

Procedures for Environmental Data Collection and Monitoring Well Management on MBTA-Owned Property

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Table of Contents

1.0	Introduction	1
1.1	Background	1
1.2	Objective.....	1
2.0	Pre-Investigatory Activities	2
2.1	Notification to MBTA and Obtaining Property Access.....	2
2.2	Permits.....	2
2.3	Utility Clearance.....	3
2.4	Health and Safety.....	3
2.5	Qualified Personnel	3
3.0	Soil Boring Advancement and Monitoring Well Installation	4
3.1	Soil Boring Advancement	4
3.2	Monitoring Well Installation.....	4
3.3	Management of Investigation-Derived Waste	5
3.4	Investigation Logs and Construction Diagrams.....	5
3.5	Well Completion Reports.....	5
3.6	Environmental Data Collection - Minimum Requirements.....	5
4.0	Post Installation Activities	6
4.1	Seasonal or Multiple Data Collection Events	6
4.2	Data Transmittal and Tracking.....	6
5.0	Seasonal Monitoring Well Maintenance/Inspections	6
5.1	Inspections and Well Security.....	6
6.0	Monitoring Well Abandonment	7
6.1	Abandonment Procedure	7
	Appendix A: References	9
	Appendix B: Environmental Data Tracking Application Flow Chart	11
	Appendix C: Pre-Investigation Checklist	12
	Appendix D: Monitoring Well Installation Flow Chart	13
	Appendix E: Monitoring Well Completion and Inspection Tables	15
	Appendix F: Monitoring Well Decommissioning Specification	17

1.0 Introduction

1.1 Background

The Massachusetts Bay Transportation Authority (MBTA) owns and controls various properties throughout the Commonwealth of Massachusetts, including but not limited to, active and inactive railroad right-of-ways. The MBTA may undertake the assessment of potential releases of oil and/or hazardous materials (OHM) on their property or properties proposed for acquisition. From time to time, third parties may also request the MBTA's permission to collect subsurface data on MBTA-owned property for environmental and geotechnical studies. The MBTA understands that the data collected from these investigations often serves an important role in facilitating design and construction or achieving regulatory compliance.

Subsurface data collection typically involves the advancement of soil borings; monitoring wells and/or test pits but may entail other investigatory methods. Soil borings or test borings are typically advanced with a drill rig to obtain soil samples or cores for evaluation. They may also be advanced as a means of installing groundwater monitoring wells. Monitoring wells (or piezometers) are typically used to monitor subsurface water in the saturated zone for purposes including:

- Determination of groundwater quality,
- Determination of groundwater elevation,
- Groundwater flow direction and velocity,
- Geochemical monitoring,
- Groundwater extraction and treatment, and
- Permeability tests.

Soil borings, test pits or trenches may be advanced to:

- Obtain soil samples and observe soil types and stratigraphy;
- Determine the potential presence of fill or other structures such as former tanks; and/or
- Conduct soil evaluations such as percolation tests.

1.2 Objective

The objective of this manual is to provide guidance to parties conducting soil boring advancement and monitoring well installations and associated data collection on MBTA-owned property. This guide will also focus on future obligations associated with groundwater monitoring wells, as these are semi-permanent features for which the MBTA requires proper documentation, maintenance and eventual abandonment. State and Federal regulatory programs such as the Massachusetts Department of Environmental Protection (MassDEP) and the Environmental Protection Agency (EPA) have provided standards and specific requirements, which are referenced in this manual. State-specific guidance is also included in the 1991 MassDEP Policy titled *Standard Reference for Monitoring Wells* (WSC-310-91) and 1999 MassDEP Policy titled *Small Diameter Driven Wells Supplement*. Additional state and federal sources referenced in this report are

included in **Appendix A**. Finally, the parties conducting the boring advance or well installations will be required to utilize MBTA's Environmental Data Tracking Application for data entry and submittal purposes but elements of this manual may be implemented manually prior to this system's availability. The Environmental Data Tracking Application can be accessed via MBTA's Landtracker GIS based property management database and protocol associated with MBTA's Environmental Tracking Application will be provided to each party prior to commencing the work. A flow chart depicting the utilization of the Environmental Data Tracking Application is included as **Appendix B**.

2.0 Pre-Investigatory Activities

2.1 Notification to MBTA and Obtaining Property Access

The MBTA point of contact for planning subsurface environmental investigations is:

Site Remediation Specialist (currently Debra Darby)
Phone: (617) 222-3169
Email: DDarby@MBTA.com
Address: 10 Park Plaza, Suite 6720, Boston, MA 02116

Once parties are authorized to conduct the soil boring advance and/or monitoring well installation, the MBTA must be notified when submitting a scope of work for review or at least two weeks (10 business days) in advance of conducting soil borings, monitoring wells, test pits or other subsurface investigation activities. Personnel conducting investigative activities are required to provide this notification on a completed Pre-Investigation Checklist to the MBTA contact referenced in **Section 2** indicating that all the procedures provided in the following sections have been conducted. The checklist is provided as **Appendix C** which can be utilized manually until the Environmental Data Tracking Application is operational. A process flow chart for the general protocols and order to be followed to conduct soil boring advance and/or monitoring well installation on MBTA property is included as **Appendix D**.

As detailed in the flow chart included as **Appendix B**, MBTA personnel will review the checklist and provide any special restrictions or requirements for the event at least one week prior to the scheduled start date. The MBTA has the right to reject requests for investigations if the checklist is incomplete.

Please note that approval for conducting subsurface investigations does not constitute approval to gain entry to active railroad right-of-ways. Licenses for Entry, Insurance and Flagging Protection can only be granted by the railroad operator. Other requirements such as railroad worker protection training may also be required.

2.2 Permits

The contractor and/or consultant is responsible for identifying all applicable permits, licenses, professional registrations, rights-of-entry, and applicable state and local regulatory procedures for conducting subsurface explorations on MBTA-owned property. The completion and submittal of these items to state and local authorities should be finalized prior to the investigation and should be coordinated between the contractor and/or consultant. Local permits pertaining to

investigations may include monitoring well permits (typically issued by Board of Health), which vary by municipality.

2.3 Utility Clearance

Prior to conducting subsurface activities at an MBTA-owned property, the contractor and/or consultant must identify and locate all underground utilities and other subsurface features that could obstruct or be damaged during the investigation. Dig Safe® must be contacted in addition to relevant local municipalities for utility mark-outs. Due to the potential presence of utilities and potential challenges that may be encountered during investigations at a property, pre-clearing using "soft dig" techniques, also known as vacuum excavation, may be needed to prepare for subsurface explorations. Overhead utilities should also be taken into consideration with respect to the clearance required by the equipment being used. The acceptability of the location of test pits or other subsurface explorations relative to the tracks and operations will be dictated by the MBTA. Soil borings or monitoring wells, including the position of the equipment/machinery must be placed at the minimum required safe clearance distances from the center line of track as required by the MBTA and/or track operator and as directed by flagmen when working on active track.

2.4 Health and Safety

Subsurface exploration on MBTA-owned property shall be conducted in accordance with local, state and federal worker safety regulations. A Site-specific health and safety plan (HASP) should be prepared and made available on-Site during all activities conducted by the contractor/consultant. The HASP typically outlines procedures, guidelines, and hazard assessment. The HASP should be prepared in accordance with applicable Occupational Safety and Health Administration (OSHA) standards, which may include 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response (HAZWOPER). Work performed on contaminated sites should be performed by OSHA 40-hour trained workers and a designated staff member should serve as the site safety and health officer (SSHO). The HASP should also consider the potential for encountering hazards specific to the railroad right-of-way.

As noted in **Section 2.1**, the consultant and their contractor may also be required to obtain railroad worker protection training and a flagger for working near an active railroad right-of-way.

2.5 Qualified Personnel

Workers who perform work on a contaminated site are required to have OSHA 40-hour training with annual refresher training as previously mentioned in **Section 2.4 and other**. Contractors should hold the appropriate licenses and permits required for operating their equipment. Furthermore, any driller installing groundwater monitoring wells on a MBTA property shall be

certified by the MassDEP to supervise the drilling, altering, or decommissioning of wells in Massachusetts.

3.0 Soil Boring Advancement and Monitoring Well Installation

3.1 Soil Boring Advancement

All equipment should be inspected and be in good working order prior to initiating work. During drilling activities, drilling equipment may need to be decontaminated in situations where contamination could be spread via augers, drill rig tires or tracks and other equipment. All materials introduced into the boring during drilling activities should be free of chemicals or other contaminants that could compromise the monitoring well or surrounding aquifer.

Soil borings or monitoring wells, including the position of the equipment/machinery must be placed at the minimum required safe clearance distances from the center line of track as required by the MBTA and/or track operator and as directed by flagmen when working on active track. Borings and monitoring wells should be at least five (5) feet from any standard utility marking and at least 10 feet from any high capacity transmission lines such as high pressure gas lines, high voltage electric lines, large diameter water lines, telecommunication and/or fiber optic lines, and oil pipelines.

3.2 Monitoring Well Installation

The diameter of monitoring wells may vary depending on need (groundwater measurement, product recovery/treatment, etc.). Monitoring well casing and screen materials should be constructed from materials that will maintain their structural integrity and durability in the environment of which they are used over their operating life until the well is decommissioned. It is recommended that PVC or stainless steel be used. The well screen is typically set at a depth interval capable for defining gradient or detecting floating phases but may be altered depending on the project objective and/or contaminant type.

Monitoring wells should be completed with an above ground stick-up casing or a flush-to-ground roadbox. All efforts should be made in order to prevent infiltration of surface runoff into the well and to prevent accidental or intentional damage to the well. Immediately after the installation of the well, it is common practice to develop the well by using a pump to remove silt and sediment. Well placement can greatly aid in the longevity of wells by avoiding active roadways subject to traffic and plowing, raised areas to avoid ponding, and in locked or secure areas to avoid tampering.

Any equipment used for well development should be decontaminated between wells to prevent the spread of contamination. Monitoring wells installed on MBTA-property must not be used for irrigation or drinking water purposes. Each well should be properly secured as noted in **Section 5.2.**

3.3 Management of Investigation-Derived Waste

At the conclusion of soil borings, test pits, and monitoring well installation, excess soil or water generated during the event that exhibits evidence of OHM impacts should be properly managed and disposed which may include containerizing and off-Site removal or in some instances, may be backfilled and re-used on site at the discretion of MBTA.

As specified in the Massachusetts Contingency Plan (MCP) section 310 CMR 40.0045(7), wastewater or groundwater collected during well development, purging, or sampling can be discharged to the ground subsurface at the point of withdrawal or at a point upgradient of the point of withdrawal if the concentrations of any oil and/or hazardous materials in the groundwater at the point of discharge are equal to or greater than the concentrations of oil and/or hazardous material in the wastewater.

3.4 Investigation Logs and Construction Diagrams

During the advancement of subsurface assessment explorations, soil samples may be collected and logged for lithologic description. Records of each investigation (including test pit, soil boring and/or monitoring well) should be documented on prepared forms or in a field notebook. The notes should contain plan and profile sketches of the materials encountered, their depth and distribution, and if necessary, sample locations. If hazardous materials are encountered, the records should also show safety and screening information as mentioned in Section 3.1-2.31 of MassDEP WSC-310-91. The MBTA will require submission of these records by the consultant and/or contractor at the conclusion of field activities via the MBTA's Environmental Data Tracking Application as detailed in **Section 3.6**.

3.5 Well Completion Reports

In accordance with 310 CMR 46.03(3) of the MCP, the certified well driller who provided supervision on drilling of a well shall be required to submit a report to MassDEP and to the municipal board of health within 30 days of well completion. For installation of groups of monitoring wells, the certified well driller shall submit one well completion report containing data on a typical well and noting the number of wells installed in the group, unless individual well completion reports are required by the municipality. A copy of the well completion report shall also be uploaded to the Environmental Data Tracking Application.

3.6 Environmental Data Collection - Minimum Requirements

MBTA requires the party conducting subsurface environmental sampling to collect and submit at a minimum, the following information to MBTA's Environmental Data Tracking Application:

- GPS (in decimal degrees)
- Depth (feet from grade)
- Refusal (if encountered)
- Depth to Water (feet from grade, if encountered)
- Surface Completion (i.e., road box, stick up casing, or backfill type and surface repair)

During the installation of the subsurface data point (i.e. test pit, well, etc.) information on the Monitoring Well Data Entry Sheet should be collected for each well installed on the property. This information shall be inputted into MBTA's [Environmental Data Tracking Application](#) to ensure proper tracking of the well. A sample Monitoring Well Data Entry Sheet is provided as **Appendix C**.

4.0 Post Installation Activities

4.1 Seasonal or Multiple Data Collection Events

Should environmental data collection require seasonal or repeat events, the Pre-Investigation Checklist included as **Appendix C** must be completed again and notification to MBTA completed. This process is detailed in the flow chart provided as **Appendix B**.

4.2 Data Transmittal and Tracking

All analytical data obtained from the groundwater monitoring wells previously installed at the MBTA property shall be uploaded to the [Environmental Data Tracking Application](#) in Microsoft® Excel and/or PDF format. Such information includes:

- Date of sampling or gauging,
- Groundwater analytical data,
- Groundwater gauging data (including the datum used for reference), and
- Groundwater gradient maps (if generated).

5.0 Seasonal Monitoring Well Maintenance/Inspections

5.1 Inspections and Well Security

Proper well maintenance and security is required per the MCP, Section 310 CMR 40.0028. The structural integrity of a monitoring well must be maintained in order to ensure that no surface water and contaminants can enter the well and impact groundwater. As such, annual well inspections are required in order to adequately document the conditions of the wells. Inspections should be conducted annually and any problems identified during the inspection should be adequately documented. Problems that could be encountered during an inspection could include, but are not limited to the following:

- Cracked well casing
- Broken, damaged, or missing well cap or lock
- Missing road box
- Poor visibility; overgrown vegetation surrounding the well
- Settling and/or cracking around the well

If any of the above issues or any other issues that could compromise the structural integrity of a well are identified during an inspection, appropriate steps should be taken to correct the issue promptly. This information should be collected for each well inspected and inputted into MBTA's

Environmental Data Tracking Application as described in **Appendix B** to ensure proper tracking of the well.

Proper well maintenance and security is required by the MCP, Section 40.0028. All monitoring wells installed on a MBTA property should be inaccessible to the public, with some form of lock present. This is to prevent unauthorized entry into the well and any damage which could occur from misuse of the well. Monitoring wells with flush-mounted surface completions are commonly protected with a bolt associated with a monitoring well key and/or several bolts requiring additional equipment to remove. A monitoring well inspection checklist is provided as **Appendix E**.

If any of the above issues or any other issues that could compromise the structural integrity of a well are identified during an inspection, appropriate steps should be taken to correct the issue promptly. This information should be collected for each well inspected and inputted into MBTA's Environmental Data Tracking Application to ensure proper tracking of the well.

6.0 Monitoring Well Abandonment

6.1 Abandonment Procedure

All groundwater monitoring wells to be decommissioned should be in conformance with MassDEP policy No. WSC 310-91: *Standard Reference for Monitoring Wells* and the specification included as **Appendix F**. Generally, decommissioning of monitoring wells shall include the physical removal of the protective road box/stand pipe and the top three or four feet of the casing. In cases where the original well did not have an adequate seal in the annular space outside the well casing, the remaining well casing can be destroyed in place or pulled out of the ground. In situations where the annular space contains an adequate seal, the well can be sealed with a bentonite/cement grout mixture. More detail regarding well decommissioning procedures and diagrams is found in Section 4.6 of Policy No. WSC 310-91. Appropriate personnel are responsible for returning to the Site no sooner than 24 hours after the completion of the well abandonment in order to confirm that concrete and/or asphalt have set properly.

Following completion of the monitoring well decommissioning event, the well abandonment contractor must prepare a complete and accurate record of the decommissioning procedure to be submitted to MBTA. The installation and decommissioning of monitoring wells is governed by 310 CMR 46.00. Well installation and decommission must be documented electronically through MassDEP's eDEP system. At minimum, the following items shall be included in the report:

- Name of property owner
- Location of wells abandoned
- Description of wells including well diameter, depth to groundwater, and total well depth
- Type and quantity of sealing materials used
- Method of grout placement
- Date of well abandonment
- Contractor certification and signature

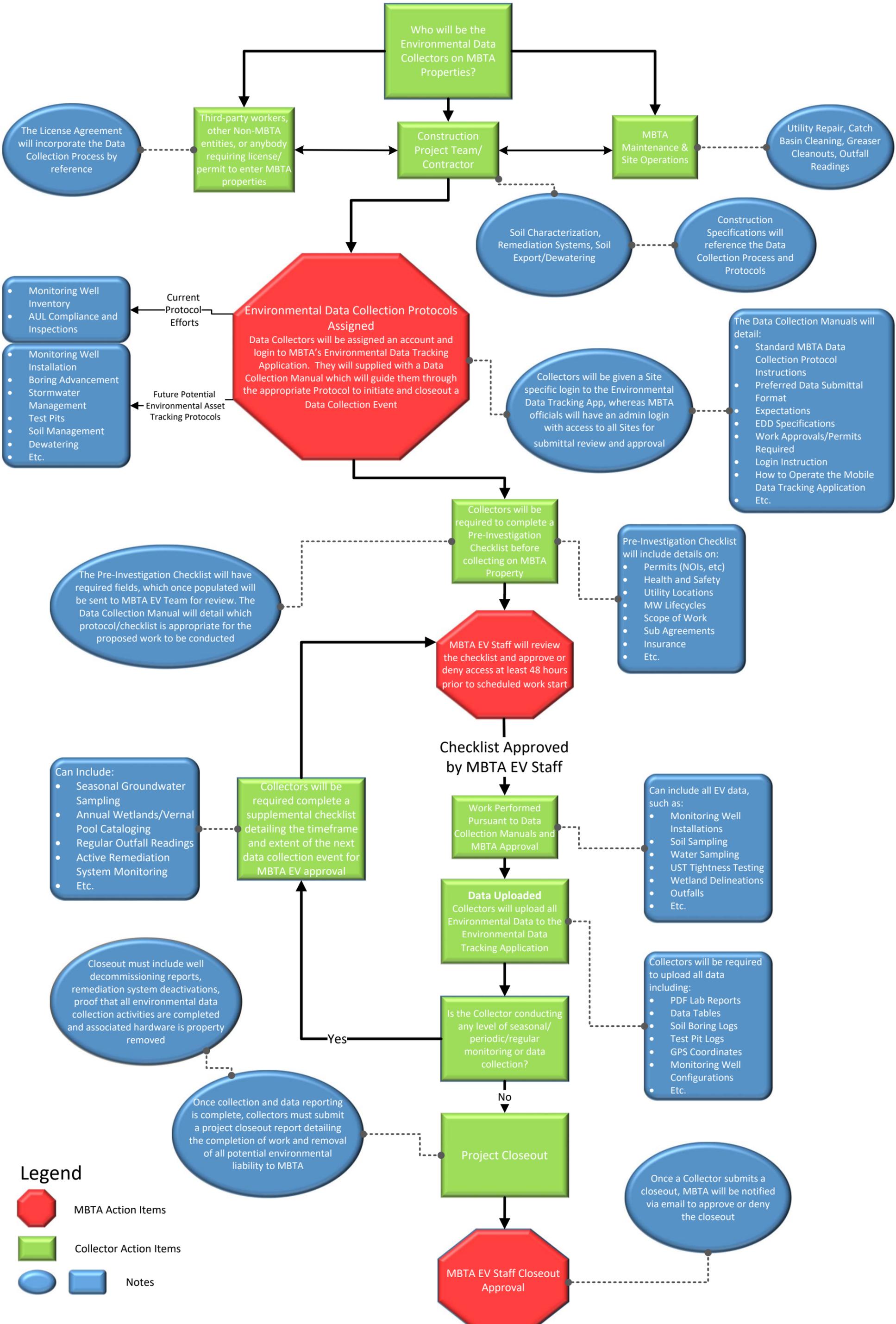
The documentation of the completed eDEP filing should be submitted via MBTA's Environmental Data Tracking Application.

Appendix A: References

1. MassDEP. *Standard References for Monitoring Wells, Policy No. WSC-310-91*, January 1991, <http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/wsc91-310-standard-refs-monitoring-well.html>.
2. MassDEP. *Standard References for Monitoring Wells Small Diameter Driven Well Supplement*, January 1999, <http://www.mass.gov/eea/docs/dep/cleanup/laws/sdwfinl.pdf>.
3. Commonwealth of Massachusetts. *Certification of Well Drillers and Filing of Well Completion Reports, 310 CMR 46.00*, April 2010, <http://www.mass.gov/eea/docs/dep/service/regulations/310cmr46.pdf>.
4. MassDEP. *Well Drillers Program*, <http://www.mass.gov/eea/agencies/massdep/water/drinking/well-drillers-program.html>.
5. EPA. *RCRA Groundwater-Water Monitoring: Draft Technical Guidance*, November 1992, https://www.epa.gov/sites/production/files/2015-06/documents/rcra_gwm92.pdf

Appendix B: Environmental Data Tracking Application Flow Chart

MBTA Environmental Data Collection Process Flow Chart



Legend

- ❖ MBTA Action Items
- Collector Action Items
- ▭ Notes

Appendix C: Pre-Investigation Checklist

PRE-INVESTIGATION CHECKLIST

MBTA Property Address: _____ Date and Time of Investigation: _____

Contractor Overseeing Investigation: _____ Contractor Performing the Work: _____

Property Access/Permits

- Property access granted for scheduled date and time of investigation (keys obtained to locked areas, imperative areas coned off, rights-entry, etc.). MBTA License Number: _____
- Contacted local Department of Public Works (DPW), Board of Health, Department of Engineering, and/or Water Department that all applicable permits required prior to subsurface investigation be completed (sidewalk crossing permit, trench permit, well permit, drilling permit, etc.).
- Notice of Intent submitted.
- Copies of permits/licenses obtained for the property are attached to this checklist.

Utility Clearance

- Dig Safe® ticket obtained for MBTA property with area of investigation clearly marked out on-site. Ticket #: _____
- Additional local municipalities not included on the Dig Safe® ticket member utility list contacted for utility mark-out (Water Department, DPW, Engineering Department, etc.).
Is a municipal water line present?
 Yes No
Is a municipal sewer line present?
 Yes No
Are soft dig/pre-clearing required due to potential presence of utilities?
 Yes No

Health and Safety

- A Site-specific health and safety plan (HASP) has been completed.

Is the Site classified as a hazardous site based on the hazard assessment provided in the HASP?

Yes No

If yes, have all personnel completed the applicable Occupational Safety and Health Administration (OSHA) 40-hour training?

Yes No N/A

Is flagging required based on the location of work within an active railroad ROW?

Yes No

- Railroad safety training obtained if work is within an active railroad ROW.

Scope of Work

Purpose of Work:

- Construction Support/Soil Pre-characterization
- Due Diligence/ ASTM
- MCP Regulatory Obligation

- Installation of borings

- If yes, how many: _____

- Installation of Monitoring wells

- If yes, how many: _____
 - Diameter of wells: _____
 - Anticipated Depth: _____
 - Road Box or Stick-up: _____
 - Anticipated rounds of sampling: _____

- Excavation of Test Pits

Media to be sampled:

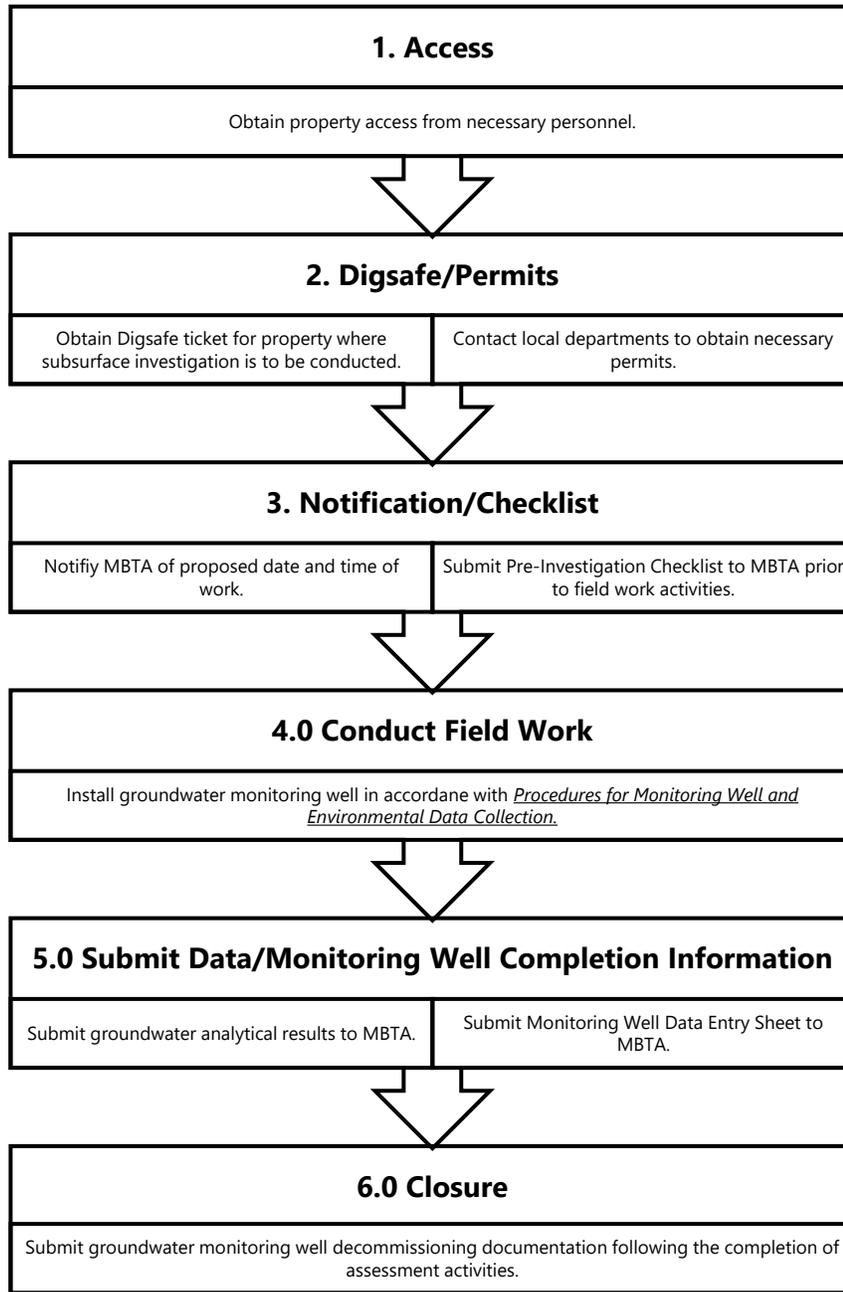
- Soil
- Groundwater
- Sediment
- Air

*Note: All analytical results shall be submitted to MBTA.

Proposed Well Abandonment Date:

Appendix D: Monitoring Well Installation Flow Chart

Protocol for Installing Monitoring Wells on an MBTA-Owned Property



Appendix E: Monitoring Well Completion and Inspection Tables

MONITORING WELL COMPLETION AND INSPECTION TABLES

Monitoring Well Completion	
PARAMETER	RESPONSE
Well ID	
Overburden or Bedrock Well?	
Latitude (Decimal Degrees)	
Longitude (Decimal Degrees)	
Static Water Level (ft.)	
Total Depth (ft.)	
Screen Length (ft.)	
Well Diameter (in.)	
Refusal Encountered	
Depth to Bedrock (if encountered) (ft.)	
LNAPL/DNAPL Present?	
Finish	
Locked?	
Firm Overseeing Well Installation	
Date of Installation	
Inspection Date	
Condition/Comments	

Inspection List	
PARAMETER	COMMENTS
Condition of Well Casing	
Condition of Concrete Collar	
Diameter of Well	
Condition of Surface Seal	
Cap on Riser?	
Standing Water Present?	
Lock Present?	
Stickup or Roadbox?	

Appendix F: Monitoring Well Decommissioning Specification

DECOMMISSIONING OF MONITORING WELLS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1, GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.
- B. All of the following monitoring wells which are located on the SITE require formal decommissioning: [LIST WELLS]. The remaining monitoring wells located on-site will be preserved and modified to match finished grades. All well decommissioning should be in conformance with MassDEP Policy No. WSC 310-91: Standard References for Monitoring Wells. The CONTRACTOR shall furnish and install all materials required to decommission the wells.
- C. Decommissioning of monitoring wells shall include the physical removal of the protective road box and the top three to four feet of the PVC riser pipe and filling of the remaining well section with a bentonite/cement grout mixture.
- D. The CONTRACTOR cannot proceed with the work without Engineer approval.
- E. Demolition of monitoring wells will occur only after specifically directed by Engineer.

1.02 QUALIFICATIONS

- A. The Contractor or subcontractor shall be a registered well driller in Massachusetts who is routinely involved with the installation and decommissioning of monitoring wells or a person knowledgeable with the installation of wells in order to properly decommission the wells.

1.03 PROHIBITIONS

- A. The use of explosives in well-plugging operation is prohibited.

PART 2 - MATERIALS

2.01 GROUT MIX DESIGN

- A. A grout mixture shall be used to decommission each monitoring well. The grout mixture shall be composed, by weight, of 20 parts Portland cement to one part of bentonite, with a maximum of 8 gallons of water per 94-pound bag of cement. The ratio of cement to bentonite shall not exceed 6:1.
- B. Bentonite for grout mixture shall be pulverized, natural Wyoming sodium bentonite containing no additives with a grain size to pass a No. 200 sieve.
- C. Clean sand, gravel, and/or pea stone shall be a uniform gradation.

PART 3 - EXECUTION

3.01 LOCATION AND INSPECTION

- A. Determine the location of all of the abandoned wells.
- B. Obtain accurate information on the well's construction and current condition.
 - 1. Material may be available through the local Board of Health, Department of Environmental Management, USGS Water Resources Division or MassDEP.
- C. Perform a Site inspection to determine the condition of the well(s).

3.03 CLEARING THE WELL

- A. All obstructions, not limited to drop pipes, check valves, pump and other debris must be removed from the well.

3.04 CASING REMOVAL OR DESTRUCTION

- A. Inadequate Seal in annular space outside of the well casing.
 - 1. Original well casing should be destroyed in place or pulled out of the ground.
- B. Adequate Seal in annular space based on As-Built notes and/or records.
 - 1. Insert neat cement grout (or equivalent) into the uncased portion of the bedrock well or the filter pack around the well screen.
 - 2. Terminate well casing at a minimum of 3 to 4 feet below grade.
- C. No annular space around casing.
 - 1. Destroy or remove the casing by over drilling
 - a. Spin the casing over and around the existing observation well.

3.01 GROUT PLACEMENT

- A. The CONTRACTOR shall remove the above top three feet of PVC well riser from the monitoring wells.
- B. Grout slurries must be placed from the bottom to the top and not from the top to the bottom of the well. The grout slurries can not be poured from the surface in to the well.
- C. Grout shall be placed from the bottom to the top by means of a tremie or grout pipe. The pipe shall be lowered to the base of the well and the grout shall be pumped or poured down the tube. The bottom of the grout pipe shall remain submerged in the grout during the grouting operation and raised gradually. Continue grouting until the grout return at the top of the well is of the same consistency as the grout being pumped.
- D. The well shall be grouted to a depth of approximately three to four feet below grade. A concrete seal shall be placed in the remaining three to four feet, as site conditions warrant. The remaining portion of the well shall be filled to grade with materials compatible with the

abutting land surface and properly compacted to minimize subsidence.

- E. The well abandonment contractor must prepare a complete and accurate record of the decommissioning procedure submitted to the ENGINEER. At a minimum, the following items shall be included in the report:
1. Name of property owner
 2. Location of wells abandoned
 3. Description of wells including well diameter, depth to groundwater, and total well depth
 4. Type and quantity of sealing materials used
 5. Method of grout placement
 6. Date of well abandonment
 7. Contractor certification and signature

END OF SECTION