Long-term Monitoring and Maintenance Implementation Plan

New Keith Middle School Property
225 Hathaway Boulevard
New Bedford, Massachusetts

October 20, 2006
Revision 4.0

Prepared for:

City of New Bedford
New Bedford Public Schools
133 William Street
New Bedford, MA 02740

Prepared by:

BETA Group, Inc.
Engineers • Scientists • Planners
315 Norwood Park South, Norwood, MA 02062 781.255.1982 fax: 781.255.1974
6 Blackstone Valley Place, Lincoln, RI 02865 401.333.2382 fax: 401.333.9225
email: BETA@BETA-eng.com

Long-term Monitoring and Maintenance Implementation Plan

New Keith Middle School
225 Hathaway Boulevard
New Bedford, MA 02740

Prepared for: City of New Bedford
133 William Street
New Bedford, MA 02740

Prepared by: BETA Group, Inc.
315 Norwood Park South
Norwood, MA 02062

Senior Project Manager: _____
David G. Billo, LSP

Associate: _____
Alan D. Hanscom, P.E., LSP
Licensed Site Professional No. 2152

October 20, 2006
Revision 4.0

1.0 Introduction

This Long-term Monitoring and Maintenance Implementation Plan (MMIP) will be implemented by the City of New Bedford (the City) to provide long term monitoring and maintenance of the exposure management barrier, groundwater, wetland sediment, vent gas, and indoor air quality of the new Keith Middle School site located at 225 Hathaway Boulevard in New Bedford, Massachusetts (the Site). The MMIP also provides a description of the maintenance activities to be performed at the Site to prevent exposure to the impacted fill layer located beneath an exposure management barrier. This MMIP has been prepared in accordance with the requirements found in the August 31, 2005 "Approval for Risk-Based PCB Cleanup and Disposal under 40 CFR §761.61(c)" letter issued by the U.S. Environmental Protection Agency (EPA) to the City of New Bedford (Attached in Appendix A).

1.1 Background

BETA performed a comprehensive review of the fate and transport characteristics of the contaminants of concern at the Site as part of the assessment of corrective actions. The contaminants of concern are polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and heavy metals (primarily lead and barium). The contaminants were ranked according to their tendency to solubilize in water, volatilize, and desorb from soil particles. The majority of the contaminants are only slightly soluble, very slightly volatile or non-volatile, and slightly or hardly mobile or immobile. This indicates that these contaminants have a very low migration potential, and that installation of an exposure management barrier is an appropriate response action to manage risk at the Site.

The results of a soil gas sampling event performed in 2002 under the location of the new Keith Middle School building were evaluated for potential adverse impacts to indoor air, assuming that no vapor barrier was installed. The conclusion was that *no significant risk* to human health is posed by the measured soil gas concentrations. Nevertheless, the City and the School Department decided to install a gas and liquid impermeable vapor barrier on top of the Site soil beneath the school building concrete floor as an added layer of protection against intrusion of any gases that may accumulate under the building. Passive ventilation has been installed to allow any sub-slab soil gases to migrate from beneath the vapor barrier to vent stacks installed through the school building roof.

Given the fate and transport characteristics of the contaminants of concern, it is not likely that either indoor air or groundwater will be adversely impacted at the Site. However, considering the potential receptors include children who could potentially be exposed for an extended period of time, the activities described in this MMIP will be implemented.

The scope of work for the collection and analysis of environmental samples presented in this MMIP shall serve, at a minimum, to provide a baseline assessment of environmental and human exposure at the Site. The collection and review of Site data over time may result in a conclusion by the City of New Bedford that a revised MMIP is warranted. Such revisions may include: modification in the frequency of sample collection, modification of the number or types of analyses performed, or changes in the locations of sample collection. Upon reaching

such a conclusion, the City may submit a revision to the MMIP for review and approval by EPA. The City will not implement such revised MMIP without written authorization by EPA.

The collection of the groundwater, indoor air, vent stack emissions, and sediment samples described in this MMIP will be performed by knowledgeable and experienced environmental scientist(s) or engineer(s) and under the direction of a Massachusetts Licensed Site Professional (LSP). The analyses of these samples will be performed by a Massachusetts certified analytical laboratory.

2.0 Indoor Air Monitoring

2.1 Air Sampling Procedures

Indoor air monitoring will be performed as part of the MMIP for the new Keith Middle School. The purpose of the indoor air monitoring is to determine if detectable concentrations of PCBs or VOCs originating from the subsurface are present in the air within the new Keith Middle School; and if present, if they pose a significant risk to the occupants of the school.

The indoor air sampling will be conducted in conformance with current industry standards and engineering practices, including protocols found in the Massachusetts Department of Environmental Protection (DEP) policy entitled "Indoor Air Sampling and Evaluation Guide" WSC Policy #02-430 dated April 2002. The concentrations of potential airborne contaminants within the school building will be monitored on a minimum tri-annual basis.

Standard laboratory pre-cleaned and evacuated passivated stainless steel SUMMA canisters will be used to collect 24-hour composite VOC samples. High volume air sampling pumps will be used to draw sample air through polyurethane foam (PUF) cartridges to collect 24-hour composite PCB samples. Refer to Appendix B1 for sampling protocols; to Appendix B2 for a description of the EPA air sampling and analytical method; to Appendix B3 for a list of analytes and detection limits; and to Appendix B4 for a description of laboratory standard operating procedures.

During at least the first year of implementation of this MMIP, indoor air samples will be collected three times per year: in July/August (during summer vacation), December (during winter break) and April (during spring break). After the collection of one complete year's indoor air sampling data, the City may submit a written request to EPA to reduce the indoor air sampling frequency.

- **July / August Sampling Event**
  Air samples will be collected in July or early August with the goal of collecting the samples, performing laboratory analyses, evaluating the data, and communicating the results to school officials at least two weeks prior to the start of each school year. The goal of this sampling event is to assess indoor air conditions during the warmer weather, when the potential for formation of any volatile gases is greatest. Also, at that time, the school will likely experience lower than normal air exchanges, since the doors and windows of the school building will be mostly closed and air handling equipment will be largely inactive. Collection of samples during this school vacation will allow the sampling to occur without interfering with normal school activities.

- **December Sampling Event**
  The second sampling event will occur during the December school vacation. The goal of this sampling event is to obtain a potential "worst-case" air sample, during the period when the unoccupied school will experience lower than normal air exchanges. During the winter vacation, the doors and windows will be mostly closed and the heating equipment will be in operation. Frozen ground surrounding the school may create conditions conducive to buildup of volatile organic gases and increase potential for gas

migration into the building. Collection of samples during this school vacation will allow the sampling to occur without interfering with normal school activities.

- **April Sampling Event**
  A third indoor air sampling event will be performed during the April school vacation week. The purpose of this sampling event will be to provide characterization of indoor air conditions during spring conditions. Collection of samples during this school vacation will allow the sampling to occur without interfering with normal school activities.

2.2 Sample Locations

One indoor air sample will be collected from the ground floor of each of the three school building sections (Sections A, B, and C). Each location will be selected to be representative of portions of the school building normally occupied by students and teachers. At least one VOC and PCB sample will be collected using the same methods from immediately outside of the building to provide comparative background results. Sample locations may be changed between each sampling event. Samples will typically be collected from a height of four to six feet - the height of the normal breathing zone.

2.3 Analytical Parameters

At each sampling event, air samples will be collected and analyzed for the following parameters:

1. Volatile Organic Compounds by EPA Method TO-15 - Standard laboratory pre-cleaned and evacuated passivated SUMMA canisters will be used to collect 24-hour composite samples.
2. Polychlorinated Biphenyls by EPA Method TO-4A – High volume air sampling pumps will be used to draw sample air through PUF cartridges to collect 24-hour composite samples. The samples will be analyzed for Arochlors (-1016, -1221, -1232, -1242, -1254, -1260, -1262, and -1268) and the 209 PCB congeners.

   The PCB sample collection media consists of a combination of a PUF cartridge and a quartz prefilter. The PUF cartridge and the quartz prefilter will be analyzed separately in order to differentiate between airborne particulate contamination captured on the prefilter and vapor phase contamination absorbed by the PUF.

Prior to the sampling program, the air concentration associated with acceptable risk levels (e.g., an excess lifetime cancer risk of 10^{-6} and a hazard index of 1 or less under continuous exposure conditions) will be calculated for all analytes covered in the analytical methods. Adjustments to sampling volumes will be made, if needed and if consistent with the method, to attain the needed quantitation limit.

Refer to Appendix B2 for a description of the TO-4A and TO-15 methods.

2.4 Quality Assurance/Quality Control

At one indoor location, a duplicate VOC sample will be collected to verify precision. One laboratory prepared and evacuated SUMMA canister and one unused PUF cartridge will be transported from the laboratory to the field and back to the laboratory without being used. These samples will be laboratory analyzed as trip blanks.

2.5 Action Levels

2.5.1 PCBs in Indoor Air

Two risk-based air concentrations (RBACs) for PCBs in the gaseous phase within the school have been calculated. Both RBACs are based on an occupational exposure within the school (8 hours per day, 250 days per year, for 25 years, since this represents the longest likely exposure in the school), and are based on non-carcinogenic health effects in addition to carcinogenic health effects of PCBs [using U.S. EPA's unit risk value of 0.1 $(mg/m^3)^{-1}$].

For both maximum acceptable levels (excess lifetime cancer risk = $1x10^{-5}$ and hazard index = 1) and action levels (excess lifetime cancer risk = $1x10^{-6}$ and hazard index = 0.2), the non-cancer endpoint results in the greater risk (or lower acceptable/action levels) and is the endpoint that is applied. The action limits are calculated from the "middle tier" slope factor developed by EPA and recommended for assessing inhalation exposure to volatilized PCBs. This middle tier slope factor was developed from oral test data on a variety of Aroclor mixtures (-1016, -1242, -1254, and -1260) and is to be applied to exposure estimates of total PCBs. These actions levels are, therefore, to be applied to total PCBs, the sum of all detected Aroclors (although somewhat imprecise because of overlapping congener content), or the sum of all detected congeners.

- The first RBAC is an Action Level set at a target excess lifetime cancer risk of $1x10^{-6}$. This Action Level is intended to be used as an initial indicator that PCB concentrations above background levels have been detected and that investigation of the source of PCBs is warranted.
- The second RBAC is the maximum acceptable air concentration that should not be exceeded for any extended time period, using a target excess lifetime cancer risk of $1x10^{-5}$. Since long-term, rather than short-term, exposure is of concern, the maximum acceptable air concentration could be exceeded over the short-term and still result in acceptable risk levels. Use of this value as the maximum acceptable air concentration is considered conservative.

The calculations of the two values are included in Appendix C and are summarized below:

RBAC for PCBs in air	RBAC ($\mu g/m^3$)
Action Level ($1x10^{-6}$)	0.05
Maximum Acceptable Level ($1x10^{-5}$)	0.3

2.5.1.1 Results Exceeding PCB Action Levels

Any indoor air PCB result with an analyte concentration exceeding 0.05 $\mu g/m^3$ will initiate a follow-up assessment. At a minimum, such assessment will consist of a visual inspection of the sample location area for potential indoor air contaminant sources and resampling of the subject location within seven days. The laboratory results of the initial sampling will be verbally reported to school officials within 24 hours and reported in writing within seven days. The follow up assessment may also include interviews with Site personnel to help identify Site activities that may have occurred during sample collection, consultation with the analytical laboratory to confirm the validity of the result, and/or any other appropriate tasks to determine the source of the elevated indoor air detection.

If the follow-up assessment determines that the previously detected elevated level(s) persists, the LSP will develop a supplemental assessment plan for submittal to school officials and EPA within 10 days of receipt of the second round of laboratory results.

If the follow up assessment determines that the previously detected elevated level(s) are either no longer present above 0.05 $\mu g/m^3$ or were anomalous or incorrect results, no further assessment will be required and the sampling program will return to its regular schedule. If warranted, additional monitoring and/or corrective actions will be implemented.

2.5.2 Volatile Organic Compounds

EPA Method TO-15 will be used as the VOC analytical method in order to assess a wide range of VOCs to provide a comprehensive and conservative evaluation of potential Site risk. The VOC results of each indoor air sample will be evaluated by comparison to a combination of the contemporary outdoor air sample and the DEP Threshold Effects Exposure Limits (TELs) and Allowable Ambient Limits (AALs) for Ambient Air currently in effect. The 1995 TELs and AALs are attached in Appendix D. For those TO-15 detected compounds that do not have either a TEL or an AAL for comparison, the LSP-of-record will evaluate the VOC(s) individually for human health risk and the existence of a condition of No Significant Risk as defined at 310 CMR 40.0006.

The assessment of VOC analytical results will also include an assessment of the possibility that Site building materials, equipment, and/or Site uses may be impacting indoor air quality. Many normal building materials such as carpeting, carpet padding, caulks, sealants, adhesives, paints, floor and ceiling tiles, cabinets, molding, composite wood products, and other woodwork can contain VOCs that are gradually emitted (off-gassed) throughout the life of the material. Office furniture, room dividers, and photocopiers can also emit VOCs. Additional airborne contaminants can also originate from the indoor storage and use of building materials, cleaning products, pesticides, etc. A determination that the source of a detection of VOC(s) is a source other than the soil or groundwater at the Site will be cause for an assessment of risk posed by the detected VOC(s).

2.5.2.1 Results Exceeding VOC Standards or Background

Any indoor air result with VOC concentration(s) exceeding TELs or AALs will cause a follow-up assessment to be performed. At a minimum, the assessment will consist of visual inspection of the sample location area for potential indoor air contaminant sources and a re-sampling of the subject location within seven days. The assessment may also include interviews with Site personnel to identify any Site activities that may have occurred during sample collection, consultation with the analytical laboratory, or any other appropriate tasks to determine the source of the elevated indoor air detection.

The VOC results of each indoor air sample will also be compared to the corresponding background (outdoor) air sample. Any indoor air result with an analyte concentration exceeding the outdoor sample result by 50 percent or more will cause a follow up assessment to be performed. At a minimum, such assessment will consist of a visual inspection of the sample location for potential indoor air contaminant sources and resampling of the subject location within seven days, along with a corresponding outdoor background sample. The follow-up assessment may also include interviews with Site personnel to identify any Site activities that may have occurred during sample collection, consultation with the analytical laboratory to confirm the validity of the result, or any other appropriate tasks to determine the source of the elevated indoor air detection.

If the follow-up assessment determines that the contaminant levels of the second sampling event are either no longer present above TELs, AALs, 150% of contemporary outdoor concentrations, or were anomalous or incorrect results, no further assessment will be required and the monitoring program will return to its regular schedule.

If the follow-up sampling and analysis confirms the presence of level(s) above TELs, AALs, or 150% of outdoor concentrations, the laboratory data will be submitted by the LSP-of-Record to a toxicologist/risk assessor for evaluation in accordance with section 10.0 Health Risk Assessment Under the MCP of the DEP policy "Indoor Air Sampling and Evaluation Guide" for further assessment. The LSP-of-Record may develop a supplemental assessment plan for submittal to school officials and EPA within 10 days of receipt of second round sampling laboratory analytical results.

For any detection of VOC(s) whose source is determined to likely be normal building materials, equipment, and/or Site uses, the risk posed by the detected concentrations will be evaluated as described for Site COCs. The risk posed by these detected concentrations will be calculated separately from Site COCs. Reporting of any such non-Site COC detections, a discussion of the risks they pose, and recommendations for the mitigation of such concentrations, will be included in all submittals as described in Section 2.6, below.

2.6 Reporting

Except as specified elsewhere in this Monitoring Plan, all analytical results will be provided verbally to school official(s) within 72 hours of receipt of results from the analytical laboratory.

Upon review of the laboratory data reports from each sampling event, if the City determines that the PCB and/or VOC Action Levels potentially have been exceeded, the City will contact EPA within 24 hours.

Except as specified elsewhere in this Monitoring Plan, within 10 days after receipt of analytical results, a written summary report presenting sampling methods, analytical methods (including description and justification for any changes to the above methods), analytical results, any deviations from the standard sampling or analytical methods, and a discussion of the implications of the analytical results will be provided to school officials and EPA. Data validation as described in Section 6.0 will be provided to EPA within 21 days of receipt of analytical results.

3.0 Groundwater Monitoring

3.1 Groundwater Sampling Procedures

Groundwater monitoring will be performed as part of the MMIP for the new Keith Middle School. The purpose of the groundwater monitoring is to determine if detectable concentrations of PCBs, VOCs, or dissolved metals are present in the groundwater at the new Keith Middle School; and if present, if they could pose a significant risk to the occupants of the school.

Groundwater samples will be collected from groundwater monitoring wells in the spring and fall. Samples will be collected using low flow sampling in accordance "EPA Region I Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells," dated July 30, 1996, which is incorporated by reference in this document. Water quality parameters (pH, temperature, specific conductance, dissolved oxygen, oxidation-reduction potential, and turbidity) will be monitored during well purging with samples collected upon stabilization (generally <5 percent fluctuation) of these parameters. Refer to Appendix B3 for a list of analytes and detection limits.

3.2 Sample Locations

Two groundwater monitoring wells will be installed along the western edge and one groundwater monitoring well will be installed along the southern edge of the school facility to serve as groundwater monitoring points. The wells will be constructed of two-inch diameter polyvinyl chloride riser pipe and screen. The wells will be installed with 10 feet of screen intersecting the approximate average annual elevation of the water table. The wells will be installed in accordance with the DEP's "Standard References for Monitoring Wells" Dated April 1991, updated July 1994 (WSC # 310-91) which is incorporated by reference in this document.

3.3 Analytical Parameters

At each monitoring well sampling event, groundwater samples will be collected and analyzed for the following parameters:

- Volatile Organic Compounds by EPA Method 8260B;
- Polychlorinated Biphenyls by EPA Method 8082; and
- Eight dissolved Resource Conservation and Recovery Act (RCRA8) metals by EPA Method 6010B/7000s.

Laboratory SOPs for each method, including extraction and cleanup methods, are included in Appendix B4.

3.4 Quality Assurance/Quality Control

During each sampling event, a duplicate sample will be collected at one groundwater monitoring well and submitted for laboratory analysis to verify precision of the metal, VOC, and PCB results. One laboratory prepared sample container containing deionized water will be transported from the laboratory to the field and back to the laboratory for analysis of Method 8260B VOCs as a trip blank.

As part of each analytical data package, the analytical laboratory will include a qualitative evaluation of GC chromatograms discussing whether any unidentified compounds may be present that can not be quantified by the EPA 8082 method.

3.5 Action Levels

The results of each groundwater sample will be evaluated by comparison to the applicable Massachusetts Contingency Plan (310 CMR 40.0000) GW-2 and GW-3 standards. A copy of MCP section 310 CMR 40.0974 containing the GW-2 and GW-3 standards is attached in Appendix E. Any groundwater result with an analyte concentration exceeding a GW-2 or GW-3 standard will be cause to initiate a follow-up verification. At a minimum, such verification will consist of the resampling of the subject monitoring well within seven days. The laboratory results of the initial sampling will be verbally reported to the School Department within 24 hours of receipt and reported to the School Department in writing within seven days. The follow up verification may also include consultation with the analytical laboratory to confirm the validity of the result, or any other appropriate tasks to determine the source of the elevated groundwater detection.

If the follow-up verification determines that the contaminant levels are either no longer present above Method 1 GW-2 and GW-3 standards, or were anomalous or incorrect results, no further assessment will be required and the sampling program will return to its regular schedule.

If the follow-up verification confirms the presence of a groundwater result with an analyte concentration exceeding its respective GW-2 or GW-3 standard, a follow-up assessment will be performed. Such assessment will consist of performing at least one of the following activities

(1) A Phase I - Initial Site Investigation in accordance with the scope presented at 310 CMR 40.0483, the purpose of which will be to investigate the source, nature, and extent of the detected contamination;

(2) A Method 3 Risk Assessment in accordance with 310 CMR 40.0990 to determine the risk to human health and the environment posed by the detected contaminant; or

(3) Other response actions determined by EPA or the LSP-of-Record retained by the City of New Bedford to be protective of human health and the environment.

3.6 Reporting

Except as specified elsewhere in this Monitoring Plan, analytical results will be verbally transmitted to school official(s) within 72 hours of receipt of analytical results.

Upon review of the laboratory data reports from each sampling event, if the City determines that the MCP GW-2 or GW-3 standards for PCB, VOC, and/or RCRA 8 metals potentially have been exceeded, the City will contact EPA within 24 hours.

Within 10 days of receipt of analytical results, a summary report presenting sampling methods, analytical methods (including description and justification for any changes to the above methods), analytical results, any deviations from the standard sampling or analytical methods, and a discussion of the implications of the analytical results will be provided EPA. Data validation as described in Section 6.0 will be provided to EPA within 21 days of receipt of analytical results.

4.0 Foundation Vent Air Monitoring

4.1 Air Sampling Procedures

Foundation vent air monitoring will be performed as part of the MMIP for the new Keith Middle School. The following methodology has been developed in conjunction with the EPA for an initial qualitative assessment of gases that may be present beneath the impermeable vapor barrier membrane beneath the building foundation.

The foundation venting system is comprised of six sub-slab vapor collection zones, each vented by two or four vent stacks penetrating the roof. For the first sampling event, sampling will occur at three of the vent stacks, one from each of the School Buildings (i.e., Buildings A, B, and C). Prior to the collection of the samples, all vent stacks will be sealed with temporary covers for the immediately preceding 24 hours. After 24 hours have elapsed, the sample will be collected from one of the vent stacks through a sample port in the vent stack cover. During sampling, the one other vent stack cover (in the two-vent stack zones) will be removed to allow for the inflow of air as the sample is removed. In four-vent stack zones, only the temporary vent stack cover furthest from the stack to be sampled will be removed. The inner two vent stacks will remain covered. A sample volume equivalent to 80% of the sub-slab foundation vent collection system will be sampled and submitted for analysis. The purpose of this method will be to collect a sample representative of all air within the venting system.

Standard laboratory pre-cleaned and evacuated passivated SUMMA canisters will be used to collect VOC samples. Personal low volume sampling pumps will be used to draw sample air through PUF cartridges to collect the composite PCB samples. The air sampling pumps will be set up and calibrated to collect a sample volume equivalent to 80 percent of the air volume within each foundation venting zone (i.e., the combined volume of the sampled vent stack, the permeable sub-slab vapor collection system, and the vent stack opened to allow air inflow during sampling).

Refer to Appendix B1 for sampling protocols; to Appendix B2 for a description of the EPA air sampling and analytical method; to Appendix B3 for a list of analytes and detection limits; and to Appendix B4 for a description of laboratory standard operating procedures.

Sampling Events

At the request of EPA, vent stack sampling will be performed three times per year. Stack sampling will be performed concurrently with the indoor air sampling described in Section 2.0.

4.2 Sample Locations

For the initial sampling events, in order to establish a baseline of regularly monitored locations to generate a basis for historical comparison, sampling will occur at four vent stacks, two at Building Section A and one each at Building Sections B and C. Prior to subsequent sampling events, and to aid in the selection of appropriate sample collection locations, an ambient air screening of each of the 16 rooftop foundation vent stacks will be performed using a RAE

Systems "ppbRAE plus" PID (or equivalent) capable of detecting total volatile organics to one (1) part per billion. In order to expand the spatial coverage of vent stack sampling, a rotation of monitoring shall be established with emphasis on those stacks at which the highest PID reading is recorded. A proposed sampling sequence is provided in the table below:

	Building A	**Building B**	**Building C**
Sampling Event 1	VS-1, VS-2	VS-9	VS-11
Sampling Event 1	VS-1, VS-2	VS-9, VS-16	--
Sampling Event 1	VS-1, VS-2	VS-7	VS-11
Sampling Event	--	VS-8	VS-11
Sampling Event	VS-1, VS-4	VS-9	VS-11

During each sampling event, one VOC and PCB sample will be collected using the same methods from one upwind location to provide comparative background results. Refer to Appendix B1 for sampling protocols; to Appendix B2 for a description of the EPA air sampling and analytical method; to Appendix B3 for a list of analytes and detection limits; and to Appendix B4 for a description of laboratory standard operating procedures.

4.3 Analytical Parameters

At each sampling event, foundation vent air samples will be collected and analyzed for the following parameters. These methods will be:

1. Volatile Organic Compounds by EPA Method TO-15 using SUMMA canisters; and
2. Polychlorinated Biphenyls by EPA Method TO-10A using low volume personal sampling pumps collecting sample on PUF cartridges. The samples will be analyzed for Arochlors (-1016, -1221, -1232, -1242, -1254, -1260, -1262, and -1268) and the 209 PCB congeners.

Prior to the sampling program, the air concentration associated with acceptable risk levels (e.g., an excess lifetime cancer risk of 10^{-6} and a hazard index of 1 or less under continuous exposure conditions) will be calculated for all analytes covered in the analytical method. Adjustments to sampling volumes will be made, if needed and if consistent with the method, to attain the needed quantitation limit.

Refer to Appendix B2 for a description of the TO-10A and TO-15 methods.

4.4 Quality Assurance/Quality Control

At one foundation vent stack, a duplicate VOC sample will be collected to verify precision. One laboratory prepared and evacuated SUMMA canister and one unopened PUF cartridge will be transported from the laboratory to the field and back to the laboratory without being used. These blank samples will be laboratory analyzed as trip blanks.

4.5 Action Levels

4.5.1 PCBs Vent Stack Air

Any PCB concentrations detected within vent stack air will be compared to the two risk-based air concentrations (RBACs) calculated for PCBs in the gaseous phase within the school. Both RBACs are based on an occupational exposure within the school (8 hours per day, 250 days per year, for 25 years, since this represents the longest likely exposure in the school), and are based on non-carcinogenic health effects in addition to carcinogenic health effects of PCBs [using U.S. EPA's unit risk value of 0.1 $(mg/m^3)^{-1}$].

For both maximum acceptable levels (excess lifetime cancer risk = $1x10^{-5}$ and hazard index = 1) and action levels (excess lifetime cancer risk = $1x10^{-6}$ and hazard index = 0.2), the non-cancer endpoint results in the greater risk (or lower acceptable/action levels) and is the endpoint that is applied. The action limits are calculated from the "middle tier" slope factor developed by EPA and recommended for assessing inhalation exposure to volatilized PCBs. This middle tier slope factor was developed from oral test data on a variety of Aroclor mixtures (-1016, -1242, 1254, and –1260) and is to be applied to exposure estimates of total PCBs. These actions levels are, therefore, to be applied to total PCBs, the sum of all detected Aroclors (although somewhat imprecise because of overlapping congener content), or the sum of all detected congeners.

- The first RBAC is a PCB Action Level set at a target excess lifetime cancer risk of $1x10^{-6}$. This Action Level is intended to be used as an initial indicator that PCB concentrations above background levels have been detected and that investigation as to the source of PCBs is warranted.
- The second RBAC is the maximum acceptable air concentration of PCB that should not be exceeded for any extended time period, using a target excess lifetime cancer risk of $1x10^{-5}$. Since long-term, rather than short-term, exposure is of concern, the maximum acceptable air concentration could be exceeded over the short-term and still result in acceptable risk levels.

The calculations of the two values are include in Appendix C and summarized below:

RBAC for PCBs in air	RBAC ($\mu g/m^3$)
Action Level ($1x10^{-6}$)	0.05
Maximum Acceptable Level ($1x10^{-5}$)	0.3

Because these concentrations are low, they must be applied with consideration of the achievable quantitation limits. For the foundation vent sampling, which is intended to extract the quiescent air in the vent piping without drawing in ambient air, the small volume of air collected may result in an elevated quantitation limit above the action level of 0.05 $\mu g/m^3$. So, the higher maximum acceptable concentration of 0.3 $\mu g/m^3$ is proposed (to the extent this detection limit can be achieved) as an alternate action level for the vent pipes only (not indoor

air sampling, for which the action level of 0.05 $\mu g/m^3$ can be achieved). This recognizes that no one will be directly exposed to the foundation vent air and that this air concentration will be further diluted through dispersion before reaching the ground level breathing zone.

4.5.1.1 PCB Results Exceeding Action Levels

Any foundation vent stack air result with PCB concentration exceeding 0.3 $\mu g/m^3$ (or the laboratory detection limit, whichever is higher) will be cause to initiate a follow-up assessment. At a minimum, such assessment will consist of a resampling of the subject location within seven days. The laboratory results of the initial sampling will be verbally reported to school officials within 72 hours and reported in writing within seven days. If the follow-up assessment determines that the previously detected elevated level(s) persist, the LSP will develop a supplemental assessment plan for submittal to school officials and EPA within 10 days of receipt of the second round of laboratory results.

If the follow up assessment determines that the previously detected elevated PCB level(s) are either no longer present or were anomalous or incorrect results, no further assessment will be required and the sampling program will return to its regular schedule. If warranted, additional monitoring and/or corrective actions will be implemented.

4.5.2 Volatile Organic Compounds

The VOC results of each foundation vent stack sample will be evaluated by comparison to the DEP TELs and AALs for Ambient Air currently in effect. The 1995 TELs and AALs are attached.

4.5.2.1 Results Exceeding VOC Background

Any foundation vent stack result with a VOC concentration exceeding TELs or AALs will cause a follow-up assessment to be performed. At a minimum, the assessment will consist of resampling of the subject location within seven days.

If the follow up sampling and analysis confirms the presence of VOC(s) above TELs or AALs, the laboratory data will be submitted by the LSP-of-Record to a toxicologist/risk assessor for further assessment. If necessary, the LSP-of-Record will develop a supplemental assessment plan for submittal to school officials and EPA within 10 days of receipt of the second round of laboratory results.

If the follow-up assessment determines that the VOC levels of the second sampling event are no longer present above TELs or AALs, or were anomalous or incorrect results, no further assessment will be required and the sampling program will return to its regular schedule. If warranted, additional monitoring and/or corrective actions will be implemented.

4.6 Reporting

Except as specified elsewhere in this Monitoring Plan, all analytical results will be provided verbally to school official(s) within 72 hours of receipt of analytical results.

Upon review of the laboratory data reports from each sampling event, if the City determines that the PCB and/or VOC Action Levels potentially have been exceeded, the City will contact EPA within 24 hours.

Except as specified elsewhere in this Monitoring Plan, within 10 days of receipt of analytical results, a written summary report presenting sampling methods, analytical methods (including description and justification for any changes to the above methods), analytical results, any deviations from the standard sampling or analytical methods, and a discussion of the implications of the analytical results, will be provided to school officials and EPA. Data validation as described in Section 6.0 will be provided to EPA within 21 days of receipt of analytical results.

5.0 Wetland Sediment Inspection and Monitoring

5.1 Wetland Sediment Inspection

An inspection of the wetlands abutting the Keith Middle School building will be performed during May of each year. The inspection will be made by a competent environmental professional designated by the City of New Bedford. The purpose of the inspection is to visually observe the wetlands and vicinity for unacceptable conditions including indications of excessive sedimentation occurring within the wetlands. Indications of excessive sedimentation or conditions that could lead to future excessive sedimentation include: dumping of debris, exposed side slopes, erosion from spring rains, stressed or dead vegetation, etc.

The inspection will consist of a walking traverse of the entire length of the top and the toe of the slope leading down from the school facility to the abutting wetland. Any area(s) of the wetland or the slope leading down to the wetland that are determined during the inspection to be unacceptable will be noted on an inspection form and photographically documented. Upon completion of the cleanup or repair of the unacceptable area, a follow up confirmatory inspection will be made and documented on the inspection form with accompanying photograph of the area. Refer to Appendix F for a copy of the Wetland Sediment Inspection Form.

Examples of general guidelines for conditions that the inspector will record and photograph as unacceptable include:

- Dumping of debris;
- Stained soil;
- Erosion of soil on slope leading down to wetland;
- Animal burrows in slope;
- Visible accumulation of mineral sediment in wetland;
- Subsidence of greater than two inches or slumping of soil on slope leading down to wetland;
- Dead vegetation, if such vegetation is required for erosion control; and/or
- Evidence of unauthorized excavation.

In addition to the list above, the inspector will use good judgment in the evaluation of the acceptability of the condition of the slope and the wetland, and the need to identify these or other problem conditions requiring additional cleanup, maintenance, or repair.

5.2 Sediment Sampling Procedures

Sediment sampling will be performed as part of the MMIP for the new Keith Middle School. The sediment sampling will be conducted in conformance with current industry standards and engineering practices, as well as the Region I, EPA-New England, Draft Sediment Sampling Guidance dated September 1998.

The concentrations of contaminants within Site wetland sediment will be monitored on an annual basis. Sediment samples will be collected from a depth of 0-6 inches with a dredge, coring device, or other appropriate manual sediment sampling implement. Refer to BETA's sediment sampling protocol in Appendix G. Refer to Appendix B3 for a list of analytes and detection limits and to Appendix G for a detailed description of sampling procedures.

5.3 Sample Locations

For each sampling event, four sediment samples will be collected from the portion of the wetland that abuts the slope leading down from the school. The sample locations will be determined by laying out a grid with a width extending out approximately ten feet perpendicular to the toe of the slope and a length equal to and parallel to the toe of the slope. Four sampling locations will be randomly selected each year (using a random number generator or equivalent method to select sampling coordinates) within this grid.

Additional samples may be collected at the discretion of the LSP-of-record from any suspect areas identified during the annual wetland inspection.

5.4 Analytical Parameters

At each sampling event, sediment samples will be collected and analyzed for the following parameters:

1. Polychlorinated Biphenyls by EPA Method 8082.

Laboratory SOPs for this method, including extraction and cleanup methods, are included in Appendix B4.

Changes based on technical justification may be made in the specific sample collection intervals and/or substitutions be made by equal or improved sampling and/or analytical methods upon review and approval of LSP-of-Record. Any such changes and its/their justification will be described in the subsequent summary report.

5.5 Quality Assurance/Quality Control

At one sediment sampling location, a duplicate PCB sample will be collected and laboratory analyzed to verify precision.

5.6 Action Levels

5.6.1 PCBs in Sediment

PCB results will be compared to the 1.0 mg/Kg cleanup level described in the "Wetland Risk-Based Cleanup Request" dated June 17, 2005, prepared by BETA and previously submitted to the U.S. EPA.

5.6.1.1 PCB Results Exceeding Action Levels

Any sediment result with an analyte concentration exceeding 1.0 mg/Kg will be cause to initiate a follow-up assessment. At a minimum, such assessment will consist of:

1. Consultation with the analytical laboratory to confirm the validity of the result.
2. Collection of a follow up sediment sample from as close as possible to the location of the sample containing the greater than 1.0 mg/Kg result; and
3. Collection of a minimum of four samples surrounding the initial high concentration sample to provide initial information on the extent of the greater than 1.0 mg/Kg PCB concentrations.

The laboratory results of the initial sampling will be verbally reported to school officials within 72 hours and reported in writing within seven days.

If the follow-up assessment confirms the previously detected elevated PCB concentration and/or that concentrations in sediment greater than 1.0 mg/Kg PCB are present in any of the four second round samples, the LSP will develop a supplemental assessment plan for submittal to school officials and EPA within 10 days of receipt of the second round of laboratory results.

If the follow up assessment finds that laboratory analysis of the second round of sediment samples does not detect concentrations greater than 1.0 mg/Kg, or that the initial result(s) were anomalous or incorrect, no further assessment will be required and the sampling program will return to its regular schedule.

5.7 Reporting

A copy of each completed Wetland Inspection Form will be submitted to the EPA within one month of each inspection.

Except as specified elsewhere in this Monitoring Plan, all analytical results will be provided verbally to school official(s) within 10 days of sample collection.

Upon review of the laboratory data reports from each sampling event, if the City determines that the PCB in sediment action level of 1.0 mg/Kg may potentially have been exceeded, the City will contact EPA within 24 hours.

Except as specified elsewhere in this Monitoring Plan, within 10 days after receipt of laboratory results, a written summary report presenting sampling methods, analytical methods (including description and justification for any changes to the above methods), analytical results, any deviations from the standard sampling or analytical methods, and a discussion of

the implications of the analytical results, will be provided to school officials and EPA. Data validation as described in Section 6.0 will be provided to EPA within 21 days of receipt of analytical results.

6.0 Laboratory QC & Data Usability

6.1 Laboratory Quality Control Requirements

Along with the field quality control requirements, the Massachusetts DEP-certified laboratory being utilized for this project maintains a quality control/quality assurance program. Table 1 below summarizes the laboratory quality control requirements that will be implemented for this project.

Relative Percent Difference (RPD) is a measure of precision and the percent surrogate recovery is a measure of accuracy. The objective of the laboratory concerning precision is to equal or exceed the precision demonstrated in the published analytical method on similar samples. RPD is calculated as follows:

$$\text{RPD} = \frac{(\text{Sample Result} - \text{Duplicate Result}) \times 100}{(\text{Mean of Sample and Duplicate Results})}$$

The objective of the laboratory concerning accuracy is to equal or exceed the accuracy demonstrated in the published analytical method on similar samples. Accuracy is determined on matrix spikes and/or blank spikes and is calculated as follows:

$$\text{Percent Recovery} = \frac{(\text{Observed Sample Concentration}) \times 100}{(\text{Spiked Concentraion})}$$

Precision is a measure of the reproducibility of the results. This quality control indicator is evaluated by examining the variability of results from field duplicates and laboratory duplicates. The precision objective for this investigation is to meet or exceed the criteria that have been established for the referenced analytical methodology. Corrective action will be implemented by the laboratory as necessary to correct any substantial deviations.

Accuracy is a measure of the closeness of the analytical result to the true concentration. The percent recovery of spiked samples and performance evaluation standards reflect whether the analytical result has a high or low bias. The accuracy objective for this investigation is to meet or exceed the criteria that have been established for the referenced analytical methodology. Corrective action will be implemented by the laboratory as necessary to correct any substantial deviations.

Table 1: Laboratory Quality Control Requirements

QC Sample	Frequency	Acceptance Criteria	Corrective Action
Extraction Blank	One/20 samples/matrix	Less than the reporting limits	Depending on concentration, results will be qualified or rejected.
Duplicate	One/20 samples/matrix	<50% RPD	Discuss results with lab to determine if reanalysis/re-sampling is required.
Surrogates	All extracted standards and associated QC	See Below*	Laboratory to reanalyze sample**
Matrix Spike	One/20 samples/matrix	See Below*	Laboratory to reanalyze sample**
Laboratory Control Sample (LCS)	One/20 samples/matrix	See Below*	Laboratory to reanalyze sample**

*** Acceptance Criteria noted below:**

Surrogates		Matrix Spikes, LFB & LCS	
Analyte	**% Recovery**	**Analyte**	**% Recovery**
VOCs		VOCs	
Toluene-d8	75-125	1,1-Dichloroethene	61-145
Bromofluorobenzene	75-125	Trichloroethylene	71-120
1,2-Dichloroethane-d4	75-125	Chlorobenzene	75-130
		Benzene	76-127
PCBs - TCMX	40-140	PCBs	45-131
PCBs - DCBP	44-110	Metals	70-140

6.2 Laboratory Data Management and Documentation

All laboratory results will be delivered both electronically and in hard copy. Following the receipt of all laboratory reports, the results will be tabulated in a spreadsheet format using the electronically delivered data. The electronic deliverable prevents the introduction of errors during data tabulation. The results of all data produced by the laboratory are automatically transferred to an electronic file. No manual data entry of the results is required; therefore eliminating the introduction of errors. All raw data including chromatograms and copies of internal chains of custody will be maintained by the laboratory.

All field data will be recorded in the form of field notes to maintain a permanent record of all field activities. Information will include date, weather, individuals on site, field screening results, sampling observations and techniques, and any additional relevant information. All field notes and photographs will be maintained and stored in dedicated project files.

6.3 Assessment and Response Actions

Throughout the course of the project, the following procedures will be implemented to detect and correct any problems that may occur:

- Project management meetings;
- Peer reviews of all reports, documents, and correspondence;
- Periodic field meetings during all site investigations; and
- Ongoing communication between the LSP-of record, regulatory agencies, the City of New Bedford, and all Subcontractors.

As warranted, problems that occur will be communicated through the issuance of project memorandums and telephone conversations. All correspondence will detail the problem encountered and any corrective actions taken. All memorandums and telephone notes will be maintained in dedicated project files.

All field sampling will be overseen by the Project Manager to ensure that the Work Plan and sampling SOPs are followed. Any sampling problems will be immediately communicated to the Project Manager and documented in the field notes.

6.4 Data Validation and Usability

Data Validation

Tier II Data Validation will be performed in accordance with EPA New England Data Validation Functional Guidelines for Evaluating Environmental Analyses, revised December 1996.

Tier II Data Validation will include a general review of sample receipt, analysis, and the ability of the instruments to recover the elements or compounds that were analyzed. The main components of a Tier II Data Validation include: assessing the technical holding times, surrogate recoveries, matrix spike/matrix spike duplicates, and method blanks. The following items are to be evaluated during a Tier II Data Validation review:

PCBs:

- Chain of Custody
- Case narrative
- Presence of field and sample identifications (IDs)
- Holding times
- Preservation and cooler receipt
- Surrogate recoveries

- Laboratory blank data
- Spike data
- Laboratory Control Samples (LCS)
- Chromatogram review

VOCs, SVOCs, and Metals:

- Chain of Custody
- Case narrative
- Presence of field and sample identifications (IDs)
- Holding times
- Preservation and cooler receipt
- Surrogate recoveries
- Laboratory blank data
- Spike data
- Laboratory Control Samples (LCS) (if metals spike recovery is out of control)

Data validation will also be performed by the laboratory analyst prior to reporting results, in accordance with their published QA protocols. The laboratory will review data against pre-existing criteria before proceeding with subsequent analytical processes and/or data. The LSP-of-record will review reported results and ensure that any required corrective action is taken. Criteria used for accepting or rejecting data are based on laboratory quality control and specific EPA methodology standard operating procedures.

Data Usability

Data usability will be based on meeting some or all, but not limited to the following criteria:

Deviations from any standard operating procedures will be reviewed to identify potential limitations in the data. If a substantial deviation to standard operating procedure is identified, consideration may be given to either re-sampling or disregarding the sample result.

The analytical methods chosen include method detection limits that are below applicable concentrations of concern. This approach ensures that all data received can be directly compared to applicable standards or calculated risk-based action levels. If a detection limit is at or above the concentration of concern, the detection limit may be lowered and the sample may be reanalyzed if technically possible to do so.

If concentrations of target analytes are at or near a concentration of concern, quality control data (blanks, spikes) will be scrutinized to determine the likelihood of false negatives and false positives. If QC data indicates that precision or accuracy is determined to be outside method specific criteria, then an evaluation of the data will be performed to determine where and how this QC issue affects the use of the data. The results of this evaluation will be presented in the final report along with a discussion of any limitations in the way the data should be used. If, after the evaluation, it is determined that the data is unusable, the data will be rejected and possible corrective actions will be documented in the final report.

A review of sample representativeness from field notes will be performed. A non-representative or non-homogeneous sample increases the potential for false negatives or false positives. Adherence to applicable field sample collection protocols, field QC measures, and transport and storage of sample to the laboratory will decrease the possibility of having a sample result that is not representative of true site conditions.

Poor data quality or lost samples will decrease confidence in the data set. To ensure completeness, adherence to all field protocols, sample tracking procedures and laboratory procedures shall be maintained. Completeness will be described in terms of the total number of samples that meet data validation requirements compared to the total number of samples that do not satisfy such requirements.

Included in each of the written reports will be an assessment of the project data (field and laboratory) to determine whether the data usability goals of the project were met and whether there were any observations, trends, anomalies, or data gaps noted.

7.0 Long-Term Cap Monitoring Plan

7.1 Background

The fate and transport characteristics of the contaminants of concern at the Site (polychlorinated biphenyls (PCBs), heavy metals (primarily lead and barium), and polynuclear aromatic hydrocarbons (PAHs)) have been evaluated and the following apply:

- All COCs are relatively insoluble in water;
- All COCs are either non-volatile or only minimally volatile; and
- Direct contact, adsorption and/or ingestion are the only significant pathways for human exposure.

Therefore, by installing engineered barriers and eliminating direct exposure to impacted media, the risk to human health and the environment has been substantially eliminated.

The engineered barriers must be maintained in accordance with the following monitoring plan, to keep the impacted fill layer isolated from human and environmental receptors:

1) The new Keith Middle School has been constructed on steel H-piles, with the base of the concrete floor of the school at or near grade. Within the building footprint, a minimum of one foot of clean, imported sand and gravel has been placed on top of the impacted fill. The ground floor of the school consists of a minimum of six inches of poured-in-place reinforced concrete. Prior to placement of the concrete floor, an impermeable elastomeric gas membrane (Liquid Boot®) was applied beneath the floor, as an added precaution to prevent migration of any volatile gases into the building. In addition, a passive vent system has been installed to vent any accumulated gases that may accumulate beneath the Liquid Boot® membrane to the atmosphere.
2) Portions of exterior areas of the school facility are landscaped. All landscaped areas were constructed by removing Site soil to a minimum depth of three feet below final grade, placing a geotextile fabric to demarcate the limits of excavation and to separate residual PCB-impacted soil from clean fill, backfilling with a 6- to 12-inch base of imported clean crushed stone, placing an orange polyethylene mesh warning barrier, followed by 2 to 2 ½ feet of imported clean sandy gravel and topsoil to achieve finished grade.
3) The remaining exterior Site areas are either asphalt or concrete paved. Asphalt has been placed at a minimum thickness of three inches on top of at least two feet of imported crushed stone sub-base underlain by a geotextile fabric. The concrete sidewalks have a minimum thickness of six inches also placed on top of two feet of imported clean crushed sub-base, gravel and geotextile fabric.

In combination, these three barriers (building floor, landscaping, and exterior asphalt and concrete pavement) represent the cap for the school facility, the purpose of which is to prevent human exposure in accordance with the requirements of 40 CFR 761.61(a)(7).

7.2 Cap Maintenance

The following activities are required to maintain the integrity of the cap. The City of New Bedford will be responsible for the performance of these cap maintenance and inspection activities as described herein.

In the event that activities prohibited in this section must be undertaken, a Massachusetts Licensed Site Professional must be involved to direct and oversee the activities.

A. Maintain all asphalt pavement, concrete pavement, and sidewalks such that the integrity of each is not compromised. This will include:

   1) If replacement of asphalt surfaces, concrete pavement and/or sidewalks is required, it will be limited to the material to be replaced such that the underlying soil is not significantly disturbed (soil six inches deep or less below the bottom of surface being removed) and the surface material is repaired or replaced with a comparable barrier within 72 hours;
   2) Prohibition against any excavation to a depth greater than two feet beneath paved areas;
   3) Prohibition against any activities that result, or could result, in compromising the structural integrity of asphalt pavement, concrete pavement, or sidewalks; and
   4) Any damage to pavement, whatever the cause, must be repaired immediately to substantially restore the cap to its original design condition.

B. Maintain all interior building floors such that the integrity of each is not compromised. This will include:

   1) Prohibition against removal of building floor slab that would expose underlying impacted soil (Note that a minimum of one foot of clean compacted granular fill directly underlies the concrete slab);
   2) Prohibition against any penetration or breaching of the vapor barrier beneath the building floor;
   3) Prohibition against any excavation beneath building floors;
   4) Prohibition against any activities that result, or could result, in compromising the structural integrity of building floors; and
   5) Any damage to interior building floors, whatever the cause, must be repaired immediately to substantially restore the cap to its original design condition.

C. Maintain all landscaped areas such that exposure to underlying impacted fill is prevented. This will include:

   1) If vegetation is to be planted or removed, excavation for planting and/or removal of existing root systems shall not extend beyond one foot below existing grade;

2) Prohibition against any excavation to a depth greater than two feet in landscaped areas;
3) Prohibition against any activities that result, or could result, in the erosion of soil in any unpaved area;
4) Prohibition against planting any deep-rooted vegetation (i.e., with roots typically extending greater than two feet below grade); and
5) Prohibition against any permanent removal of overburden soil that reduces the depth of clean fill over the residual PCB-impacted soil to less than three feet.

Particular attention is drawn to the following best management practices:

- Performance of frequent and short watering of landscape vegetation to encourage shallow root growth is recommended.
- Any deep-rooted species identified in the landscaped area during routine inspections shall be immediately removed.
- Regular mowing of lawn areas to discourage deep rooted vegetation and minimize the establishment of habitat for burrowing animals.

7.3 Cap Inspections

The City of New Bedford will perform regular inspections and associated record keeping activities to confirm that the cap is being properly maintained to prevent exposure to the impacted fill beneath. During every year, the cap shall be inspected three times: one inspection between April 1 and 15; one inspection between August 1 and 15, and one inspection between November 1 and 15.

The inspection will consist of a walking traverse of the entire Site such that visual observation of the entire cap (concrete and asphalt pavement, building floors, and landscaping) is made. The inspection will be made by a competent person designated by the City of New Bedford. The City will provide the name, title, and phone number of this person to EPA. The City will also inform EPA when a new person is designated. The inspections will be made at regular three month intervals. Any area of the pavement, building floors, or landscaping that are determined during the inspection to be unacceptable will be noted on an inspection form and photographically documented. Upon completion of the repair of the unacceptable area, a follow up confirmatory inspection of the repaired area will be made and documented on the inspection form with accompanying photograph of the repaired area. Refer to Appendix F for a copy of the Cap Inspection Form.

Examples of general guidelines for conditions that the inspector will record and photograph as unacceptable include:

- Any breach or other significant damage or deterioration in pavement or building floors other than minor cracking typically associated with horizontal concrete surfaces;
- Cracks in concrete or asphalt paving greater than ¼-inch width;

- Localized subsidence or heaving of asphalt surface(s) with a vertical displacement of greater than one inch;
- Gap between edge of concrete or asphalt and building wall or other abutting stationary feature of greater than ½-inch;
- Spalling or other deterioration of concrete resulting in a loss of greater than ½-inch thickness;
- Any other general deterioration of or damage to asphalt or concrete pavement that is allowing, or if unrepaired could allow, contact with soil below;
- Erosion in landscaped area resulting in the loss of more than one inch of soil;
- Dead vegetation, if such vegetation is required for erosion control; and/or
- Evidence of unauthorized excavation.

In addition to the list above, the inspector will use good judgment in the evaluation of the acceptability of the condition of the cap, and the need to identify these or other problem conditions requiring additional maintenance or repair.

7.4 Deed Restriction

The above maintenance requirements will be recorded in a Notice of Activity and Use Limitation (AUL) on the property deed(s) at the Bristol County Registry of Deeds. The AUL will be prepared and filed in accordance with the requirements of the Massachusetts Contingency Plan 310 CMR 40.0000 and within 60 days of the EPA's acceptance of the AUL. The AUL will be maintained, and the Cap Monitoring Plan will continue to be implemented, in perpetuity, or until such time as additional response actions allow the modification or removal of the AUL and Cap Monitoring Plan in accordance with all applicable laws and regulations in force at the time; or until such time that the EPA and the DEP determine, in writing, that such activities are no longer necessary.

7.5 Soil Management Plan

A Soil Management Plan must be prepared by a Massachusetts Licensed Site Professional (LSP) and implemented prior to the commencement of any activity which is likely to disturb impacted soil, the top of which is located at one and a half to four feet below surface grade within the AUL area. The Soil Management Plan should describe appropriate soil excavation, handling, storage, transport, and disposal procedures and include a description of the engineering controls and air monitoring necessary to ensure that workers and receptors in the vicinity are not affected by fugitive dust or particles. On-Site workers must be informed of the requirements of the soil management plan, and the Plan must be available on-Site throughout the course of the project.

7.6 Health and Safety Plan

A Health and Safety Plan must be prepared by a certified Industrial Hygienist or other qualified individual sufficiently trained in worker health and safety requirements and implemented prior to the commencement of any activity which is likely to disturb impacted soil, the top of which

is located at one and a half to four feet below surface grade within the AUL area. The Health and Safety Plan should specify the type of personal protection (i.e., clothing, respirators), engineering controls, and environmental monitoring (if any) necessary to prevent worker exposures to impacted soil through dermal contact, ingestion, and/or inhalation. Workers must be informed of the requirements of the Health and Safety Plan, and the plan must be available on-Site throughout the course of the project.

7.7 Record Keeping

The City of New Bedford will maintain all records pertaining to cap maintenance and inspection for a minimum of twenty years from the date of generation of each document.

7.8 Reporting

The City of New Bedford will communicate the results of the tri-annual cap inspections by submitting copies of each completed Cap Inspection Form to EPA within one month of each inspection. If any necessary repairs and the subsequent follow-up inspection are completed such that the initial Cap Inspection Form and the follow up Cap Inspection Form documenting the repair are completed within one-month, both forms will be submitted concurrently. If the repair and subsequent follow-up inspection are not completed within one month, the initial Cap Inspection Form describing the unacceptable condition (including photographs) will be submitted to EPA along with a cover letter providing the schedule for completion of the repair. The follow up Cap Inspection Form will subsequently be submitted to EPA no later that one-month after completion of the repair.

8.0 Communication Plan

All activities described herein will result in written documentation submitted to EPA. The submittals received by these government agencies will be considered public information, and as such will be available for review by all interested parties. To increase the ease of access to site maintenance and monitoring information, all written submittals will be concurrently submitted to the McCoy Field/Keith Middle School document repository maintained by the City of New Bedford at the New Bedford Public Library. The City will provide access to all MMIP results by posting the results on the City of New Bedford website. The City will also evaluate other methods for providing public notice and communication of MMIP activities and results to the public.

9.0 Training

The City of New Bedford will provide worker training, the purpose of which will be to educate appropriate School employees (e.g., facilities, maintenance, landscaping personnel, etc.) on the background, contents, and requirements of the Activity and Use Limitation and the MMIP. The specific topics to be covered will include:

- The location of impacted soil at the Site;
- The purpose of the AUL;
- What work is allowed under the AUL;
- What work is not allowed under the AUL;
- When an LSP should be contacted;
- Conducting the inspections required under the MMIP; and
- Summary of air, groundwater, foundation vent, and annual wetland sediment sampling.

Each employee will receive a Certification of Training upon completion of the training session. The School Department will provide each existing employee with this worker training within 30 days of the employee beginning work at the new Keith Middle School. The School Department will provide new employees at the new Keith Middle School with this worker training within 30 days of employment. All applicable employees will subsequently receive annual Refresher Training each year on or near the anniversary of the initial training. The City will maintain a copy of all training records, including training sessions, employee names, etc., for a minimum of five years from the time of generation.

10.0 Amendments to MMIP

In consideration of analytical results compiled under this MMIP, modifications to future monitoring requirements may be proposed to the U.S. EPA by an LSP retained by the City. No modifications to the MMIP will be implemented until written approval of such modifications is received by the City from the U.S. EPA.

CAP INSPECTION FORM
KEITH MIDDLE SCHOOL

Use this inspection form to document cap inspections. If unacceptable conditions are observed, complete an additional form immediately after repairs are completed.

Inspection Date: _____ **Inspection By:** _____

A. ASPHALT AND CONCRETE PAVING - observe asphalt and concrete paving for cracking, holes, asphalt removed during construction, other damage.

All asphalt and concrete paving acceptable? ☐ **YES** ☐ **NO**

If no, attach photograph ☐

If no, describe unacceptable condition:

Location _____

Condition _____

_____

_____

Describe any repairs to asphalt and/or concrete paving conducted since previous inspection:

_____

_____

_____

All repairs adequate? ☐ **YES** ☐ **NO** **Photograph of repair attached** ☐

B. INTERIOR CONCRETE FLOORS - observe concrete for cracking, holes, concrete removed during construction, other damage.

All interior concrete floors acceptable? ☐ **YES** ☐ **NO**

If no, attach photograph ☐

If no, describe unacceptable concrete:

Location _____

Condition _____

_____

Describe any repairs to interior concrete floors conducted since previous inspection:

_____

_____

All repairs adequate? ☐ **YES** ☐ **NO** **Photograph of repair attached** ☐

C. LANDSCAPING - observe landscaping for erosion, animal holes, excavation, erosion control vegetation health.

All landscaped areas acceptable? ☐ **YES** ☐ **NO**

If no, attach photograph ☐

If no, describe unacceptable condition:

Location _____

Condition _____

_____

_____

Describe any repairs to landscaping conducted since previous inspection: _____

_____

_____

_____

All repairs adequate? ☐ **YES** ☐ **NO** - **Photograph of repair attached** ☐

D. Areas Not Inspected:_____

Reason:_____

_____

Additional Notes:_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

WETLAND SEDIMENT INSPECTION FORM
KEITH MIDDLE SCHOOL

Use this inspection form to document annual inspections. If unacceptable conditions are observed, complete an additional form immediately after repairs are completed.

Inspection Date: _____ **Inspection By:** _____

A. SLOPE BETWEEN SCHOOL AND WETLAND -

Is slope condition acceptable? ☐ **YES** ☐ **NO**

(Look for dumped debris or waste; stained soil; erosion of soil on slope leading down to wetland; subsidence or slumping of greater than two inches of soil on slope; dead vegetation, if such vegetation is required for erosion control; animal burrows; and/or evidence of unauthorized excavation)

If no, attach photograph ☐

If no, describe unacceptable condition:

Location _____

Condition _____

_____

Describe any repairs to slope conducted since previous inspection:

_____

_____

_____

All repairs adequate? ☐ **YES** ☐ **NO** **Photograph of repair attached** ☐

B. WETLAND -

Is wetland condition acceptable? ☐ **YES** ☐ **NO**

(look for dumped debris or waste, stained soil, visible accumulation of mineral sediment in wetland, and/or evidence of unauthorized excavation)

If no, attach photograph ☐

If no, describe unacceptable condition:

Location _____

Condition _____

_____

Describe any repairs to wetland conducted since previous inspection:

_____

_____

All repairs adequate? ☐ **YES** ☐ **NO** **Photograph of repair attached** ☐

TABLE OF CONTENTS

1.0 Introduction 1

1.1 Background 1

2.0 Indoor Air Monitoring 3

2.1 Air Sampling Procedures 3
2.2 Sample Locations 4
2.3 Analytical Parameters 4
2.4 Quality Assurance/Quality Control 5
2.5 Action Levels 5
2.6 Reporting 7

3.0 Groundwater Monitoring 9

3.1 Groundwater Sampling Procedures 9
3.2 Sample Locations 9
3.3 Analytical Parameters 9
3.4 Quality Assurance/Quality Control 10
3.5 Action Levels 10
3.6 Reporting 10

4.0 Foundation Vent Air Monitoring 12

4.1 Air Sampling Procedures 12
4.2 Sample Locations 12
4.3 Analytical Parameters 13
4.4 Quality Assurance/Quality Control 13
4.5 Action Levels 14
4.6 Reporting 15

5.0 Wetland Sediment Inspection and Monitoring 17

5.1 Wetland Sediment Inspection 17
5.2 Sediment Sampling Procedures 17
5.3 Sample Locations 18
5.4 Analytical Parameters 18
5.5 Quality Assurance/Quality Control 18
5.6 Action Levels 19
5.7 Reporting 19

6.0 Laboratory QC & Data Usability 21

6.1 Laboratory Quality Control Requirements 21
6.2 Laboratory Data Management and Documentation 22
6.3 Assessment and Response Actions 23
6.4 Data Validation and Usability 23

7.0 Long-Term Cap Monitoring Plan 26

7.1 Background 26
7.2 Cap Maintenance 27
7.3 Cap Inspections 28
7.4 Deed Restriction 29
7.5 Soil Management Plan 29
7.6 Health and Safety Plan 29
7.7 Record Keeping 30
7.8 Reporting 30

TABLE OF CONTENTS

8.0 Communication Plan 31

9.0 Training 32

10.0 Amendments to MMIP 33

Table of Contents

Figures

Figure No.	Description
1	Site Location Map
2	Foundation Vent Stack Identification Plan
2	Site Topographic Plan (1” = 40’)

Appendices

Appendix	Description
A	Approval for Risk-Based PCB Cleanup and Disposal under 40 CFR §761.61(c)
B	Sampling & Analytical Procedures
	B1 Air Sampling Protocols
	B2 EPA TO-4A, TO-10A, & TO-15 Methods
	B3 Analytical Detection Limits
	B4 Laboratory Standard Operating Procedures
C	Risk-based Air Concentration Calculations
D	TELs and AALs
E	MCP Groundwater Standards
F	Inspection Forms
G	Sediment Sampling Protocol

Figures

Figure 3

[To be inserted upon completion of site features yet to be installed, including paving, landscaping, and groundwater monitoring wells]

Appendix A

Approval for Risk-Based PCB Cleanup and Disposal under 40 CFR §761.61(c)

Appendix B

Sampling & Analytical Procedures

Appendix C

Risk-based Air Concentration Calculations

Appendix D

TELs and AALs

Appendix E

MCP Groundwater Standards

Appendix F

Inspection Forms

Appendix G

Sediment Sampling Protocol

Appendix B1

Air Sampling Protocols

Appendix B2

EPA Toxic Organics in Air Methods TO-4A, TO-10A & TO-15

Appendix B3

Laboratory Analytes and Reporting Limits

Appendix B4

Laboratory Standard Operating Procedures