ground storage tanks (ASTs) for storage of equipment fuel. A fuel truck is also anticipated to enter and exit the site for re-fueling equipment at the site. All petroleum product ASTs used at this facility will be double walled and constructed in accordance with industry specifications and will contain approximately 250-500 gallons of fuel. Alternatively, the storage tanks may be placed in secondary containment. The storage containers used will be compatible with the characteristics of the petroleum product they contain, and with temperature and pressure conditions.

Emergency generators with a day tank will also likely be used at the Site with a capacity of approximately 250 gallons. Piping between storage tanks and in connection with a storage tank will be placed aboveground for easy access and visual monitoring during use. The piping will either be double walled or placed in secondary containment.

Fuel trucks will be brought on Site during construction activities to re-fuel equipment and fuel oil storage tanks. (i.e., cranes, excavators, day tanks, etc.). Fueling of equipment will be performed using the portable, containment system (Drawing DDP EN1.04). The Developer's Representative will direct the Contractor to ensure that the driver understands the site layout, knows the protocol for entering the Site and unloading product, is familiar with this SPRP, and has the necessary equipment to respond to a discharge from the vehicle or fuel delivery hose. The trucks and/or site contractor will be equipped with a

functioning spill kit that meets industry standards exercised by experienced professionals performing the same services under similar circumstances. Those engaged with re-fueling activities will be knowledgeable with the deployment and use of the spill kit.

Transfer of contact storm water and groundwater extracted by the HMS or extracted for construction purposes will be conducted within a containment area of sufficient size and construction of appropriate materials to contain materials spilled during transfer (Drawings DDP EN1.03, EN1.04, F1.16 and F1.17). A spill kit will be maintained near the area where the transfer occurs. Spills within the containment area will be managed in a similar manner to the procedures noted in section 5.0 of this plan.

ASTs for the storage of extracted groundwater are located inside the Transfer Station tank room and are within secondary containment (Drawing DDP EN1.07). The ASTs include two (2) 10,000 gal ASTs for storing contaminated groundwater extracted by the HMS and one (1) 1,000 gal AST periodically filled with a potable water/acid mix (Table 3-1). These tanks are covered under this SPRP only as they relate to the redevelopment and construction activities, specifically during selective demolition of the Transfer Station and during pipe pile driving activities adjacent to the Transfer Station.

For the purpose of the this Plan, "non-contact" water is defined as storm water that is collected above the MMC synthetic layers, while "contact" water is defined as storm water collected from excavation zones below the MMC synthetic layers. Contaminated groundwater is defined as water extracted from below the MMC synthetic layers via the HMS or water other than contact water removed from any excavation. Each of these waters is further described in the MHMP.

Temporary storage containers to be provided include two (2) 16,380-gallon double-walled Frac tanks (Table 3-1). Contaminated groundwater will be temporarily diverted to one of the two Frac tanks via double-wall conveyance lines plumbed below grade from Vault 1 (Drawing DDP EN1.05). Should the Level II contingency plan be implemented, double-wall conveyance lines will be plumbed above grade and protected from vehicular traffic. The second Frac tank is provided primarily for collecting non-contact water that may pond on the surface during "normal" storm events or may be used as supplemental storage for HMS generated contaminated groundwater, if needed. In the event the second Frac tank is used for supplemental storage, the tank will be decontaminated and verified as clean by sample results prior to being used for storage for non-contact water.

Additional temporary storage containers include two (2) 168,000-gallon MODU™ tanks (Table 3-1). The MODU™ tanks are 75 ft. x 75 ft. x 4 ft. and are provided for temporary storage of contact water generated from open excavation(s) during a 24-hour period of 25-year and 100-year frequency storm event (Drawing DDP EN1.01). One MODU™ tank has adequate volume capacity to store approximately 107,000 gal/day and 138,000 gal/day, for 25-year and 100-year frequency storm event, respectively. The second MODU™ tank is provided for supplemental storage during the period when the first MODU™ tank is being emptied.

A 120 ft. x 205 ft. x 1.5 ft. deep containment berm with 14-inches of filling capacity will provide storage sufficient to handle water stored in a single ModuTank.

Since the storm water collected will be potentially impacted by contact with the bottom of the excavation, double-walled conveyance pipes or alternatively conveyance pipes within secondary containment must be installed from the pump location to the storage tanks. Double-walled conveyance pipes will drain back to the excavation for recovery. Contact and non-contact water testing and disposal requirements are provided in the MHMP.

Table 5-1. On Site Storage Tanks/Drums Anticipated during Construction

Tank #	Container Type	Size (gal)	Contents
Tank # 1 (GWT-201)	AST	10,000	Contaminated groundwater
Tank # 2 (GWT-202)	AST	10,000	Contaminated groundwater
Frac Tank #1	AST	16,380	Non-contact water Frac Tank
Frac Tank #2	AST	16,380	Contact water Frac Tank
MODU Tank #1	AST	168,000	Storm Water management (Contact water)
MODU Tank #2	AST	168,000	Storm Water management (Contact water)
MWT-210	AST	1,000	Existing water/Acid Mix
NA	Drum	55	Impacted PPE

Existing Tanks #1 and #2 and Frac Tanks #1 and #2 will be emptied via a vacuum tanker truck for transportation and appropriate off-site disposal. In the event that a vacuum truck is not available, a centrifugal transfer pump may be used to pump water to a transfer tractor-trailer.

Water stored in the ASTs will be transferred for off-site disposal using the existing 3-inch "Kamlock" connection located on the western wall of the Tank room. Double-wall flexible hose will be connected from the Kamlock to a portable, temporary loading secondary containment system. During periods when access to the existing loading dock is restricted, a "collapse-a-tainer" containment system, described as a Temporary Loading Dock (Drawing DDP-EN1.03), will provide the portability needed to ensure water transfer operations by vacuum truck or tractor-trailer are uninterrupted. The vacuum truck will be equipped with a functioning spill kit that meets industry standards exercised by experienced professionals performing the same services under similar circumstances.

Construction equipment will be re-fueled nearby its working location and stationed on a portable "collapse-a-tainer" secondary containment system as described above. Those engaged with re-fueling activities will be knowledgeable with the deployment of the collapse-a-tainer and use of the spill kit. If a fuel spill occurs outside of the collapse-a-tainer system, other measures in addition to a spill kit may be used to contain and manage the spill. These measures include the following:

- installation of containment berms around the spill;
- installation of swales around the spill;
- construction of a sump(s) for removal of the spill. The liquids will be conveyed to the groundwater storage tanks;
- other containment measures may be used to immediately stop the migration of the liquids; and,
- removal of soil materials that are impacted by the spill for characterization and off-site disposal. The soil would be excavated at a minimum to a depth at which there is no visual or olfactory evidence of the spill. Soil excavation will not penetrate any part of the ERS not intended to be disturbed as part of development.

Tank MWT-210 is used for storing maintenance/backwash water on an as-needed basis. This tank will temporarily hold an acid solution used for flushing accumulated precipitates from the HMS lines (only used during backwash activities). Tank MWT-210 is also a vertical cylindrical, flat bottom, reinforced flat/vent top tank constructed of fiberglass reinforced plastic with a nominal capacity of 1,000 gallons.

During proposed construction activities, an Emergency Generator will also be maintained at the Site by HDP. The generator will be inspected daily for leaks during use.

The generator will include a double-walled fuel tank (110% containment system) to ensure all fuels are isolated from the surrounding environment. In the event of a fuel leak, sorbent pads or other similar response materials will be used to recovery fuel, and contaminated soil will be promptly excavated and properly disposed off-site, along with the sorbent material. The soil would be excavated at a minimum to a depth at which there is no visual or olfactory evidence of the spill. Depending on the extent of the spill, soil sampling may be required to confirm cleanup. Soil excavation will not penetrate any part of the ERS not intended to be disturbed as part of development.

5.1 DISPOSAL OF RECOVERED MATERIALS

During construction activities, diesel fuel storage for small construction equipment will be provided on Site in the form of small ASTs and/or generator belly tanks. In the event of a small fuel spill during construction activities (e.g., spills less than 5 gallons) at the facility, fuel will be recovered by the Contractor's employees using absorbent materials from spill kits, or other measures. Any oil-soaked recovered material or wastes resulting from a spill cleanup will be stored in an approved container and then disposed or recycled off-site according to applicable federal and State regulations.

In the event of an oil spill or discharge at the facility, the Contractor will notify the Developer's Representative immediately upon being aware of such an event. The Maryland Department of the Environment (MDE) Oil Control Program (OCP) will to be notified by the Developer's Representative in accordance with Code of Maryland Regulations (COMAR) 26.10.08.01 Reporting Of Suspected Releases. The MDE OCP contact number to report a spill is 866-633-4686 (24 hour) or 410-974-3551.

Honeywell's emergency response contractor (Maryland Environmental Services at 410-979-8200); Baltimore City or the Maryland Department of the Environment's HAZMAT Team will be contacted by the Developer's Representative to recover the oil. Disposal of any recovered materials generated from cleanup by a spill response contractor will be coordinated through the Site Manager to ensure proper disposal of recovered materials in accordance with Maryland regulations.

6.0 DISCHARGE NOTIFICATIONS

The Contractor will immediately commit all necessary manpower, equipment, and materials required to prevent a spill from reaching waterways, shorelines, or sewers. Once the spill, release or discharge is under control, the Contractor will immediately notify the Developer's Representative.

The MDE OCP is to be notified by the Developer's Representative in accordance with Code of Maryland Regulations (COMAR) 26.10.08.01 Reporting Of Suspected Releases. The MDE OCP contact number to report a spill is 866-633-4686 (24 hour) or 410-974-3551.

6.1 PROJECT SPECIFIC EMERGENCY CONTACTS

In the event of a contaminated groundwater spill, material release, fire or explosion, the following Honeywell and developer should be notified immediately.

Emergency Coordinator (EC)

Developer: Jonathan Flesher – 443-463-3937

Resident Site Manager: Ken Biles – 410-522-5293

6.2 EMERGENCY NOTIFICATIONS

The following table provides government agency and emergency response contact information in the event of a spill:

Table 6-1. Emergency Contact Information

	Name	Phone
US Coast Guard Spill Reporting	National Response Center (Chemtrec)	800-424-8802
EPA Region III Reporting	US EPA Region III	215-814-5000
State Reporting	Maryland Department of the Environment Emergency Response Notification	866-633-4686 (24 hour) or 410-974-3551
	Maryland Natural Resources Police	410-643-5773

	Name	Phone
Local Reporting	Baltimore Fire Department	911 (emergency) 410-396-3083 (non-emergency)
Emergency Response Contractor	Maryland Environmental Services	410-729-8200

6.3 DISCHARGE RESPONSE PROCEDURES

In the event of an oil, contaminated groundwater or contact water spill outside of the containment area, spill response measures will be utilized to minimize migration of contaminated material.

If the EC determines that the facility has had a release, fire, or explosion that could threaten human health or the environment, or if the release is of a quantity which would exceed the Reportable Quantity (RQ) for chromium (1 pound as referenced in 40 CFR 302.4) outside of the tank containment or truck loading area, he shall report his findings as follows:

- Name, address, and telephone number of the person reporting
- Name, address, and telephone number and the responsible party
- Specific location of the incident
- Date and time the incident occurred or was discovered
- Name of the chemical/material released
- Source and cause of the release
- Total quantity discharged
- Medium into which the substance was discharged
- Amount spilled into water
- Weather conditions
- Name of the carrier or vessel, the railcar/truck number, or other identifying information
- Number and type of injuries or fatalities

- Whether an evacuation has occurred
- Estimation of the dollar amount of property damage
- Description of current and future cleanup actions
- Other agencies notified or about to be notified

If the facility stops operations in response to a fire, explosion, or release, the EC shall monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, wherever this is appropriate. Immediately after an emergency, the EC shall provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

If the spill material is flammable, all ignition sources shall be controlled/disabled. Fire extinguishers will be on hand for immediate use. The following actions should be taken as needed:

- Clear the area;
- Keep unnecessary personnel away;
- Identify the spilled material and report to the SM;
- Develop a plan of action;
- Don additional protective equipment;
- Control the source of the spill;
- Dike or apply absorbent material to spill;
- Decontaminate area as necessary; and
- Decontaminate personnel.

The EC shall ensure that, in the affected areas of the facility:

- Waste that may be incompatible with the released material is not treated, stored or disposed of until cleanup procedures are completed; and

- All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed.

Material spills may occur during construction from excavation, truck loading, and vehicle accidents, as well as during operation and maintenance of the HMS during Level II operations (See Contingency Plan and Drawing DDP EN1.02). Every effort will be made to prevent or minimize spilled groundwater discharge to the local surface waters.

Should an onsite spill of contaminated groundwater occur, the immediate response will include closing off the source of the spill, controlling the spilled material, application of a sorbent material or sand bagging, and street sweeping, as appropriate. The spill shall be collected as soon as possible, either manually or with equipment such as pumps. Ground material that comes in contact with the spill shall be cleaned (concrete, asphalt, or removed for disposal and replaced with clean material. The spill shall be collected as soon as possible, either manually or with equipment such as pumps.

6.4 WRITTEN NOTIFICATIONS

If the facility discharges more than 1,000 U.S. gallons of oil in a single discharge, or discharged more than 42 U.S. gallons of oil in each of two discharges that occur within any twelve-month period, into or upon navigable waters, a written report will be sent to the following address within 60 days of meeting the 1,000-gallon or 42-gallon criteria discussed above:

U.S. EPA – Region III
Office of Remediation, 3LC20
1650 Arch Street
Philadelphia, PA 19103
Attn: Mr. Russell Fish

A copy of this written report will also be sent to the State agency at the following address:

Maryland Department of the Environment (MDE)
1800 Washington Boulevard
Baltimore, Maryland 21230
Attn: Mr. Edward Dexter

The written report will include the following information:

- Name and location of the facility and name of the owner/operator;
- Corrective actions and countermeasures taken, including a description of equipment repairs and replacements;
- Description of facility, including maps, flow diagrams, and topographical maps;
- Cause of the discharge(s) to navigable waters and adjoining shorelines, including a failure analysis of the system and subsystem in which the failure occurred;
- Additional preventive measures taken or contemplated to minimize possibility of recurrence; and
- Other pertinent information requested by the Regional Administrator.

7.0 DISCHARGE PREVENTION MEASURES, CONTROLS, AND COUNTERMEASURES POST CONSTRUCTION ACTIVITIES

This SPRP is limited to construction-related activities. Once construction is completed, the current spill prevention control and countermeasures (SPCC) plan will continue to be employed at the site.

Figures

Figure 1
Site Location Map

Area 1, Phase 1
Storm Water Pollution Prevention Plan

Baltimore Works Site
Baltimore, Maryland

August 2013

By:
Environmental Resources Management, Inc.
Harbor Point Development LLC

For:
U.S. Environmental Protection Agency – Region III
Maryland Department of the Environment

TABLE OF CONTENTS

1.0	*INTRODUCTION*	*2*
1.1	*REGULATORY BACKGROUND*	*2*
1.2	*PURPOSE OF SWPPP*	*3*
1.3	*CONSISTENCY WITH OTHER PLANS*	*3*
1.4	*PLAN ORGANIZATION*	*4*
2.0	*FACILITY DESCRIPTION*	*5*
2.1	*SITE LOCATION*	*5*
2.2	*SITE HISTORY*	*5*
3.0	*IDENTIFICATION OF POTENTIAL POLLUTION SOURCES*	*6*
3.1	*SIGNIFICANT DUST OR PARTICULATE GENRATING PROCESS*	*6*
3.2	*LOADING AND UNLOADING OPERATIONS*	*7*
3.3	*OUTDOOR STORAGE ACTIVITIES*	*8*
4.0	*BEST MANAGEMENT PRACTICES FOR STORM WATER MANAGEMENT CONTROLS*	*9*
4.1	*EXISTING BMPS*	*9*
4.2	*DURING CONSTRUCTION*	*9*
4.3	*POST CONSTRUCTION*	*13*
4.4	*SWPPP REVISION*	*15*
5.0	*STORM WATER POLLUTION PREVENTION TEAM AND TRAINING*	*17*
5.1	*PROJECT SPECIFIC TEAM MEMBERS AND RESPONSIBILITIES*	*17*
5.2	*TRAINING REQUIREMENTS*	*17*

1.0 INTRODUCTION

1.1 REGULATORY BACKGROUND

This Storm Water Pollution Prevention Plan (SWPPP) was developed for the Harbor Point site, located in Fell's point, next to the Baltimore Inner Harbor in Baltimore, Maryland. The SWPPP has been prepared in accordance with the United States Environmental Protection Agency (USEPA) and Maryland Department of the Environment (MDE) regulations governing storm water runoff. The federal requirements regarding stormwater runoff are codified under the National Pollutant Discharge Elimination System (NPDES) regulations, found in Title 40, Part 122, Subpart B of the Code of Federal Regulations (40 CFR 122.26). USEPA has delegated NPDES authority in the State of Maryland to MDE. The State regulations governing the stormwater discharge permit program are codified in the Code of Maryland Regulations in Title 26, Subtitle 08 and Subtitle 17 (COMAR 26.08 and COMAR 26.17).

Federal storm water regulations (40 CFR 122.26(a)(1)(ii) and 40 CFR 122.26(b)(14)) and corresponding state storm water regulations require a permit for the discharge of storm water associated with industrial activities within SIC code 2813. The State of Maryland, through the Maryland Department of the Environmental (MDE), has primacy for NPDES storm water discharges. Therefore, the existing Facility's storm water discharge is covered under MDE's Discharge Permit No. 02-SW: General Discharge Permit for Storm Water Associated with Industrial Activities. MDE has a draft version of an updated General Discharge Permit No. 12-SW available for review. The comment period on the permit update ended on May 20, 2013. When a new permit is issued, the owner/operator of the site will be required to submit a notice of intent (NOI) for coverage under the new permit.

The management activities for compliance with this permit are provided in the site's Erosion and Sediment Control Plan. This SWPPP is intended to discuss best management practices for managing storm water runoff during construction activities. This SWPPP should be utilized in conjunction with other plans as discussed in Section 1.3

This SWPPP was developed in accordance with the requirements of *USEPA's NPDES Multi-Sector General Permits for Storm Water Discharges Associated with Industrial Activities* as published in the Federal Register on October 30, 2000. A copy of this SWPPP must be kept on site at all times.

1.2 PURPOSE OF SWPPP

The purpose of the SWPPP is to evaluate potential pollution sources at the Facility that could come in contact with storm water and to select and implement appropriate measures to mitigate or control the discharge of pollutants in storm water runoff.

The pollution prevention approach focuses on three objectives: (1) to identify sources of pollution potentially affecting the quality of storm water discharges associated with industrial activity from the Facility; (2) to describe and outline implementation of practices to minimize and control pollutants in storm water discharges associated with industrial activity from the Facility; and (3) to provide a mechanism for compliance with the terms and conditions of the General Permit.

This SWPPP document is a foundation for the Facility's storm water pollution prevention program. This document is revised accordingly as conditions and practices at the Facility change to accommodate new methods of production, storage and material transfer.

The SWPPP describes activities, materials and physical features of the Facility that may contribute pollutants to storm water runoff and the procedures and methods that are used to minimize these impacts.

1.3 CONSISTENCY WITH OTHER PLANS

Special Condition Part IV-C.3 of the General Discharge Permit states that the SWPPP may incorporate parts of other plans or permits that are relevant to storm water pollution prevention.

Honeywell stores less than 1,320 gallons of aboveground oil storage and less than 42,000 gallons of underground oil storage. Based on these thresholds, Honeywell is not subject to the Spill Prevention Control and Countermeasures (SPCC) regulations under 40 CFR 112.

A Materials Management and Handling Plan has been prepared to address the handling and management of solids (asphalt, stone aggregates, concrete and wood debris and soil) and liquids (storm water, decontamination water and ground water) that may be encountered during the intrusive activities at the Site. This Plan also includes dust control measures that describe soil/debris handling practices to be implemented to minimize dust emissions.

An Air Monitoring Plan has also been prepared to ensure the safety of workers and the public during construction.

Additionally, a Spill Prevention and Response Plan (SPRP) has been prepared and is meant to be used in conjunction with the Material Handling & Management Plan, as well as the Storm Water Pollution Prevention Plan (SWPPP) also previously prepared for the same Site.

This SWPPP will serve as the site document relevant to storm water pollution prevention and erosion and sediment control and does not incorporate parts of any other plans or permits.

1.4 PLAN ORGANIZATION

The remainder of the SWPPP is organized in the manner listed below.

- *Section 2.0 - Facility Description.* Section 2.0 presents a narrative of the site location, a description of the site history, and current storm water runoff control.

- *Section 3.0 - Identification of Potential Pollution Sources.* Section 3.0 describes in more detail potential storm water pollution sources at the Facility.

- *Section 4.0 - Best Management Practices for Storm Water Management Controls.* Section 4.0 describes those practices to be implemented to ensure proper storm water management control.

- *Section 5.0 - Storm Water Pollution Prevention Team and Training.* Section 5.0 identifies the pollution prevention team and training to implement the SWPPP.

2.0 FACILITY DESCRIPTION

2.1 SITE LOCATION

The Site is located on a peninsula on the northeast shore of the Patapsco River of the Inner Harbor, in the Fells Point section of Baltimore City, Maryland. The former chromium chemical manufacturing facility consisted of chromium processing production buildings and numerous support buildings on an area that covered approximately 14 acres. The Site is surrounded by water on the north, west and south, the Living Classrooms facility to the north and by the redevelopment project, Thames Street Wharf Office Building, constructed in 2009, to the east.

2.2 SITE HISTORY

The Site has been divided into Areas 1, 2, and 3. Area 1 is the principal site of Honeywell's (formerly AlliedSignal) Baltimore Works Facility. Chromium ore was processed in Area 1 from 1845 to 1985. The former manufacturing processes resulted in chromium impacts to soil and groundwater. An Environmental Remediation System (ERS) is maintained and operated by Honeywell International Inc. (Honeywell) to contain CrVI-impacted ground water in Area 1 and control the potential for human exposure to affected soil. The ERS consists of a Multimedia cap (MMC), Hydraulic barrier, Head Maintenance System (HMS), a ground water storage and transfer system, and Outboard Embankment. The HMS maintains an inward ground water gradient to mitigate the migration of chromium-impacted ground water from the Site.

Area 2 was mainly used for coal and raw chromium ore storage. In addition, a fertilizer warehousing and supply company operated in this area for many years. This area was covered with a soil and asphalt cap system.

Area 3 consists of five separate properties all with a history of industrial activity. This industrial activity included brass casing, oil blending and storage, lumber storage and coating/plastics production. This area was covered with a soil cap which has since been paved.

Honeywell purchased the five properties by 1993 prior to which all manufacturing was halted and subsequently all buildings and tanks were removed from these sites.

3.0 IDENTIFICATION OF POTENTIAL POLLUTION SOURCES

The planned foundations include driven centric closed-end pipe piles filled with concrete. The driven concentric pipe pile is proposed for the one-story Plaza Garage. Pile caps with driven piles will be placed below columns at the interior and perimeter of the Exelon Tower and Trading Floor Garage. A large, pile-supported slab will be placed below the Exelon Tower.

The potential pollutant sources are hexavalent chromium encountered during excavation activities being conducted on this site (primary source), stored groundwater collected to maintain an inward groundwater gradient to the site (secondary source) and acid which is used on an intermittent basis to create pH adjusted water used in the maintenance (cleaning) of the conveyance piping. Hexavalent chromium is expected to be encountered when the liner is exposed and removed to facilitate excavation of foundations. The source of the dissolved chromium is groundwater conveyed via piping to the enclosed permitted, secondarily contained storage tanks. Tanks are emptied via vacuum tanker trucks within the loading area of the Transfer Building. The acid is delivered and stored in 1 gallon glass bottles. In the event of a spill, the spilled contents would be contained within the secondarily contained loading area and disposed of in accordance with the Facility SPCC Plan.

There is also the potential for fuel leaks during construction activities, such as during fuel deliveries. This potential pollution source will be discussed in the Construction SPCC Plan.

3.1 SIGNIFICANT DUST OR PARTICULATE GENRATING PROCESS

A Materials Management and Handling Plan has been prepared for inclusion in the DDP that describes soil/debris handling practices to be implemented to minimize dust emissions. In general, dust emissions will be controlled by misting with potable water onto open excavations as needed to keep exposed soil surfaces moist. The aerosolized water misting is also effective in precipitating dust emissions.

3.2 LOADING AND UNLOADING OPERATIONS

The excavation planned for the Exelon Tower moment slab will generate clean soil/aggregate from above the MMC synthetic layers and chromium contaminated soil/debris. The proposed momentum slab excavation will terminate at El. +6 feet mean sea level (msl), approximately four feet below the MMC. Abandoned, concrete or wood foundation structures have been identified that will be encountered below the MMC during centric, steel pile driving and concrete pile cap construction. The abandoned structures will be removed only to the extent necessary for construction of new foundations. As such, the removed, abandoned structures will be considered contaminated debris requiring off-site disposal.

While direct-loading excavated soil/debris into lined, sealed roll-off containers is the preferred daily excavation and transportation method; a controlled, temporary storage area will be constructed, as described above, for use in the event that sealed roll-off containers cannot be transported daily for off-Site disposal. Some events that might prompt the use of this temporary storage area, as a contingency, are:

- Volume limit to the daily capacity of the primary and alternate off-site disposal facilities;
- Off-site disposal facility hours of operation; and
- Limited availability of long-haul trucks.

The storage area will be located in close proximity to the excavation zone required for construction of the momentum slab (west side of Limit of Disturbance) to reduce the distance for moving containers (Drawing DDP-EN1.01). The controlled area will be approximately 5,000 square feet which will provide a storage capacity of 20; 25-cubic yard lined and sealed roll-off containers or approximately 250 cubic yards of containerized soil/debris storage.

There are four categories of water anticipated to be managed during intrusive work, including:

- Storm water diverted from contact with contaminated material below the MMC;
- Storm water that comes into contact with contaminated material below the MMC;

- Ground water; and

- Equipment decontamination water.

Contact and non-contact water will be transported via piping to two, 16,380-gallon double-walled Frac tanks. Contaminated water will be transferred from the Frac tanks by vacuum trucks for disposal at a hazardous waste facility in Baltimore, MD. All connections will be tightly secured prior to unloading. A Harbor Point Development designee will be present for the duration of each water transfer activity.

3.3 OUTDOOR STORAGE ACTIVITIES

Non-contact and contact water removed from excavations during construction will be pumped to 16,380-gallon double-walled Frac tanks and tested prior to disposal. The water will be stored in the Frac tanks until the appropriate disposal classification is determined.

Honeywell maintains a list of their approved Subtitle C landfill facilities and as such the addition of alternative, proposed disposal facilities must be pre-approved. The following RCRA landfill facilities are located within reasonable proximity to the Site and be may be considered, as may others with the caveat of Honeywell approval, for off-site disposal:

- Environmental Quality (EQ) [EPA ID: PAD010154045]
  730 Vogelsong Road
  York, PA 17404
  ~ 60 miles

- MAX Environmental Technologies [EPA ID: PAD004835146]
  233 Max Lane
  Yukon, PA 15698
  ~ 200 miles

- Waste Management Solutions [EPA ID: NYD049836679]
  1550 Balmer Road
  Youngstown, NY 14174
  ~ 400 miles

4.0 BEST MANAGEMENT PRACTICES FOR STORM WATER MANAGEMENT CONTROLS

Best Management Practices (BMPs) for storm water management control are described in this section. The BMPs were developed using EPA's publication *Storm Water Management for Industrial Activities* (October 1992) as a guidance.

Baseline BMPs are employed across the entire Site and are not necessarily associated with any specific source of significant materials. The BMPs described below are consistent with the conditions of the General Permit to ensure proper management of storm water runoff.

4.1 EXISTING BMPS

The site currently has a drainage system in place. A MMC with LLPDE liner with a composite drainage net covers the entire site and is sloped to drain water to a perimeter drain. The perimeter drain is perforated polyvinyl chloride (PVC) pipe on the landward perimeter and HDPE drain tubing at the waterfront perimeter. The tubing was placed in a stone-filled trench at the perimeter of the geomembrane outboard of the hydraulic barrier. The perimeter drain was placed around the entire perimeter. The perimeter drain allows storm water infiltration within the cap drainage layer (i.e., above the synthetic layers of the cap) to drain to the surface water of the Inner Harbor.

The only other existing BMP is a riprap waterside perimeter embankment. This embankment helps to mitigate the potential erosion of the slope into the river.

4.2 DURING CONSTRUCTION

4.2.1 Non-contact Water

Storm water will be diverted from excavation zones by installing the required erosion and sediment controls as shown on drawings DDP-C8.00 and DDP-F1.21, F1.30 and F1.31. Should storm water that has not come into contact with contaminated material below the MMC pond on a controlled surface, the standing water will be pumped to one of two 16,380-gallon double-walled Frac tanks. This non-contact water will be held for analytical testing results to ensure proper disposal.

4.2.2 Contact Water

Storm water that inadvertently comes in contact with contaminated soil below the MMC and ponds in open excavations will be collected in a sealed sump and pumped to one of two 16,380-gallon double-walled Frac tanks. Additionally, storm water collected in the sealed sump from the perimeter drain installed at the temporary storage area will be pumped to this Frac tank. This contact water will be held for analytical testing results to ensure proper off-site disposal.

4.2.3 Storm Water Management System

The storm water management plan was examined for the 25-year storm event and 100-year storm event, however the storage requirements were determined based primarily on the 25-year storm event. When a storm event occurs, the only water that will come in contact with soil below the membrane will be storm water falling directly into an excavation. All water that falls outside of the excavations is treated as surface runoff because it will be deflected away from open excavations by diversion berms. Infiltration through the cover soil into the drainage net was assumed to not occur because the drainage net is sealed at the edge of each excavation. The bottom of each excavation is open to soil below the membrane, so that any storm water collected in the excavation may be impacted.

Each excavation will be sloped and a sump will be installed in each excavation to collect storm water to prevent it from rising above the capillary break gravel at the down-slope side of the excavation. The entire footprint of the excavation, including the sloped portions, was considered to catch storm water in the excavation. Contact and non-contact water testing and proper disposal procedures are described in the Material Handling and Management Plan project control document.

The total volume of impacted water generated by a 25-year storm event over 24 hours has been calculated to be approximately 107,000 gallons, based on the open excavation area computed. This volume can be contained in one 75 ft. x 75 ft. x 4 ft. (168,000-gallon) "modutank" container. Considering it takes approximately 24 hours to sample and properly discharge impacted water, two modutanks will be present to store the volume of impacted water generated as well as any additional surge that may occur during the 25-year storm event. The storage volume provided by a single 168,000-gallon modutank storage container is approximately 57% greater than the volume of impacted water generated during a 25-year storm event, and approximately 22% greater than the volume of impacted water generated during a 100-year storm event.

Two storage containers will provide sufficient storage required to test, sample, and dispose of impacted water during a 24-hour, 25-year or 100-year frequency storm event at the site. A 120 ft. x 205 ft. x 1.5 ft. deep containment berm with 14-inches of filling capacity will provide storage sufficient to handle water stored in a single ModuTank.

4.2.4 Sediment and Erosion Control

The Erosion and Sediment Control Plan outlines specific activities to mitigate erosion by water or wind transport of sediment and soil during construction activities. In general, sediment control measures will consist of perimeter control devices such as:

- Silt fence and Super silt fence (except on Multimedia Cap);
- Asphalt berms;
- Earth dikes; and
- Stabilized construction entrances.

Point control measures will include dewatering practices such as portable sediment tanks and sump pits.

4.2.5 Spill Prevention and Response Procedures

The following measures should be implemented upon discovery of a release:

- Assess the risk;
- Implement the construction SPRP Plan based on the source of the release;
- Control the release to the extent possible;
- Report the release to management and government agencies;
- Clean up the impacted area as soon as possible; and
- Follow up with preventive measures and any necessary documentation.

Site personnel will immediately commit all necessary manpower, equipment, and materials required to prevent the spill from reaching waterways, shorelines, or sewers. The SPRP Plan further outlines spill prevention and control measures.

4.2.6 Good Housekeeping

Good housekeeping practices are designed to maintain a clean and orderly work environment. Good housekeeping practices to be used during construction activities are the following:

- Maintain clean vehicle access roads;
- Keep all paved and vegetated areas clean of litter and debris and properly maintained.
- Maintain regular refuse pick-up and disposal;
- Spill response equipment is properly located, in adequate supply and working order, and the location(s) are known to all employees;
- Promptly clean up spills and leaks and properly dispose of recovered material;
- Keep walkways and passageways easily accessible and free of protruding objects, materials, and equipment;
- Make sure all trucks which entered any disturbed area, have gone through decontamination procedures for tires, prior to leaving the site; and
- Discuss and promote good housekeeping practices with employees.

Good housekeeping elements are covered in the storm water inspections and throughout the Facility's storm water management process.

4.2.7 Visual Inspections

Storm water inspections will be conducted at this facility as required by the permit. At a minimum, authorized personnel will perform a monthly inspection of the Facility. The trained inspector will perform the inspections consistent with the requirements of the General Discharge Permit and Materials Handling and Management Plan. The inspections will be performed to detect evidence of potential common problems that may occur during construction

At the completion of each inspection, the inspector will review the SWPPP to determine if any observation may require revisions to the SWPPP. Any suggested revisions to the SWPPP will be brought to the attention of the Developer's representative. If the Developer's team determines that revisions are necessary, the SWPPP will be revised.

In addition to the monthly inspections, quarterly inspections of proposed outfalls will also be performed after major storm events. The inspections will be performed to detect evidence of potential storm water blockage or pollution.

4.3 POST CONSTRUCTION

4.3.1 Oil/Water Separators

Once construction is completed, permanent storm water control measures will be employed at the site. The northwestern and northeastern corners of the proposed Exelon tower will have garage drainage interceptors to ensure that no oil is in the water when it is discharged. Each of these oil/ water separators will consist of an underground tank that is 96 inches long and 62 inches wide that is connected to a venting system. The system will discharge to the sanitary sewer system.

4.3.2 Management of Runoff

The following methods are planned to help with the management of runoff at the site post construction:

- Reduce impervious area via the installation of a green roof;
- Reduce impervious area via the installation of green space within the Central Park and tree pits along the street network;
- Rainwater harvesting within the building (collect rooftop runoff) and reuse for mechanical/plumbing systems; and
- Collect surface runoff from open space areas and direct the discharge via piping to the harbor.

4.3.3 Preventive Maintenance

Preventive maintenance involves the timely inspection and maintenance of storm water management devices as well as inspecting and testing facility equipment and operational systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters.

The preventive maintenance program for facility equipment is intended to mitigate breakdowns or failures by adjustment, repair, or replacement, and includes the following elements:

- identification of equipment at the facility that should be inspected;
- a schedule for periodic inspections of the equipment;
- appropriate and timely adjustment, repair, or replacement of equipment; and
- maintenance of complete records of inspections and equipment.

Preventive maintenance for site management areas and sediment and erosion control structures includes inspection for debris or other clogging material to ensure proper functioning of the structures, repair of minor erosion, cleaning of ditches and structures, reseeding and fertilization of vegetative areas.

4.3.4 Good Housekeeping

Good housekeeping practices require that the facility is maintained in a clean and orderly manner. This is accomplished through instilling proper employee work habits and by training and checking the progress through visual inspections. Good housekeeping assures that:

- floors and surfaces are kept clean and orderly;
- spill response equipment is properly located, in adequate supply and working order, and the location(s) are known to all employees;
- spills and leaks are promptly cleaned up and recovered material is properly disposed; and
- all paved and vegetated areas are routinely kept clean of litter and debris and are properly maintained.

Floors and ground surfaces should be cleaned by sweeping or shoveling and not by washing. Hosing down an area with water increases the potential for pollutants to be carried down-gradient to be released at a later time into stormwater. Brooms should be stored in an appropriate area and should not be exposed to precipitation. Shovels should be cleaned before being stored.

Sorbents are materials that are capable of cleaning up spills through the physical/chemical processes of adsorption and absorption. Typical sorbent materials that can be thrown onto a spill on paved surfaces include clays, sand, kitty litter, and sorbent booms, matting and pads. Sorbent booms should be used to absorb spills on unpaved areas. For absorbent materials to be effective, they must be applied immediately onto the spilled area, and cleanup should proceed immediately. Proper disposal of the used absorbent material is necessary.

In the areas outside of the Exelon tower and in the parking garage, good housekeeping involves:

- picking up refuse and recyclables deposited outside of any dumpsters or trash bins;
- sweeping or shoveling any dry/solid materials that may have accumulated outside of any dumpsters and recycled material collection areas;
- proper disposal of refuse and recyclable materials;
- keeping walkways and passageways easily accessible; and
- cleaning the storm drain inlets.

The site storm water drains will discharge to two oil/water separators to the northeast and northwest of the Exelon Tower before entering the storm water sewer system. The oil/water separators will be regularly inspected and maintained, as per the manufactures specifications.

4.4 SWPPP REVISION

This SWPPP will be amended whenever there is a change in design, operation, maintenance, or other circumstances that materially increase the potential for releases of significant materials, or that changes the response necessary in an emergency.

This SWPPP will also be amended in the event of new regulations, there is a change in the Developer's team, or if the SWPPP proves ineffective in achieving the general objective of controlling storm water discharges. At least once a year, the Developer's Team will review and discuss the appropriateness of the SWPPP, and determine whether the SWPPP requires revisions. As appropriate, the plan will be revised within a reasonable time period following the plans annual review.

Amendments to the SWPPP will be recorded a SWPPP Revisions Log and appended to this document.

5.0 STORM WATER POLLUTION PREVENTION TEAM AND TRAINING

5.1 PROJECT SPECIFIC TEAM MEMBERS AND RESPONSIBILITIES

The members of the Storm Water Pollution Prevention Team are listed below:

Facility Coordinator	Jonathan Flesher: 443-463-3937
Resident Site Manager	Ken Biles: 410-522-5293

The above-listed persons are trained to implement the SWPPP. Mr. Flesher will designate an inspector for the SWPPP responsible for monthly inspections and documentation as well as assurance that appropriate BMPs are in place. The Facility Coordinator has the overall responsibility for ensuring plan adherence, updated training, and authorizing the resources necessary to implement the SWPPP and corrective measures. Additional team members will provide support on an as needed basis.

5.2 TRAINING REQUIREMENTS

Members of the pollution prevention team are responsible for conducting employee training programs. The employee training programs are designed to inform personnel at all levels of responsibility of the components and goals of the SWPPP. Training sessions will address topics such as spill prevention and response, preventive maintenance, good housekeeping, storage practices, visual inspections, and recordkeeping and reporting. At a minimum, formal training sessions shall be conducted annually. Topics discussed in the training session and a roster of employees who attend the training sessions are to be recorded and retained in the SWPPP file. Informal training in the form of one-on-one communications with personnel on the importance of pollution prevention should occur during visual inspections by members of the pollution prevention team. This will allow members of the pollution prevention team to point out potential pollutants to employees and to verify that the information addressed in the training sessions has been communicated effectively to them.

The information described in the plan regarding potential pollution sources (Section 3.0) and storm water management controls/BMPs (Section 4.0) are distributed to all employees whose work influences storm water or includes a potential pollution source. At a minimum, this includes maintenance personnel, equipment and vehicle operators, and anyone who handles or oversees the transfer of fuel or other granular or liquid materials into and out of the facility. Employee training includes these four core subjects.

- *Good Housekeeping* - Employees are required to maintain a clean and orderly work environment. The routine sweeping of floors and the prompt cleanup of spilled material is discussed. The location of shovels, brooms, absorbents, and any other spill response equipment are identified. Employees are informed to regularly check for leaks, and spills. Housekeeping issues are addressed during regular safety meetings.

- *Spill Prevention and Response* - Employees are made aware of potential spill areas, drainage routes, and to whom a spill should be reported. Specific material handling procedures to avoid spills and response procedures in the event of a spill are also discussed.

- *Loading and Unloading Procedures* - Employees are instructed to provide constant supervision during all outdoor fuel transfer and material handling operations and to ensure that all containers are properly sealed prior to handling.

- *Preventive Maintenance* – Employees are instructed to provide constant care when using equipment to ensure that the equipment is maintained properly.

Appendix C
Index of Drawings

INDEX OF DRAWINGS

DDP A0.01.00 Sheet Index
DDP A1.00.01 Floor Plan – Level 1
DDP A1.00.02 Floor Plan – Level 2
DDP A1.31.00 Enlarged Floor Plans – Transfer Station

DDP A0.01.00 Sheet Index
DDP A1.00.01 Floor Plan – Level 1
DDP A1.00.02 Floor Plan – Level 2
DDP A1.31.00 Enlarged Floor Plans – Transfer Station

DDP C1.00 Existing Conditions Site Constraints
DDP C1.01 Existing Conditions
DDP C2.00 Site Demolition Plan
DDP C4.00 Site Plan
DDP C5.00 Existing Utility Disposition Plan
DDP C5.10 Utility Composite Plan
DDP C5.20 Storm Drain & Grading Plan
DDP C7.00 Water Profiles & Details
DDP C7.10 Storm Drain Profiles & Details
DDP C7.11 Storm Drain Profiles & Details
DDP C7.20 Telecom Profiles & Details
DDP C7.30 Electric Profiles & Details
DDP C7.31 Electric Profiles & Details
DDP C7.40 Conceptual Gas Profiles
DDP C8.00 Erosion & Sediment Control Plan
DDP C8.10 Erosion & Sediment Control Details
DDP C8.20 Erosion & Sediment Control General Notes

INDEX OF DRAWINGS (continued)

DDP F1.01	General And Technical Notes
DDP F1.02	General And Technical Notes
DDP F1.03	General And Technical Notes
DDP F1.10	Boring Location Plan
DDP F1.11	Geologic Sections
DDP F1.12	Pre-Load Areas Plan
DDP F1.13	Potential Obstructions Plan
DDP F1.14	Foundation Excavation Areas Plan
DDP F1.15	Construction Access Roads Plan
DDP F1.16	Demolition of Honeywell Offices Plan
DDP F1.17	Demolition of Honeywell Offices Sections
DDP F1.20	Sheet Pile Barrier Wall Plan
DDP F1.21	Multimedia Cap Drainage Plan
DDP F1.22	Sheet Pile Wall Construction Sequence
DDP F1.23	Sheet Pile Wall Construction Sequence
DDP F1.24	Sheet Pile Wall Typical Details
DDP F1.25	Sheet Pile Wall Typical Details
DDP F1.30	Pile Cap Construction Sequence
DDP F1.31	Concentric Pile Construction Sequence
DDP F1.32	Utility Crossing Plan And Sections
DDP F1.40	Foundation Plan
DDP F1.41	Foundation Partial Plan
DDP F1.42	Foundation Partial Plan
DDP F1.43	Foundation Partial Plan And Sections
DDP F1.44	Foundation Partial Plan
DDP F1.50	Foundation Details And Sections
DDP F1.51	Foundation Details And Sections
DDP F1.52	Foundation Details And Sections
DDP F1.53	Foundation Details And Sections
DDP F1.54	Foundation Details And Sections
DDP F1.55	Pile Schedule
DDP F1.60	Development Cap Plan

INDEX OF DRAWINGS (continued)

DDP EN1.01 Environmental Remediation System Improvements

DDP EN1.02 Transfer Station Operation And Sequencing Plan

DDP EN1.03 Level 1 Contingency Piping Plan And Details

DDP EN1.04 Level 2 Contingency Piping Plan And Details

DDP EN1.05 Vault Modification Details

DDP EN1.06 Piezometer, Junction Box And Other Details (1 of 2)

DDP EN1.06.01 Piezometer, Junction Box And Other Details (2 of 2)

DDP EN1.07 Transfer Station Piping And Conduit Plan

DDP EN1.08 Transfer Station Contingency Modifications

DDP EN1.09 Modifications For Pile Supported HMS Vaults And Piping In Dock Street