

Appendix L

Air Monitoring Plan



Environment

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January 2010

Air Monitoring Plan Readville 5-Yard Remediation Project Release Tracking Number 3-2856

**Massachusetts Bay Transportation Authority
Readville 5-Yard Facility
Industrial Drive
Dedham & Readville, Massachusetts**



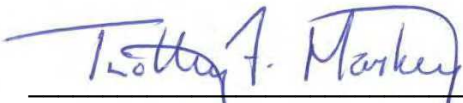
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List of Acronyms and Abbreviations

AAC	Acceptable Ambient Concentration
COC	Contaminant of Concern
GC	Gas chromatograph
GC/MS	Gas chromatography with mass spectrometry
HASP	Health and Safety Plan
HI	Hazard Index (Noncancer)
ICP	Inductively Coupled Plasma
L/min	Liters per minute
MassDEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan (310 CMR 40.0000)
mg/m ³	Milligrams per cubic meter
NIOSH	National Institute for Occupational Safety and Health
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PID	Photo-ionization detector
ppm	Parts per million, by volume
RI	Risk Index (Cancer)
RTN	Release Tracking Number
SOP	Standard operating procedure
tVOCs	Total volatile organic compounds
THI	Total Hazard Index (Noncancer)
TRI	Total Risk Index (Cancer)
ug/m ³	Micrograms per cubic meter
USEPA	United States Environmental Protection Agency
VOCs	Volatile organic compounds

1.0 Introduction

On behalf of Massachusetts Bay Transportation Authority (MBTA) of Boston, Massachusetts, AECOM is conducting a remediation program at the Readville 5 Yard facility (“the Site”) located on Industrial Drive at the border between Dedham and Boston, Massachusetts. The Site is a 42-acre property that, for the purposes of site investigation and risk characterization purposes, was divided into four separate potential exposure areas (Areas 1 through 4) based primarily on historical use, types and concentrations of contaminants, and existing zoning and access. Under the Massachusetts Contingency Plan (310 CMR 40.0000 – the MCP) the Site is identified by the Massachusetts Department of Environmental Protection (MassDEP) as Release Tracking Number (RTN) 3-2856. Construction activities associated with the remediation of the Site to be performed under Phase IV of the MCP have the potential to generate fugitive emissions of Volatile Organic Compounds (VOCs) and particulates. The MBTA has developed an air monitoring and controls component into the remediation program to minimize the potential impact of these emissions. This document outlines the monitoring activities to be implemented during the remediation.

Section 2 presents the methods for field screening and constituent-specific sampling/analysis.

Section 3 presents the procedures for evaluating results and ensuring that the data is appropriate to accurately characterize ambient air quality.

Section 4 describes how the monitoring and mitigation activities will be reported.

Section 5 provides references and citations.

Changes to the plan will be documented using the Amendment Form presented in Attachment A. The remaining appendices provide the development of site-specific acceptable Acceptable Ambient Concentrations (AACs) for the primary contaminants at the Site (Attachment B), and the development of total particulate Action Levels with comparison of the maximum predicted air concentrations with the AACs (Attachment C).

2.0 Monitoring Activities

AECOM is overseeing the remediation of the Site to remove certain soil stockpiles and heavily impacted soil in order to insure that the concentrations in soil do not exceed the respective risk-based commercial/industrial worker standards derived for the Site, to achieve a permanent solution pursuant to the MCP. Soil stockpile and heavily contaminated soil removal activities are expected to be conducted for approximately 6 months starting in August 2011, as described in the Phase III and Revised Phase IV Remedy Implementation Plan for the Site (AECOM, 2009).

The contaminants of concern (COCs) encountered in the Site are well understood, based on the Supplemental Phase II Comprehensive Site Assessment (AECOM, 2009) conducted at the Site. The primary COCs include metals (primarily lead and arsenic), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and petroleum hydrocarbons. These constituents may contribute to fugitive emissions during the proposed remedial activities. Significant levels of petroleum hydrocarbons are not expected to volatilize into the ambient air and be present in the gaseous state. The heavier constituents, such as metals, PCBs, and PAHs are typically associated with entrained particulate matter.

The Site is abutted by residential properties to the north and west and by industrial properties to the south and east.

Fugitive dust from the excavation of soil may contain COCs, including lead and arsenic. A summary of the site-specific, risk-based AAC developed for the project is provided in Attachment B. The AACs were developed for both carcinogenic and non-carcinogenic compounds using MassDEP and USEPA risk assessment guidance and assumptions. In accordance with the MCP (310 CMR 40.0980 – Method 2 Risk Characterization), the carcinogenic values were calculated based on a 10^{-6} excess cancer risk and non-carcinogenic values were based on 0.2 of the noncancer toxicity information (Reference Dose and Reference Concentration) obtained from the MassDEP Risk Assessment Short Forms (MassDEP, 2008). The carcinogenic and non-carcinogenic values were calculated for a resident between the ages of 2 and 3 years since this is the most sensitive residential receptor and has the highest ventilation rate per body weight for age groups typically evaluated for a residential exposure (1-31 years of age), and since the duration of the planned remediation activities at the Site is anticipated to be only 182 days. The AACs were generally based on the lesser of the carcinogenic/non-carcinogenic values for each compound. Consideration was given to applicable National Ambient Air Quality Standards (NAAQS).

Monitoring activities will be conducted once soil excavation begins and throughout the program to: evaluate Site conditions; ensure that the measures used to control potential fugitive emissions are effective; and to document ambient air quality/conditions in the immediate vicinity of the Site. An overview of the monitoring approach is provided in Figure 1. As indicated in Figure 1, the integrated approach consists of the following components:

- Monitoring – conducted using real-time screening techniques and constituent-specific methods that are appropriate for the COC;
- On-going Data Evaluation – review of constituent-specific results collected throughout the program in comparison with the site-specific action levels measured during screening; and

- Quality Assurance – specific procedures performed to ensure the validity of the data and associated conclusions related to Site conditions.

The specific monitoring activities proposed for the program are summarized in Table 2-1 and detailed below.

2.1 Real-time monitoring

The real-time monitoring program is designed to promptly identify instances when emission controls should be implemented to prevent significant off-Site emission events. Real-time measurements for particulate matter will be conducted on an hourly basis throughout the work periods at a series of four monitoring stations around the perimeter of the primary remediation areas at the Site, once soil excavation begins. The location and number of monitoring points will be adjusted, as required, throughout the program to evaluate potential emissions from specific Site activities/areas. Typical locations for characterizing potential emissions from Site activities are illustrated in Figure 2.

The results from these measurements will be compared to a set of site-specific “action levels,” i.e., the concentration/level at which additional control measures are required to ensure that Site conditions will not pose a potential health risk. The site-specific action levels are discussed in the following sections, with a summary of their derivation provided in Attachment B (AACs) and Attachment C (total particulates).

AECOM will install a meteorological station at the Site to track wind conditions and precipitation. Field notes regarding sampling activities will be documented in project notebooks and field sampling data sheets, and transferred into computer spreadsheets. Monitoring data generated on-site, including field notebooks and data sheets, will be filed and maintained on-site. Subsequent to field activities, the field data will be transferred to the office project files.

2.1.1 Particulate Matter

An aerosol meter will be used to provide screening results for ambient concentrations of dust. As indicated in Attachment C, a total particulate matter Action Level of 150 micrograms per cubic meter (ug/m^3) is proposed for use during the program. As above, fugitive emission controls will be instituted if particulate levels at downwind locations are determined to be greater than the action level for periods longer than 30 minutes at the fence line of the Site.

AECOM calculated a site-specific, cumulative risk-based particulate matter at particle sizes less than 10 microns level (PM_{10}) (see Attachment C, Table C-1) and compared that to the NAAQS for total particulate matter, which is $150 \text{ ug}/\text{m}^3$ for a 24-hour averaging time. As discussed previously in Section 2, the site-specific, cumulative risk-based PM_{10} was calculated for a resident between the ages of 2 and 3 years since this is the most sensitive residential receptor and has the highest ventilation rate per body weight for age groups typically evaluated for a residential exposure (1-31 years of age), and since the duration of the planned remediation activities at the Site is anticipated to be only 182 days. AECOM determined that an Action Level of $150 \text{ ug}/\text{m}^3$ results in a condition of No Significant Risk, as defined by the MCP (see Attachment C). This level is the same as the NAAQS for PM_{10} of $150 \text{ ug}/\text{m}^3$ for a 24-hour averaging time and is adequately protective of Site COCs present in soil at the Site using a cumulative risk approach. It is expected that the maximum predicted air concentrations resulting from this Action Level will not exceed the site-specific, risk-based AACs developed for the project (Attachment B) as demonstrated in Table C-2 in Attachment C.

Table 2-1 Summary of Air Monitoring Activities

	Sampling Activity	Parameter	Analysis Method/ Instrument	Timing	Results	Additional Actions	Section
Field Sampling	Real-Time Monitoring	Dust	Mini-Ram or Aerosol Meter	Hourly at perimeter locations. If elevated results are identified, efforts will focus on the fence line location closest to the workplace occurrence.	Record on appropriate log sheet.	If $PM_{10} > 0.150 \text{ mg/m}^3$ for sustained period (30 minutes) institute engineering controls.	2.1.2
	Constituent-Specific Sampling	Lead Arsenic	High Volume Sampling for Particulate with subsequent analysis of the collected particulate by ICP. 24-hour turnaround.	Four fence line locations sampled 8-10 hour periods each location. Samples collected daily during initial month of program. Frequency may be revised based on results. Minimum of one sampling period/week. One prioritized sample analyzed for each day. Prioritization based on field screening and/or meteorological data from that period. Laboratory analysis with 24-hour turnaround time.	Record on appropriate log sheet.	Use results to calculate HI or RI for each COC daily $HI \text{ or } RI = \frac{\text{measured concentration}}{AAC}$ Site action levels and/or engineering responses will be reviewed/modified if the THI or TRI exceeds 1.0.	3.3.2

Note: HI –Hazard Index, RI – Risk Index, THI – Total Hazard Index, TRI – Total Risk Index, ICP – Inductively Coupled Plasma, AAC – Acceptable Ambient Concentration

2.2 Constituent-Specific Sampling and Analysis

Additional, constituent-specific samples will be collected to verify that the action levels established to correspond with acceptable risk levels developed based upon project and construction assumptions (Attachment C) and associated responses to exceedances are effective and protective of off-site receptors. The purpose of this constituent-specific analysis is to provide additional assurances and protection beyond the scope and capabilities of real-time monitoring.

During the first two weeks of field activities, samples will be collected on a daily basis at all fence line locations (typical breathing zone height). The frequency of collection and analysis of samples will be reviewed and may be revised once the initial results are evaluated. A minimum frequency of one sampling period per week will be used for the program. Sampling for the principal constituents of interest (lead and arsenic) will be conducted in accordance with the procedures outlined below.

2.2.1 Metals

Potential exposure to the primary metals of interest (lead and arsenic) is associated with airborne particles to which the metals are entrained, which may be raised by Site activities related to Site soils including excavation, on-site transportation and soil stockpiling.

Ambient concentrations of dust will be characterized using an USEPA High Volume Method for the "Determination of Suspended Particulate Matter in the Atmosphere" (40 CFR 50, Attachment B). Samples will be collected at a flow rate of approximately 1.5 cubic meters per minute (m^3/min) using a glass fiber filter. Collected samples will be returned to the laboratory where they will be analyzed gravimetrically. The filters will then be extracted and analyzed for lead and arsenic using inductively coupled plasma (ICP).

2.2.2 Polycyclic Aromatic Hydrocarbons

Airborne particles to which the PAHs are entrained may be generated by Site activities related to certain existing Stockpile Hot Spot Areas including excavation, on-site transportation and soil stockpiling. Ambient concentrations of PAHs will not be quantitatively characterized during activities that disturb the Stockpile Hot Spot Areas with elevated PAHs since the primary COCs at the Site are lead and arsenic and it is felt that monitoring for these metals will be protective of other Site COCs.

2.2.3 Polychlorinated Biphenyls

Airborne particles to which the PCBs are entrained may be generated by Site activities related to certain existing Soil Stockpile areas including excavation, on-site transportation and soil stockpiling. Ambient concentrations of PCBs will not be quantitatively characterized during activities that disturb the Stockpile Areas with elevated PCBs since the primary COCs at the Site are lead and arsenic and it is felt that monitoring for these metals will be protective of other Site COCs.

2.2.4 Prioritization of Samples for Analysis

As noted above, the air monitoring effort will result in the collection of a significant amount of data. Since these data can aid in Site management decisions, it will be necessary to expedite the analysis of selected samples to facilitate the timely evaluation of Site conditions. Therefore, the results of the real-time monitoring data will be used to prioritize certain "worst case" samples from at least one monitoring location per sampling period for expedited analysis (24-hour turnaround). The real-time data will be reviewed to identify the location exhibiting the highest concentrations of dust. In the event that the real-time monitoring results do not clearly identify a location, information from an on-site monitoring station will be used to identify the predominantly downwind location. The data from the prioritized sample(s) will

be reviewed using the procedures detailed in Section 3.2.2 to provide an on-going screening evaluation of Site emissions.

The remaining samples will be stored in the laboratory sample bank and analyzed within a 30-day maximum holding time. The data from the prioritized sample from each sampling round will be reviewed in concert with the real-time data to provide an on-going screening evaluation of Site emissions. The Site emissions data will be evaluated as discussed further in Section 3.2 to assure protection of human health. The air sample laboratory results will be evaluated and the Site Action Levels and/or engineering response to Action Level exceedances (e.g., adjustment of work conditions) will be modified to ensure continued compliance.

3.0 Quality Assurance

The program will include several activities designed to ensure that the proper list of analytes are being evaluated; and that the Site action levels, as well as the associated responses to exceedances, are appropriate and protective.

3.1 Sampling and Analysis

General Quality Assurance/Quality Control (QA/QC) procedures related to the collection and analysis of representative field samples are discussed in the following sections.

3.1.1 Calibration

3.1.1.1 Real-Time Monitoring

All instrumentation associated with field screening activities will be calibrated on a daily basis in accordance with the manufacturers' instructions using either commercially available standards, or internal calibration points. Specific calibration checks will be conducted at the start and conclusion of daily remediation activities.

3.1.1.2 Constituent-Specific Monitoring

The high volume samplers will be calibrated in accordance with manufacturers' instructions and the requirements of the method. The flow rate of the sampling pumps will be calibrated daily prior to, and at the completion of each sampling run. In the event that the post-sampling measurements differ from the initial calibrations by more than 10 %, the lower of the measured flow rates will be used in determining the total sample volume, as this will result in a more conservative concentration result. In these instances, the sampler will be recalibrated prior to being put back into service.

3.1.2 Field Quality Control Samples

The following field QC samples will be used to facilitate the evaluation of the precision and accuracy of the results from laboratory samples:

- Field Blank – filters that will be shipped to the field, exposed to ambient conditions for an 8 to 10-hr. period (without drawing air through the sampler) and returned to the laboratory for analysis. Field blanks will be collected at a frequency of 1/week during sampling periods.
- Field duplicate samples - two sets of samples will be collected from a single location and analyzed by the laboratory. Each sample will be labeled with a unique sample number, and both will be submitted to the laboratory for the appropriate analyses. Field duplicate samples will be collected at a frequency of one in 20 samples.

3.1.3 Sample Custody

All samples collected in the field will be labeled and kept in a secure location until ready for shipment to the laboratory. Prior to shipment, a Chain of Custody form will be completed for each batch of samples. The Chain of Custody form will include information such as project name, project number, sampler's name, sampling date, reporting address, sample contact, laboratory and contact information, sample identifications, sample matrix, analysis required, and special instructions or comments. The completed

Chain of Custody will be signed and timed/dated before the samples are shipped or picked up by the lab. A copy of the Chain of Custody will be retained for the project file. The samples will either be picked up by a laboratory courier, hand delivered, or will be shipped to the laboratory via overnight courier services for next day delivery. A designated staff member will be responsible for proper shipment of the samples and completing the necessary documentation.

Laboratory personnel will sign and date the Chain of Custody form in acknowledgement of receipt and comment, as necessary to document the sample conditions upon receiving each batch of samples. The laboratory will also assign a case number or unique sample identification number to each sample, and will retain one copy of the completed Chain of Custody for its records.

3.1.4 Laboratory Analysis

Sample analysis will be conducted in strict accordance with the requirements of the USEPA methods. As discussed previously, prioritized air samples will be submitted to a certified laboratory for 24-hour turnaround analysis of the air samples. A 30-day holding time will be imposed for the analysis of metals air samples.

3.2 Evaluation of Site Emissions

Control of Site emissions to assure protection of human health is an important aspect of the remedial design. In particular, AECOM will:

- Compare real-time screening results on an on-going basis to site-specific action levels developed for this Site (Table 2-1).
- Review results of constituent-specific monitoring sample laboratory results to developed site-specific action levels established to correspond with acceptable risk levels developed based upon project and construction assumptions (Attachment B, Acceptable Ambient Concentrations) on an on-going basis.
- Manage day-to-day operations during the cleanup to assure that the project meets these action levels.

MBTA has established appropriate AACs for each COC (Attachment B), and will use two metrics/standards to demonstrate protection of human health:

- Hazard Index (HI) – The HI will be calculated for the principal COCs by dividing the constituent concentration by the appropriate risk-based criteria for non-carcinogens (RBC_{NC}). The sum of the hazard indices for all non-carcinogenic constituents is defined as the Total Hazard Index (THI). A THI value less than 1 indicates that the combined effect of the COCs is not likely to pose a significant health risk.
- Risk Index (RI) – The RI will be calculated for the principal COCs by dividing the predicted concentration by the appropriate risk-based criteria associated with a 10^{-5} excess cancer risk (RBC_C). The sum of the risk indices for all carcinogenic constituents is defined as the Total Risk Index (TRI). A TRI value less than 1 indicates that the combined effect of the COCs is not likely to pose an excess cancer risk greater than 1×10^{-5} .

The Site will be managed to a THI and TRI of 1.0, or less. The indices will be recorded on the Site data log on a daily basis. If the results indicate a maximum index value is being approached, the Site Action Levels and/or engineering response to Action Level exceedances (e.g., adjustment of work conditions) will be modified to ensure continued compliance.

4.0 Reporting

The monitoring results will be summarized as noted below. Ultimately, the results of the air monitoring work will be provided in the Phase IV Status Reports and the appropriate post-remediation MCP report.

4.1 Real-Time Screening Results

Daily information collected at each air monitoring station will be recorded on a field sheet designated for that location. The information will be supplemented with notations of any exceedances of action levels and associated control responses. A summary report detailing the average and maximum values recorded during the program to date will be developed on a weekly basis. This report will be available at the Site.

4.2 Constituent-Specific Results

The results from the laboratory analyses will be reviewed by an AECOM Air Quality specialist for comparison to AACs, and then attached to the daily report corresponding with the sampling date and air monitoring station.

5.0 References

AECOM, 2009. Supplemental Phase II/III and Revised Phase IV Remedy Implementation Plan; MBYTA Readville 5-Yard Site, Industrial Drive, Readville and Dedham, Massachusetts. AECOM Environment.

MADEP, 2008. Massachusetts Contingency Plan (MCP) Numerical Standards Spreadsheets. MCP Toxicity. May 2009. <http://www.mass.gov/dep/service/compliance/riskasmt.htm#site>.

USEPA. 1989. Risk Assessment Guidance for Superfund, Volume 1. Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response, Washington, DC. EPA 540/1-89/002.