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SUPERFUND TECHNICAL ASSESSMENT & RESPONSE TEAM V
EPA CONTRACT NO.: 68HE0319D0004

September 18, 2024

Mr. Jonathan Byk, On-Scene Coordinator
U.S. Environmental Protection Agency, Region II
Superfund and Emergency Management Division
2890 Woodbridge Avenue
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EPA CONTRACT NO: 68HE0319D0004

TD NO: TO-0030-0170

DC NO: STARTV-05-D-0212

**SUBJECT: SITE-SPECIFIC COMMUNITY AIR MONITORING PLAN
HISTORIC POTTERIES SITE
TRENTON, MERCER COUNTY, NEW JERSEY**

Dear Mr. Byk,

Enclosed please find the Site-Specific Community Air Monitoring Plan (CAMP) for the air monitoring and sampling activities to be conducted in support of the Removal Action Two East Trenton Parks (RV2) part of the Historic Potteries Site located in Trenton, Mercer County, New Jersey. Site activities will commence on September 23, 2024, and are expected to continue for approximately eight weeks.

If you have any questions or comments, please do not hesitate to contact me at (732) 570-4943.

Sincerely,

Weston Solutions, Inc.

Ronan Clynn

For: Olga Kuzmitskaia

START V Site Project Manager

Enclosure

cc: TDD File No.: TO-0030-0170

SITE-SPECIFIC COMMUNITY AIR MONITORING PLAN

HISTORIC POTTERIES SITE (RV2)

Trenton, Mercer County, New Jersey

Site Code: A29V

CERCLIS Code: NJN000203535

Prepared by:

Superfund Technical Assessment & Response Team V
Weston Solutions, Inc.
Federal East Division
Edison, New Jersey 08837

Prepared for:

U.S. Environmental Protection Agency, Region II
Superfund and Emergency Management Division
2890 Woodbridge Avenue
Edison, New Jersey 08837

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September 2024

TABLE OF CONTENTS

1. INTRODUCTION.....	1
1.1 Community Air Monitoring Program Objectives	1
2. PERIMETER AND COMMUNITY AIR MONITORING.....	2
2.1 Air Monitoring Procedures	2
2.2 Basis for Establishing the Air Monitoring Action Level.....	3
2.3 Non-working Hours	4
2.4 Equipment Maintenance and Calibration.....	4
2.5 Engineering Controls	4
3. AIR SAMPLING	5
3.1 Air Sampling Procedures	5
3.2 Basis for Establishing Air Sampling Action Level.....	5
3.3 Non-working Hours	6
4. REPORTING OF AIR MONITORING AND SAMPLING RESULTS.....	6
4.1 Community Notification Procedures	6
4.2 On-Site Reporting Procedures	6
4.3 Reporting Procedures for Site Employees	6
4.4 Reporting Procedures for the Analytical Laboratory.....	7
4.5 Data Review and Interpretation	7

TABLES

Table 2-1: Air Monitoring Specifications.....	3
Table 2-2: Community Air Monitoring Action Level for Particulates (Direct Reading Instrumentation).....	4
Table 3-1: NIOSH Sampling Procedures.....	5
Table 3-2: Community Air Sampling Action Level.....	6

ATTACHMENTS

Attachment A – Figures

Figure 1: Sonny Vereen Park Air Monitoring Air Station Locations

Figure 2: Breunig Avenue Park Air Monitoring Air Station Locations

Attachment B - NIOSH Analytical Method 7300

1. INTRODUCTION

This Community Air Monitoring Plan (CAMP) has been prepared to support the RV2 Removal Action (RV) at two East Trenton parks, part of the Historic Potteries Site in Trenton, New Jersey. Weston Solutions, Inc., Superfund Technical Assessment & Response Team V (START V), prepared this CAMP at the request of the U.S. Environmental Protection Agency, Region II (EPA).

This CAMP presents air monitoring activities to be performed while implementing RV activities that may produce fugitive dust emissions. This CAMP identifies action levels and associated control measures to be implemented based on the results of air monitoring. Air monitoring for on-site personnel safety will be addressed in the Emergency and Rapid Response Services (ERRS) contractor's Site-Specific Health and Safety Plans. The air monitoring activities described in this CAMP will be performed by the START V contractor during implementation of RV activities that may produce fugitive dust.

1.1 Community Air Monitoring Program Objectives

START V has been tasked by EPA with providing field support as part of RV2 RV activities at the Site at the Sonny Vereen Playground and Breunig Avenue Park. EPA has tasked its ERRS contractor with installing temporary soil covers consisting of certified clean fill, mulch, soil/sod, and crushed stone over lead contaminated soil areas. As part of the scope of work (SOW) for the RV, minor excavation of some areas of the Site and backfilling with clean materials will be required. Dust suppression will be performed as needed during Site activities (i.e., soil excavation). Consequently, START V will perform air monitoring using particulate monitors (i.e., DustTrak®) to ensure that site engineering controls for dust suppression are effective in protecting the health of all site personnel (workers, students, and faculty) and adjacent residences from fugitive dust which may potentially contain site-related contaminants. Air sample locations will be co-located with air monitoring locations, and air samples will be submitted for laboratory analysis as directed by the EPA On-Scene Coordinator (OSC) during ground intrusive activities. Air monitoring and sampling locations will be determined on-site by the OSC based on the SOW for the day and prevailing weather conditions and documented using global positioning system (GPS) technology. Air monitoring and sampling will be conducted throughout the duration of activities associated with excavation of contaminated soils. The following objectives have been set for the Site air monitoring program:

- Establish a Site-Specific Action Level for dust particulate concentration;
- Continuously monitor dust particulate concentrations in air to ensure that off-site migration of contaminants remain below the Site-Specific Action Level;
- Collect confirmation air samples for lead analysis to ensure the effectiveness of the engineering control being utilized on-site for dust suppression; and
- Establish corrective actions to be taken in the event that temporary exceedances of the Site-Specific Action Level are experienced.

This Site-Specific CAMP outlines the air quality monitoring and sampling procedures to be followed in order to protect on-site personnel and the surrounding community from potential airborne contaminant releases during the implementation of the RV.

2. PERIMETER AND COMMUNITY AIR MONITORING

2.1 Air Monitoring Procedures

Air monitoring activities will be conducted in accordance with the procedures outlined within the EPA guidance document entitled, “Superfund Program Representative Sampling Guidance, Volume 2: Air (Short-Term Monitoring), Interim Final. 1995. EPA 540/R-95/140. (OSWER Directive 9360.4-09, PB 96-963206).” Appropriate activities as outlined within this document include the monitoring necessary to ensure appropriate health and safety levels for protection of on-site personnel and to ensure that the surrounding community is not exposed to Site-related constituents at concentrations above the Site-Specific Action Level.

Real-time particulate air monitors (e.g., DustTraks or equivalent) equipped with PM10 (particulate matter smaller than 10 microns in diameter) detectors will be used to monitor dust particulate levels throughout the duration of the RV, specifically during the excavation of contaminated soil. The monitors will be operated each workday to measure PM10 concentrations in real time.

Up to four air monitoring stations will be located around the Site perimeter at each park; one upwind station, and up to three downwind stations.

The monitors are calibrated by the equipment manufacturer prior to being used at the Site. When the monitors are turned on daily, the instrument is self-calibrating. Once turned on, the monitors record dust concentrations on a 15-minute time-weighted average (TWA).

Meteorological data will be obtained from Weather Underground (<http://www.wunderground.com/>) and recorded daily in the Site logbook.

Meteorological monitoring will be conducted using a meteorological system to measure wind speed, wind direction, and temperature. The meteorological sensors will be positioned to provide for representative readings relative to the Site. Meteorological readings will be recorded on a data logging device in the on-site files and will be available for review. Readings will be evaluated at least three times per day (i.e., once in the early morning, once in the mid-afternoon, and once in the late afternoon) by START V to determine the upwind and downwind boundaries of the Site.

Perimeter air monitoring will consist of continuous real-time air quality monitoring and data collection. Monitoring locations will be selected by the EPA OSC and will include locations in the vicinity of residences adjacent to work activities at the Site. The monitoring stations will be linked via a wireless network-based communications system, which will provide instantaneous real-time air quality readings through a computer server. The air monitoring data generated will help to determine if dust levels have exceeded the Site-Specific Action Level and to ensure the effectiveness of engineering controls (i.e., dust suppression). Although air monitoring data from each monitoring station is automatically being stored real-time in the computer server, the air monitoring data will be downloaded from each DustTrak unit to a field computer or electronic data storage device at the end of each workday.

Table 2-1: Air Monitoring Specifications

Direct Reading Instrumentation	Monitoring Locations	Monitored Parameters
DustTraks	<ul style="list-style-type: none"> Perimeter monitoring Workspace monitoring 	Total PM ₁₀ Particulates

2.2 Basis for Establishing the Air Monitoring Action Level

The community air monitoring program at the Site consists of a combination of perimeter and community monitoring for particulates (dust). In accordance with EPA National Ambient Air Quality Standards (NAAQS), the particulate Action Level measured by the PM₁₀ concentration at Sonny Vereen Playground was 13.04 milligrams per cubic meter (mg/m³) [13,040 micrograms per cubic meter (µg/m³)]. The particulate Action Level measured by the PM₁₀ concentration at Breunig Avenue Park was 49.67 mg/m³ (49,670 µg/m³). This was calculated using the following equation, which calculates a corresponding PM₁₀ Action Level for contaminated dust for worker exposure limit based on the Occupational Safety and Health Administration (OSHA) Action Level and contaminant concentration on Site (at zero to six inches below grade, the maximum depth of disturbance), then dividing the result by a safety factor. One day of background dust monitoring and air sampling will be completed prior to the start of work onsite.

$$\text{PM}_{10} \text{ Action Level (mg/m}^3\text{)} = \frac{(10^6 \text{ mg/kg})(\text{OSHA Action Level, mg/m}^3\text{)}}{(\text{Concentration, mg/kg})(\text{Safety Factor})}$$

Where: 10⁶ mg/kg = Conversion Factor

OSHA Action Level for Lead = 0.03 mg/m³ (8-hour TWA)

Concentration = highest concentration detected at the Site (1150 mg/kg at Sonny Vereen Playground and 302 mg/kg at Breunig Avenue Park)

Safety Factor = degree of confidence of concentration, 1 being very confident and 10 being not confident

$$\text{Sonny Vereen Playground PM}_{10} \text{ Action Level} = \frac{(10^6 \text{ mg/kg})(0.03 \text{ mg/m}^3\text{)}}{(1,150 \text{ mg/kg})(2)}$$

$$= 13.04 \text{ mg/m}^3 \text{ (13,040 } \mu\text{g/m}^3\text{)}$$

$$\text{Breunig Avenue Park PM}_{10} \text{ Action Level} = \frac{(10^6 \text{ mg/kg})(0.03 \text{ mg/m}^3\text{)}}{(302 \text{ mg/kg})(2)}$$

$$= 49.67 \text{ mg/m}^3 \text{ (49,670 } \mu\text{g/m}^3\text{)}$$

The calculated Action Level assumes that the Site contaminant (lead) will be present in airborne dust at the highest concentration detected in Site soils (1,150 mg/kg at Sonny Vereen Playground and 302 mg/kg at Breunig Avenue Park). Although 13.04 mg/m³ for Sonny Vereen Playground and 49.67 mg/m³ for Breunig Avenue Park would be acceptable Site-Specific particulate Action Levels for lead, 0.100 mg/m³ (100 µg/m³), 15 minute average over background level, with a maximum of 0.150 mg/m³ (150 µg/m³) 15 minute average will be adopted as the Site-Specific particulate Action

Level based on the NAAQS for PM₁₀. See Table 2-2 for the air monitoring Action Levels for particulates at the Site.

Table 2-2: Community Air Monitoring Action Level for Particulates (Direct Reading Instrumentation)

Parameter	Monitoring Locations and Interval	Action Level (Above Upwind)	Response Activity
Dust (PM ₁₀)	Perimeter and community monitoring locations with dust readings every 60 seconds, calculate 15-minute average during RV activities.	< 100 µg/ m ³	<ul style="list-style-type: none">• Continue monitoring.
		≥ 100 µg/m ³	<ul style="list-style-type: none">• Continue monitoring.• Begin dust suppression measures.• Notify field crew that early warning alert level has been reached.
		≥ 150 µg/m ³	<ul style="list-style-type: none">• Cease activities; re-evaluate dust suppression measures.• Analyze collected air samples for lead.

2.3 Non-working Hours

No release of contaminants above background level is anticipated during non-working hours, therefore, no monitoring will be conducted during that time period.

2.4 Equipment Maintenance and Calibration

All air monitoring equipment will be maintained in accordance with applicable manufacturer recommendations. All pertinent data will be logged in a health and safety logbook (or equivalent) and maintained on site for the duration of site activities. All direct-reading instrumentation will be calibrated in accordance with the manufacturer's instructions.

2.5 Engineering Controls

Dust suppression measures, utilizing a water mist, will be the primary engineering control used during all site intrusive activities. It will be implemented as necessary to prevent the generation of dust during excavation activities.

Measures for airborne particulate control may include, but are not limited to, the following items:

- Apply water mist to point of dust generation.
- Apply water to exposed soil.
- Cover staged soil piles with polyethylene sheeting or other appropriate material.
- Reduce surface area of exposed material area.
- Containerize and cover material.
- Modify the pre-demolition/demolition or debris handling methods.
- Modify the rate soil excavation activities or specific methods.

Continued exceedances of the particulate control levels may result in work stoppage (as determined by the OSC) until such time that the contractor has demonstrated an ability to consistently conduct the work without exceeding the action levels.

3. AIR SAMPLING

3.1 Air Sampling Procedures

In addition to real-time dust monitoring, periodic air sampling will be conducted at each station during ground intrusive activities or at the direction of the OSC. Low flow air sampling pumps (Gilian GilAir® programmable pumps, or equivalent [low flow]) will be used for air sample collection. Air samples will be collected in accordance with the National Institute of Occupational Safety and Health (NIOSH) Method 7300 for lead.

Air samples will be collected using air sampling media (0.8 micrometer [μm], mixed cellulose ester [MCE] filters, or 5.0- μm , polyvinyl chloride [PVC] membrane filters) connected to the GilAir pumps via Teflon® tubing. The sampling pumps will be calibrated to collect the target volume (greater than 500 liters) at flow rates between 1.0 and 4.0 liters per minute (L/min) for a period of eight hours or the duration of the Site activities.

Air samples will be collected from perimeter air monitoring locations upon initiation of intrusive activities (excavation) and periodically as needed depending on changes in Site conditions, expected elevated contaminant concentrations in soils being excavated, and if analytical results of previous air samples indicate there is a need for further sampling. The samples will be submitted to the assigned laboratory for lead analysis after collection. The samples will be analyzed in accordance with NIOSH Method 7300 for lead.

Table 3-1: NIOSH Sampling Procedures

Analyte	Sampling Method	Sampling Media	Recommended Flow Rate (Liters per Minute)*	Total Volume	Site-Specific Action Level
Lead	NIOSH Method 7300	MCE Filters (0.8- μm , cellulose ester membrane, or 5.0- μm , polyvinyl chloride membrane)	1.0 to 4.0 L/min	> 500 Liters	30 $\mu\text{g}/\text{m}^3$

Notes: Actual flow rates will be determined in the field based on prevailing Site conditions. Air sampling activities may be cancelled for the day if high humidity conditions and precipitation events occur.

3.2 Basis for Establishing Air Sampling Action Level

The NIOSH Recommended Exposure Limit (REL) for lead in air is 50 $\mu\text{g}/\text{m}^3$ measured over an 8-hour TWA; the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) for lead in air is also no greater than 50 $\mu\text{g}/\text{m}^3$ averaged over an 8-hour period; and the OSHA Action Level for lead in air is 30 $\mu\text{g}/\text{m}^3$. This Action Level will be adopted as the Site-Specific Action Level. For effective implementation of engineering controls, all air sampling results will be compared with the Site-Specific Action Level. Preliminary analytical results of air samples will be provided on a three day turnaround time basis, and validated analytical results of air samples will be provided on a standard turnaround time basis, unless otherwise specified by the EPA OSC.

If analytical results of air samples indicate that the Site-Specific Risk-Based Action Levels were exceeded, the cause of the exceedance will be investigated, and appropriate corrective actions will

be implemented immediately. An evaluation of other engineering control options, additional off-site air monitoring/sampling and a reduction in daily work hours will be considered. See Table 3-2 for the Action Level established for the RV at the Site.

Table 3-2: Community Air Sampling Action Level

Parameter	Sampling Interval and Locations	Action Level (Above Background)	Response Activity
Lead Dust	Upon excavation and backfilling activities and periodically; at perimeter and community monitoring locations	$< 30 \mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> Continue monitoring PM₁₀.
		$\geq 30 \mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> Continue monitoring. Begin dust continuous dust suppression measures throughout all site work activities. Notify field crew that early warning alert level has been reached.
		$\geq 50 \mu\text{g}/\text{m}^3$	<ul style="list-style-type: none"> Cease activities; investigate cause. Re-evaluate dust suppression measures. Consider additional off-site air monitoring/sampling. Evaluate site conditions for other engineering control options.

3.3 Non-working Hours

No release of contaminants above background level is anticipated during non-working hours, therefore, no air sampling will be conducted during that time period.

4. REPORTING OF AIR MONITORING AND SAMPLING RESULTS

4.1 Community Notification Procedures

The specific community notification procedures will be at the discretion of the EPA OSC. The exact notification procedures will be developed based on the most feasible means of getting information to the surrounding community in an effective, useful, and timely manner.

4.2 On-Site Reporting Procedures

The Site Health and Safety representative will maintain a sample log and report airborne levels on a daily basis to the EPA OSC. Elevated results (above Site-Specific Action Level) will be reported immediately to the EPA OSC so that appropriate engineering controls can be implemented to reduce airborne levels.

4.3 Reporting Procedures for Site Employees

Where personal sampling for on-site workers is performed, the Contractor will be responsible for informing employees and subcontractors of their monitoring results to comply with OSHA regulations and good occupational health practices. Within five working days after the receipt of

monitoring results, the Contractor will notify each employee of the results representing that employee's level of exposure.

Whenever the results indicate that employee exposure exceeds the OSHA PEL, notification shall be provided to the affected employee stating that the OSHA PEL was exceeded and providing a description of the corrective action taken to reduce exposures to a level below the OSHA PEL.

4.4 Reporting Procedures for the Analytical Laboratory

Chain-of-custody (COC) procedures will be followed during sample handling and transport to the assigned laboratory. Areas sampled, tasks performed, duration, volumes, and laboratory results will be provided in a letter report format within three days of receiving the sample analysis results. Sampling and analysis will be performed in accordance with the appropriate NIOSH method under the direction of the EPA OSC.

4.5 Data Review and Interpretation

The general public will be able to review the preliminary captured data for the Site on a weekly basis based upon the EPA OSC's authorization for release of the information. The final validated air sampling data will be included in a final report for public release. Monitoring records will be maintained on site.

Attachment A
Figures


Figure 1: Sonny Vereen Park Air Monitoring Air Station Locations
Figure 2: Breunig Avenue Park Air Monitoring Air Station Locations



SCALE

1:600

LEGEND

 Air Monitoring Stations



Sonny Vereen Park Air Monitoring Station Locations

**Historic Potteries
Trenton, New Jersey**

**UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY
SUPERFUND TECHNICAL ASSESSMENT
& RESPONSE TEAM V
CONTRACT # 68HE0319D0004**

**Weston Solutions, Inc.
Federal East Division**

In Association With
Eco-Risk, Avatar Environmental, LLC,
Pro-West & Associates, Inc.,
On-Site Environmental, Inc.,
Sovereign Consulting, Inc.,
and TechLaw Consultants, Inc.

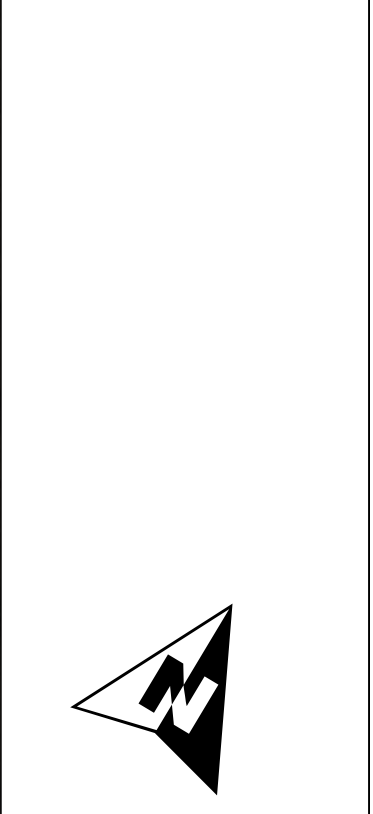
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CHARGE #:	40200.051.930.5170





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1:360

LEGEND
 Air Monitoring Stations



Breunig Avenue Park Air Monitoring Station Locations

**Historic Potteries
Trenton, New Jersey**

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY
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GIS ANALYST:	A. PETROSH
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Attachment B

NIOSH Analytical Method 7300

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	ytrium
	barium	copper	manganese*	selenium	thallium	zinc
	beryllium*	iron	molybdenum*	silver	titanium	zirconium*
	cadmium	lead*				

*Some compounds of these elements require special sample treatment.

SAMPLING		MEASUREMENT	
SAMPLER:	FILTER (0.8-µm, cellulose ester membrane, or 5.0-µm, polyvinyl chloride membrane)	TECHNIQUE:	INDUCTIVELY COUPLED ARGON PLASMA, ATOMIC EMISSION SPECTROSCOPY (ICP-AES)
FLOWRATE:	1 to 4 L/min	ANALYTE:	elements above
VOL-MIN:	Table 1	ASHING	
-MAX:	Table 1	REAGENTS:	conc. HNO ₃ / conc. HClO ₄ (4:1), 5 mL; 2mL increments added as needed
SHIPMENT:	routine	CONDITIONS:	room temperature, 30 min; 150 °C to near dryness
SAMPLE		FINAL	
STABILITY:	stable	SOLUTION:	4% HNO ₃ , 1% HClO ₄ , 25 mL
BLANKS:	2 to 10 field blanks per set	WAVELENGTH:	depends upon element; Table 3
ACCURACY		BACKGROUND	
		CORRECTION:	spectral wavelength shift
RANGE STUDIED:	not determined	CALIBRATION:	elements in 4% HNO ₃ , 1% HClO ₄
BIAS:	not determined	RANGE:	varies with element [1]
OVERALL PRECISION (\hat{S}_{π}):	not determined	ESTIMATED LOD:	Tables 3 and 4
ACCURACY:	not determined	PRECISION (\hat{S}):	Tables 3 and 4

APPLICABILITY: The working range of this method is 0.005 to 2.0 mg/m³ 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 (HNO₃), conc., ultra pure.
2. Perchloric acid (HClO₄), conc., ultra pure.*
3. Ashing acid: 4:1 (v/v) HNO₃:HClO₄. Mix 4 volumes conc. HNO₃ with 1 volume conc. HClO₄.
4. Calibration stock solutions, 1000 µg/mL. Commercially available, or prepared per instrument manufacturer's recommendation (see step 12).
5. Dilution acid, 4% HNO₃, 1% HClO₄. 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% HNO₃/1% HClO₄:

- 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, Ti, 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/m³), of each element in the air volume sampled, V (L):

$$C = \frac{C_s V_s - C_b V_b}{V}, \text{mg} / \text{m}^3$$

NOTE: µg/L ≡ mg/m³

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.
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METHOD REVISED BY:

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TABLE 1. PROPERTIES AND SAMPLING VOLUMES

Element (Symbol)	Properties		Air Volume, L @ OSHA PEL	
	Atomic Weight	MP, °C	MIN	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/m ³ (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	YW2400000	--	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.