QUALITY ASSURANCE PROJECT PLAN

Prepared for**:**

Review Avenue Development Properties
Long Island City, Queens, New York

Review Avenue Development (RAD) I
37-30 Review Avenue
(BCA # 241089)

and

Review Avenue Development (RAD) II
37-80 Review Avenue
(BCA # 241005)

Submitted to:

New York State Department of Environmental Conservation
Albany, New York

Submitted by:

MACTEC Engineering
MACTEC Engineering and Consulting, P.C. (MACTEC)
511 Congress Street, Suite 200
Portland, Maine 04112

December 2015
Version 1

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MACTEC Environment and Infrastructure

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Kinjal Shah	Christian Ricardi, NRCC-EAC
Project Manager	Quality Assurance Manager

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ARF	Analysis Request Form
ASP	Analytical Services Protocol
ASTM	American Society for Testing and Materials
AVS	Acid Volatile Sulfide
cc	cubic centimeter
CLP	contract laboratory program
COC	chain of custody
DD	Decision Document
DI	deionized
DO	dissolved oxygen
DQOs	Data Quality Objectives
DUSR	data usability summary report
EDD	electronic data deliverable
EDS	Electronic Document Standards
ELAP	Environmental Laboratory Approval Program
FDR	Field Data Record
FOL	Field Operations Leader
ft.	foot/feet
GIS	Geographic Information System
GPR	ground penetrating radar
GPS	Global Positioning System
HASP	Health and Safety Plan
HDPE	high density polyethylene
Hg	mercury
HSA	hollow stem auger
I.D.	inside diameter
ID	identification
K	hydraulic conductivity
L	liter
LCS	laboratory control samples

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

LEL	lower explosive limit
LNAPL	light non-aqueous phase liquid
LTMP	long term monitoring plan
mg	milligram(s)
MGP	maximum allowable gauge pressure
ml	milliliter
MS	matrix spike
MSD	matrix spike duplicate
NAPL	nonaqueous phase liquid
NTU	nephelometric turbidity unit
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O.D.	outside diameter
ORP	oxidation reduction potential
OM&M	Operation, Maintenance & Monitoring
oz.	ounce
PCBs	polychlorinated biphenyls
PID	photoionization detector
PM	project manager
PPE	personal protective equipment
PS	Procurement Specialist
psi	pounds per square inch
PVC	polyvinyl chloride
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	quality assurance project plan
QC	quality control
RAD I property	Review Avenue Development I property
RAD II property	Review Avenue Development II property

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

RCRA	Resource Conservation and Recovery Act
ROD	record of decision
RPD	relative percent difference
RQD	rock quality data
SCGs	standards, criteria and guidance
SDG	sample delivery group
SEM	Simultaneously Extracted Metals
SOP	standard operating procedure
SOW	statement of work
SVOC	semivolatile organic compound
TAL	target analyte list
TC	terrain conductivity
TCL	Target Compound List
TED	Technical Environmental Database
TICs	tentatively identified compounds
µg	microgram
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
VOA	volatile organic analysis
VOC	volatile organic compound
WP	work plan

1.0 PROJECT SCOPE AND GOALS

1.1 PROJECT SCOPE

This quality assurance project plan (QAPP) has been prepared to support remedial action and Operations, Maintenance and Monitoring (OM&M) activities planned at the Review Avenue Development Properties, RAD I and RAD II, Long Island City, Queens, New York (Site). Required field and monitoring activities are described in the Site Management Plans (SMPs) for RAD I and RAD II Separately (MACTEC, 2015). Each SMP includes a Community Air Monitoring Plan Appendix L, and LNAPL and Groundwater Monitoring Requirements for the Site Long Term. This QAPP will be used in conjunction with the SMP to describe quality assurance and quality control (QA/QC) for SMP activities.

The work is being conducted consistent with a Record of Decision (ROD) for RAD II that was issued on February 2007 and a Decision Document (DD) for RAD I approved in December of 2015. The ROD and the DD requires an area-wide light non-aqueous phase liquid (LNAPL) recovery system, a capping system to prevent direct contact with impacted Site soils, and a long term monitoring program (LTMP) to monitor the effectiveness of the LNAPL recovery system. The site remedy is to operate until the remedial objectives have been achieved or until the New York State Department of Environmental Conservation (NYSDEC) determines that continued operation is technically impracticable or not feasible.

This quality assurance project plan (QAPP) was prepared in accordance with the DER-10 Technical Guidance for Site Investigation and Remediation (DER-10) (NYSDEC, 2010). The QAPP addresses remediation and OM&M activities at the Site.

1.2 PROJECT GOALS

Project remediation goals for the Site are stipulated by the DD for RAD I (2015) and the ROD for RAD II dated February 2007. All Site activities are being conducted to achieve these remedial goals and to eliminate or reduce to the extent practicable the migration and exposure to Site related constituents of concern. Further details are provided in the Site SMPs for RAD I and RAD II.

2.0 PROGRAM ORGANIZATION

2.1 ORGANIZATION

MACTEC Engineering and Consulting, P.C. (MACTEC) will complete this project using a multi-disciplinary team-based system. Personnel representing both engineering and scientific disciplines are assigned to this project team. The primary administrative person for the project is the MACTEC Project Manager Kinjal Shah (PM). Task Leaders and key technical staff are assigned to work assignments based on project scope and technical disciplinary needs. The technical staff may include engineers, quality assurance (QA) specialists, geologists, hydrogeologists, physicists, chemists, risk assessors, and data managers.

This portion of the QAPP addresses MACTEC project organization and quality control (QC) coordination and responsibilities. **Table 1** identifies the primary personnel for the overall program organization and principal lines of communication and authority.

Table 1: Project Personnel

Individual	Organization	Title	Responsibility
Bill Weber	MACTEC	Principal Professional	Overall Project Direction
Brent Odell	MACTEC	Engineer of Record	Overall engineering supervision
Tim Kessler	MACTEC	Task Lead	Technical Manager
John Poserina	MACTEC	Quality Assurance Officer	QA/QC Management

2.2 SPECIFIC RESPONSIBILITIES

The responsibilities of the MACTEC project positions and support organizations are summarized below.

Project Manager. The PM, Kinjal Shah, is responsible for day-to-day technical administration of the project and will be the primary contact for the project. The PM will be responsible for:

- Initiating project activities;
- Identifying project staff, equipment, and other resource requirements;
- Managing cost, contractual, personnel, and other administrative matters;
- Providing project work plan (WP) and QAPP to individuals assigned to the project and ensure program procedures are followed;

- Providing health and safety plan (HASP) and project-specific safety documents to individuals assigned to the project and ensure program procedures are followed;
- Monitoring task activities, and adjusting efforts on resources, as required, to help assure that existing budgets, schedules, and work programs are maintained;
- Distributing copies of standard procedures and the project-specific planning documents to all appropriate personnel involved in the project;
- Maintaining project technical and financial records; and,
- Implementing subcontracting as required.

Task Leaders. The Task Leaders for this site are Tim Kessler and Brent O'Dell, P.E., DEE. The Task Leaders are responsible for:

- Implementing technical and engineering services;
- Obtaining copies of the WP and project QAPP, and any other applicable project planning documents, and ensuring implementation of procedures described in these documents;
- Obtaining copies of the project-specific HASP and project-specific safety documents and ensuring implementation of procedures described in these document; and
- Developing the technical approach and level of effort required to address each task/subtask, i.e. the day-to-day conduct of the work, ongoing QC during performance of the work, and the technical integrity of the project work products.

Principal Professional. A key component in the review process is the designation of a Principal Professional that will serve as technical leader for each project. The Principal Professional, William Weber, will provide guidance on the technical aspects of the project. This is accomplished through periodic reviews of the services and objectives of the project. The Principal Professional provides input to project deliverables by conducting technical reviews while work is in progress. The Principal Professional along with the Quality Assurance Officer (QAO) serves as a resource for the PM in evaluating the magnitude of identified QC problems and supporting the development of appropriate corrective action.

Quality Assurance Officer. The QAO, John Poserina, has responsibility for establishing, overseeing, and auditing specific procedures for documenting and controlling analytical and field data quality. Many of the procedures will be implemented by other individuals. The QAO works with the PM, Task Leaders, Site Managers, and the Principal to verify that established protocols are followed.

Responsibilities of the QAO include:

- Overseeing and coordinating analytical work;
- Monitoring the QA and QC activities of the laboratory for conformance with approved policies, procedures, and sound practices, and authorize improvements as necessary;
- Supervising/mentoring project staff on the preparation of data usability summary report and data validation report;
- Informing the PM, Task Leaders, Site Managers, and/or subcontract laboratory management of nonconformance to the approved QC program;
- Completing system audits of field activities;
- Reviewing project records, logs, standard procedures, project plans, and analytical results to verify records are complete and maintained in a retrievable fashion; and,
- Assuring sampling and analysis are conducted in a manner consistent with the WP/QAPP.

2.3 PERSONNEL QUALIFICATIONS AND TRAINING

Assignment of technical staff is completed by MACTEC with regard to appropriate qualifications in the technical areas relevant to the project and any associated QC techniques. Training typically consists of one or more of the following activities:

- Reviewing the QAPP and project SMPs;
- Planning investigation and sample collection procedures;
- Planning QA and QC procedures or activities;
- Establishing documentation and record keeping procedures
- Completing of internal planning meetings; and,
- Reviewing procedures required to complete the remedial tasks and monitoring tasks.

MACTEC personnel involved with hazardous waste site investigations are required to attend an approved 40-hour health and safety course prior to working on hazardous waste sites. In addition, personnel are required to attend annual 8-hour, refresher health and safety training courses.

2.4 SUPPORT SERVICES

MACTEC may retain subcontractors (selected considering price and technical qualifications) to perform specialized services, including laboratory sample analysis, surveying, drilling, or engineering consulting services.

3.0 DATA QUALITY USABILTY OBJECTIVES, SAMPLING PROCEDURES, AND EQUIPMENT DECONTAMINATION

The objectives for remedial action field activities and monitoring activities are described in the Remedial Action Workplan (Golder Associates, 2011). Specific field activities and supporting procedures are summarized in the following sections.

3.1 DATA QUALITY USABILITY OBJECTIVES

The MACTEC project team will incorporate requirements and procedures described in the following documents into their planning documents and technical evaluations of site conditions:

- DER-10 “Technical Guidance for Site Investigation and Remediation”; New York Department of Environmental Conservation; Division of Environmental Remediation; May 2010.
- USEPA 542-S-02-001 “Ground-Water Sampling Guidelines for Superfund and Resource Conservation and Recovery Act (RCRA) project Managers”; United State Environmental Protection Agency (USEPA); Office of Solid Waste and Emergency Response; May 2002.
- 6 NYCRR PART 375 “Environmental Remediation Program”; New York Department of Environmental Conservation; Division of Environmental Remediation; December 2006
- CP-43: Groundwater Monitoring Well Decommissioning Policy New York Department of Environmental Conservation; Division of Environmental Remediation; November 2009.
- Technical and Operational Guidance Series (TOGs) 1.1.1. “Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations”; New York Department of Environmental Conservation; Division of Water; June 1998

3.1.1 Identification Of Project Data Quality Objectives

The objects of the remedial action and monitoring are described in detail in the project WP and are summarized below:

- Removal of recoverable LNAPL at the RAD I and RAD II sites;
- Measurement of LNAPL thickness during scheduled field events;
- Groundwater level measurement and development of groundwater contour maps;

- Groundwater sampling for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals during scheduled field events;
- Well development for wells identified in the monitoring program; and,
- Well abandonment for selected wells.

Project Data Quality Objectives (DQOs) have been established for each particular data collection activity. The DQOs have been established to ensure that data collected can support project-specific decisions. During the development of the project WP, the guidance documents identified in Section 3.1 will be used to establish sampling processes and analytical testing goals. The WP includes detailed descriptions of the following information:

- Project site description, history, and previous investigations/reports
- Site remediation objectives/goals
- Planned activities and sampling objectives
- Summaries of proposed samples for groundwater, as well as sample locations
- Applicable standards, criteria and guidance values for groundwater and soil.

3.2 SAMPLING PROCEDURES

This section of the QAPP describes the following field and sampling procedures:

- Measurement of LNAPL thickness
- Groundwater level measurement
- Groundwater sampling
- Well development
- Well abandonment
- Instrument Decontamination Procedures
- Effluent air sample collection

3.2.1 Measurement of LNAPL

LNAPL measurements will be made in monitoring wells identified in the WP either during monitoring events. LNAPL measurements should be made in monitoring wells where LNAPL is anticipated.

The procedures for water level measurements are:

1. Check the well for proper identification and location.
2. Measure and record the height of protective casing from ground surface to check for settlement or heave.
3. After unlocking the well and removing any well caps, measure and record the ambient and well-mouth organic vapor levels using a PID. This level will be recorded in the field notebook and the appropriate health and safety actions taken, in accordance with the project-specific HASP.
4. Measure and record the distance between the top of the well riser and the top of the protective casing to check for heave or settling.
5. Using an electronic interface probe (or similar measuring device), measure and record the top of the LNAPL and then the static water level in the well to the nearest 0.01 ft. Measurements will be referenced from the top of the well riser, as opposed to the protective casing, when feasible.

All LNAPL and static water level measurements will be recorded, along with the date and time of measurement, in the field notebook. Every well will have a clearly established reference point of known elevation, normally a painted mark on the upper edge of the riser pipe. For events that include groundwater sampling, water level data are recorded on the site forms located in Appendix H of the SMP.

3.2.2 Groundwater Level Measurement

Groundwater level measurements will be made in monitoring wells identified in the WP either during sampling events or separate water level events. Water level measurements in monitoring wells should be made before purging and evacuation for groundwater sampling.

The procedures for water level measurements are:

1. Check the well for proper identification and location.
2. Measure and record the height of protective casing from ground surface to check for settlement or heave.
3. After unlocking the well and removing any well caps, measure and record the ambient and well-mouth organic vapor levels using a PID. This level will be recorded in the

field notebook and the appropriate health and safety actions taken, in accordance with the project-specific HASP.

Using an electronic water level meter (or similar measuring device), measure and record the static water level in the well and the depth to the well bottom to the nearest 0.01 ft. Measurements will be referenced from the top of the well riser, as opposed to the protective casing, when feasible. An interface probe will be used in areas where LNAPLs are anticipated.

All well measurements will be recorded, along with the date and time of measurement, in the field notebook. Every well will have a clearly established reference point of known elevation, normally a painted mark on the upper edge of the riser pipe. For events that include groundwater sampling, water level data are recorded on the site forms located in Appendix H of the SMP. In areas where light non-aqueous phase liquids (LNAPLs) are anticipated or suspected, an interface probe will be used to measure the thickness of free product present as described in Section 3.2.1.

3.2.3 Groundwater Sampling

Sampling of groundwater monitoring wells will proceed from the upgradient or background wells to the downgradient or potentially contaminated wells, as best as can be determined. Wells will be sampled using conventional purging and grab sampling or low flow sampling techniques described in the following sections. The following activities shall be performed immediately prior to purging each well:

1. Check the well for proper identification and location.
2. Measure and record the height of the protective casing above ground surface.
3. After unlocking the well and removing any well caps, measure and record the ambient and well-mouth organic vapor levels using a PID.
4. Measure and record the distance between the top of the well and the top of the protective casing.
5. Using the electronic water level meter, measure and record the static water level in the well and the depth to the well bottom to the nearest 0.01 ft. Measurements will be referenced from the top of the well riser as opposed to the protective casing, when feasible. The point of measurement and the depth to water will be recorded in the logbook and the site forms located in Appendix H of the SMP. The water level meter is decontaminated upon removal

as described in Subsection 3.2.6. In areas where light non-aqueous phase liquids (LNAPLs) are anticipated, an interface probe will be used to measure the thickness of free product present.

6. Calculate the volume of water in the well. Volume in gallons for a well equals 0.041 times the square of the ID of the well riser, in inches, times the depth of water, in ft. Volume calculations are detailed on the site forms.

Groundwater sampling may be conducted using the three purged well volumes method or the low flow purging method, depending on the groundwater conditions in the well to be sampled.

3.2.3.1 Groundwater Sampling Using Three Purged Well Volumes

The following steps outline the purging and sample collection activities for purged well volume sampling.

Upon completion of the measurements and calculations described above, sampling will commence in the sequence listed below, utilizing the appropriate purging technique (1a, 1b, or 1c):

1. Lower the pump intake into the well. For shallow groundwater situations, the pump intake will be lowered to the top of the well screen to begin purging (see Step No. 2). Modifications to this setup may be used in certain situations:

    a. If the well screen is very large, and pumping from the top is impractical, the pump intake will be lowered to the approximate mid-point of the screened portion of the well.

    b. If the well is situated in tight formations such as tills, clays or rock, the purging of the well will be performed from near the top of the well screen. As the water level in the well is lowered by purging, the pump is also lowered.

    c. If the well is in a highly productive aquifer, purging will progress by purging at intervals in the well screen, from the top of the water column downward, to avoid leaving stagnant water in the well.

To avoid aeration of the sandpack, the water level will not be allowed, to the extent feasible, to fall below the top of the filter pack during purging except possibly in tight formations (see 1b above), where purging the well (and sandpack) dry can be unavoidable. The selection of the pump to be used for well purging will be recorded on the site forms located in Appendix H of the SMP.

Considerations in pump selection are depth to water, the level of contamination anticipated, site access, and cost. Readily available choices include peristaltic pumps (good for shallow groundwater depths), disposable submersible pumps, such as a Whale® pump (good for moderate groundwater depths and contamination), and stainless steel/Teflon® submersible pumps, such as the Redi-Flow® (good for most applications). Teflon bailers may also be used (good for shorter water columns).

1. Purge the well. Monitor the field parameters, pH, temperature, turbidity, and specific conductivity, and measure the volume of groundwater being pumped. In situ parameters may be monitored in a beaker filled from the pump discharge or in-line with the pump discharge. Purging of the standing well water is considered complete when any of the following is achieved:
    - A minimum of three well volumes has been purged; and,
    - The well has been pumped dry and allowed to recharge.
2. Record the in situ parameters, temperature, pH, specific conductivity, and turbidity in the field logbook and the site forms located in Appendix H of the SMP.
3. After purging, the pump intake or the bailer will be lowered to the middle of the screened interval or mid-point of the static water level. If the analysis to be performed is for LNAPLs, then the bailer will be lowered to the top of the water column for sample collection.
4. Collect the sample(s). VOC samples are filled directly from a bailer or pump discharge with as little agitation as possible. Other samples can be placed directly into the appropriate container from the bailer or pump discharge.
5. Remove the pump or bailer from the well and decontaminate the pump, tubing or bailer by flushing with the decontamination fluid, or dispose.
6. Complete the site forms after each well is sampled. Include any observations made during sampling such as color, odor, etc., in the field logbook and field sample data record.

7. Secure the well cap and lock.

3.2.3.2 Low Flow Groundwater Sampling.

The following steps outline the purging and sample collection activities for low-flow sampling. Data will be recorded on the site forms located in Appendix H of the SMP. Pumps and probes may differ depending on the well diameter, groundwater constituents and depth to groundwater, but generally, sampling will require the following equipment:

- Peristaltic, bladder or inertial pump capable of a flow rate between 50 and 500 ml/minute and appropriate power supply. The pump type will principally depend on the depth to water and well diameter. Bladder pumps are preferred; peristaltic pumps are acceptable only for wells where the depth to water is less than about 25 ft.; inertial pumps are only recommended for narrow diameter wells that cannot be sampled using a bladder or peristaltic pump.
- Field probe and flow-through cell (e.g., YSI) for measuring pH, temperature, conductance (and/or specific conductance), DO and ORP of groundwater, and a standalone turbidity meter (e.g. Hach).
- Calibration solutions for the field probes
- Water level tape/meter
- Tubing, connections and tools as appropriate
- Graduated cylinder and stopwatch
- Ring stand setup
- 5-gallon bucket and funnel for purge water
- Low flow groundwater FDR
- PPE
- Decontamination supplies (e.g., DI water, Liquinox soap, paper towels)
- Sample containers and cooler (provided by the laboratory)
- Ice for sample preservation
- Clean plastic sheeting, paper towels and miscellaneous supplies

Field parameter measurements shall be made using instrumentation and a commercially manufactured flow through cell. Dedicated high density polyethylene (HDPE) tubing shall be used. Further details on the low-flow purging and sampling procedure are presented in the "Ground-Water

Sampling Guidelines for Superfund and RCRA Project Managers; Ground Water Forum Issue Paper (USEPA, 2002). Sample collection information shall be recorded on the site forms located in Appendix H of the SMP. The USEPA guidance shall be used for purging and sampling procedures only.

Sampling will be conducted using the following procedure:

1. Determine target depth for location of the pump intake. Target depth should be the portion of the screened interval that intersects the zone of highest K. If the zone of highest K is unknown, or if the screen is placed within homogenous material, then the target depth shall be the midpoint of the saturated screen length. Primary flow zones should be identified in wells with screen lengths longer than 10 ft.

2. Measure and record the depth to water. Care should be taken to minimize disturbance of the water column within the well during pre-sample measurements.

3. Decontaminate pump prior to use (if pumps are dedicated then this applies to the initial effort only). Attach appropriate length of dedicated HDPE tubing or mark the tubing at the appropriate point so that when the pump and tubing are lowered into the well, and the mark is at the top of the well riser, the pump shall be located at the target depth within the screened interval.

4. Carefully lower the pump to the predetermined target depth. Start the pump at a purge rate low enough to achieve 0.3 ft. of drawdown or less based on historical data. If sampling the well for the first time, start the pump at the lowest possible setting (or approximately 100-ml per minute) and slowly increase the speed until discharge occurs. Check water level. Adjust pump speed until there is little or no drawdown (less than 0.3 ft.) if possible. If stabilized drawdown cannot be achieved, use the no-purge method described later in this section.

5. Monitor and record pumping rate and water levels every 3 to 5 minutes (or as appropriate) during purging. Record any adjustments to pumping rates.

6. During purging, monitor field parameters using a flow through cell (the flow through cell cannot be used for turbidity measurements and the sample for turbidity measurement must be collected prior to entering the flow through cell). Purging is considered complete and sampling may begin when the field parameters have stabilized. Stabilization is considered

to be achieved when three consecutive readings, taken at 3 to 5 minute intervals, are within the following limits:

- Turbidity (+/- 10% for values >10 NTUs if turbidity is greater than 10 and well is not stable, continue purging well for up to two hours, collect sample and document on field data record and in log book (collection of a filtered sample for metals analysis may be necessary if turbidity is greater than 50 NTUs).)
- DO (+/- 10% for values greater than 0.5 milligram per liter (mg/L). If three dissolved oxygen values are < 0.5 mg/L, consider the values stabilized)
- Specific conductivity (+/- 3%)
- Temperature (+/- 3%)
- pH (± 0.1 unit)
- ORP (± 10 millivolts)

7. The final purge volume must be greater than the stabilized drawdown volume plus the tubing extraction volume.
8. During purging and sampling the tubing should remain filled with water.
9. Disconnect the tubing from the flow through cell to collect the analytical samples. Water samples for laboratory analyses must not be collected after water has passed through the flow through assembly. Fill sample containers directly from the tubing without alterations to the pumping rate.
10. The VOC fraction shall be collected first. The VOC sample container shall be completely filled without air space within the container. The remaining samples shall be collected for PAHs, PCBs, metals, and any other fraction specified in the project-specific FAP for the sample location.
11. For subsequent sampling efforts, duplicate the pump intake depth and final purge rate from the initial sampling event (use final pump dial setting information).
12. If using non-dedicated equipment, remove the pump and decontaminate by flushing with the decontamination fluid specified in Subsection 3.2.7, or dispose. Obtain and record a depth to bottom of well measurement before closing the well.
13. Complete the site forms after each well is sampled. Include any observations made during sampling such as color, odor, etc., in the field logbook and field sample data record.

14. Secure the well cap and lock.

3.2.4 Well Development

Well development is a process of pumping or purging a monitoring well, designed to stabilize and increase the permeability of the filter pack around the well screen and to restore the permeability of the formation. The selection of the well development method will be made by the site hydrogeologist based on the drilling methods, well construction and installation details, and the site geology. New monitoring wells should be allowed to set for a minimum of 24 hours before well development to allow for the seal and grout to set. Any equipment introduced into the well will be decontaminated in accordance with the procedures presented in Section 3.2.7. Water levels will be taken from each well before and after development. To avoid aeration of the filter pack, the water level will not be allowed, to the extent feasible, to fall below the top of the filter pack during development.

Well development may be accomplished using one of several methods including:

- Overpumping, which uses a pump (e.g., submersible or peristaltic) or compressed air (i.e., air lift) to remove water from the well.
- Surge block which uses a plunger, the approximate diameter of the well, to agitate water in and out of the screen. No water is removed from the well.
- Compressed air which develops a well by either backwashing (i.e., forcing water out of the well and reducing pressure to let water flow back in) or surging (i.e., releasing a large volume of air suddenly into an open well below the water table producing a strong surge due to resistance of water head, friction, and inertia). Water is pumped from the well using airlift.

Well development will continue until the turbidity of the discharge water is 50 nephelometric turbidity units (NTUs) or less. Field measurements of turbidity, temperature, pH, and specific conductivity will be recorded for each well volume removed. If the turbidity of the development water is not less than 50 NTUs within a reasonable amount of time, 2 to 3 hours or as specified in the project scope, field personnel will record information of the well condition and contact the PM to determine if well development should continue. An average of two weeks should be allowed between development and subsequent sampling or water level measurements to allow the aquifer to re-equilibrate.

Well development will be documented in the field notebook and on the site forms located in Appendix H of the SMP.

3.2.5 Well Abandonment

Well decommissioning and abandonment will be completed in accordance with NYSDEC guidelines described in CP-43: Groundwater Monitoring Well Decommissioning Policy (NYSDEC, 2009).

3.2.6 Effluent Air Sampling

The inspection and measuring sampling of the vapor phase granular activated carbon (GAC) units will proceed from the influent to the effluent. The sampling of the vapor phase GAC units will proceed from the effluent to the influent. The air vapor stream will be sampled using direct reading with a PID. The following activities shall be performed for the sampling of the vapor phase GAC units:

1. Inspect the vapor phase GAC units for condensation and drain, if necessary.
2. Read and record influent (inflow), mid flow, and effluent (outflow) pressure gauge and air flow measurements, compare to anticipated and previous readings, and check for blockage, if necessary.
3. Identify and check the GAC system air vapor stream sampling ports.
4. Open the GAC treatment system sampling ports and measure and record the air vapor stream from each port with a PID.

3.2.7 Equipment Decontamination Procedures

Equipment to be decontaminated during the project may include: (1) tools; (2) monitoring equipment; and (3) sample collection equipment.

3.2.7.1 Tools and Sampling Equipment

Contaminated tools and sampling equipment will be dropped into a plastic pail, tub or other container. The tools will be brushed off, rinsed, and transferred into a second pail to be carried to further decontamination stations where they will be washed with a Liquinox ®, or equivalent soap and water solution, rinsed with clean potable water, and finally rinsed with deionized water.

3.2.7.2 Monitoring Equipment

Any direct or obvious contamination will be brushed or wiped with a disposable paper wipe. The units will then be wiped off with damp disposable wipes and dried. The units will be checked, standardized, and recharged, as necessary, for the next day's operation. They will then be prepared with new protective coverings.

3.2.7.3 Sample Handling/Shipping Areas

Sample containers will be wiped clean at the sample site, taken to the decontamination area to be further cleaned, as necessary, and transferred to a clean carrier. The samples will be checked off against the COC record. The samples will then be stored on ice in a secure area prior to shipment.

Sample handling areas will be cleaned/wiped down daily using disposable wipes. Disposable wipes will not be used on any equipment that comes in contact with samples. For final cleanup, all equipment will be disassembled and decontaminated. Any equipment which cannot be satisfactorily decontaminated will be disposed (e.g., glassware, covers for surfaces).

The management of disposal of liquid and solid wastes generated during decontamination is presented in Subsection 3.5.

3.3 SAMPLE LABELS AND RECORDS

A label will be attached to each sample collected for laboratory analysis. Identification of samples collected during the field investigation will be accomplished with a Field Sample Identification (ID) code indicating sample type, sample location and identification, depth of sample (if applicable), and designation of duplicate samples. The sample container labels will contain the following information:

- Project/Site Name
- Media
- Field sample ID
- Date and time collected

- Sampler initials
- Analytical method (s)

At the time the sample is obtained a field data record (FDR) sheet and field logbook entries will be completed. The FDRs for specific types of sampling are found in Appendix H of the SMP.

Additional sample record documentation will include:

- Description of the site with the sample location;
- Sample label numbers;
- Description of the sample site;
- Other physical descriptors of the sample site, if appropriate (e.g., groundwater depth, etc.);
- Photographs of the sample site may be taken showing the sampling equipment and/or unusual conditions (orientation of photograph must be shown on sketch map, and photo number recorded in field notebook); and
- Chain of custody (COC) documentation (see **Section 4**).

3.4 SAMPLE CONTAINER AND PRESERVATION REQUIREMENTS

Sample integrity is maintained by using containers and preservation methods that are specific to the media sampled and analytical parameters. Sample containers and preservation methods specified are summarized in **Table 2**.

3.4.1 Sample Preservation

Steps to maintain the in situ characteristics required for analysis may include storage of samples at 4 degrees Celsius, pH adjustment, and chemical fixation. Specific sample and container preservation requirements are summarized in **Table 2** for planned analytical methods. Holding times are based on time of sample receipt at the laboratory. Sample preservation must be documented on the COC form either using codes provided by the laboratory or written notes.

Table 2: Sample Parameters and Analytical Methods

Sample Matrix	PARAMETER	ANALYTICAL METHOD	SAMPLE CONTAINER	PRESERVATION	HOLDING TIME
Aqueous	VOC	USEPA 8260B	2 – 40 mL VOA vial	HCL pH < 2 Ice to 4°C	14 days
	SVOC	USEPA 8270C/SIM	2 – 1L Amber	Ice to 4°C	Extract within 7 days Analyze within 40 days
	Pesticides	USEPA 8081A	2 – 1L Amber	Ice to 4°C	Extract within 7 days Analyze within 40 days
	PCB	USEPA 8082	2 – 1L Amber	Ice to 4°C	Extract within 7 days Analyze within 40 days
	Metals	USEPA 6010/6020/7470 A	1 – 500 mL Plastic	HNO_3 pH <2, Ice to 4°C	6 months, Hg 28 days
	Sulfate	EPA 375.4	1 – 500 mL Plastic	Ice to 4°C	28 days
	Nitrate-nitrite	EPA 353.2	1 – 500 mL Plastic	Ice to 4°C	28 days
	Chloride	EPA 300	1 – 500 mL Plastic	Ice to 4°C	28 days
	Alkalinity	EPA 310.1	1 – 500 mL Plastic	Ice to 4°C	14 days
	Ferrous iron	SM3500D	1 – 500 mL Plastic	Ice to 4°C	Immediate
	Dissolved gases	RSK175	2 – 40 mL VOA vial	HCL pH < 2 Ice to 4°C	14 days
	TOC	USEPA 9060			28 days
	Hardness	SM2340B	1 – 500 ml Plastic	HNO_3 pH <2, Ice to 4°C	6 months
	Ammonia	USEPA 350.1	1 – 500 mL Plastic	H_2SO_4 pH <2	28 days
Oil	PCB	USEPA 8082	1 – 4oz Amber	Ice to 4°C	Extract within 14 days Analyze within 14 days
Air	VOC	PID	Direct Reading	NA	NA

3.4.2 Sample Handling/Shipping Areas

Sample containers will be wiped clean at the sample site, taken to the decontamination area to be further cleaned, as necessary, and transferred to a clean carrier. The samples will then be stored on ice in a secure area prior to shipment.

At the time samples are obtained, the following must be recorded by the sampler in the field logbook and/or on sample data sheets:

- Sample site location (e.g., grid coordinates baseline station and offset, or the location plotted on a map or aerial photograph);
- Sample type;
- Date and time of sampling;

- Project and sample designations;
- Sample identification, and;
- Analyses requested.

3.5 MANAGEMENT OF INVESTIGATION-DERIVED WASTES

MACTEC is responsible for collecting, controlling, and staging hazardous materials generated during LNAPL recovery and during groundwater sampling events.

3.5.1 Water Disposal

Investigation generated water (i.e. well development and purge water) is to be containerized upon production. It is anticipated that investigation water will be treated on site in the remedial treatment system and discharged into the New York City sewer system. The following permits have been obtained and are included in Appendix E of the OM&M Manual.

- New York City Department of Environmental Protection (NYCDEP) Bureau of Customer Service (BCS) Groundwater Discharge Permit

  Permit Number: 743197

  Issue Date: November 5, 2015

- NYCDEP Bureau of Wastewater Treatment (BWT), Industrial Pretreatment Program (IPP) Inspection and Permit Section, Letter of Approval (LOA) Renewal for Groundwater Discharge:

  NYCDEP File Number: C-5652

  Renewal Issue Date: November 2, 2015

  Renewal Expiration: November 1, 2016

  Renewal required: Annually

  Outfall: New York City Wastewater System

  Sampling Frequency: Quarterly, submitted to NYCDEP BWT within 21 days after sampling date

  Analytical Requirements: Included in **Appendix E**.

Discharge Limitation: 36,000 gallons per day (gpd)

- NYCDEP Bureau of Water and Sewer Operations (BWSO) Detailed Dewatering Scheme (DDS) LOA

  NYCDEP File Number: C-5652

  Issue Date: December 15, 2015

  Expiration: December 14, 2016

  Renewal required: Annually

  Discharge Limitation: 36,000 gpd, 0.06 cubic feet per second

Groundwater can be collected, purged, and discharged to the GWTS.

3.5.2 LNAPL Disposal

The area selected for VER recovery may contain LNAPL with PCB concentrations above 50 mg/kg (possibly TF-6D) which requires segregation, special handling and disposal separately from the LNAPL recovered from the remainder of the Site. The area selected for skimmer pump recovery represents those parts of the Site where the LNAPL is expected to contain PCB concentrations less than 50 mg/kg. LNAPL with PCB concentrations above 50 mg/kg will require incineration, while LNAPL with PCB concentrations below 50 mg/kg can be disposed or recycled less expensively. LNAPL shall not be released to the ground surface, but will be containerized and tested for hazardous characteristics and PCBs in accordance with approved disposal facility requirements and procedures.

4.0 SAMPLE CUSTODY PROCEDURES

MACTEC has established a program of sample COC that is followed during analytical sample handling activities in both field and laboratory operations. This program is designed to assure that each sample is accounted for at all times. To maintain this level of sample monitoring, sample container labels, COC forms, and shipping manifests are employed. Field data sheets and COC records are completed by the appropriate sampling and laboratory personnel for each sample. The objectives of the MACTEC COC program are to ensure:

- Samples are uniquely identified;
- Samples are collected for all scheduled analyses;
- The correct samples are analyzed for requested analyses and are traceable to their records;
- Descriptions of important sample characteristics and field observations are recorded;
- Samples are protected from loss and/or are identified if damaged;
- Alteration of samples (e.g., filtration, preservation) is documented;
- A forensic record of sample integrity is established;
- Sample security is maintained; and
- Relevant field information is recorded including location, sample number, date and time, identification of field samples, and individuals collecting the samples.

The COC protocol followed by the sampling crews involves the following steps:

- Documenting procedures and reagents added to the sample during sample preservation;
- Recording sampling locations, sample bottle identification, and specific sample collection procedures on the appropriate forms;
- Using sample labels that contain all information necessary for effective sample tracking; and
- Completing standard FDR forms to establish analytical sample custody in the field before sample shipment (see Subsection 3.2).

Prepared labels are normally developed for each sample to be collected. Each label is numbered to correspond with the appropriate sample(s) to be collected.

The COC record is used to document sample-handling information (i.e., sample location, sample identification, and number of containers corresponding to each sample number). The following information is recorded on the COC record:

- Project reference;
- The site location code, sample identification number, date of collection, time of collection, sample bottle number, preservation, and sample type, number of containers, sample matrix;
- The names of the sampler(s) and the person shipping the samples;
- Serial number of custody seals and shipping cases;
- The date and time that the samples were delivered for shipping;
- Analyses required; and
- The names of those responsible for receiving the samples at the laboratory.

COC Forms may be obtained from the subcontract laboratory or from the MACTEC field operations office. An example of a COC is found in Appendix H of the SMP. A copy of the COC is sent with the analytical samples to the laboratory; another is kept by the sample crew leader and maintained in the project file. When this shipment is received by the laboratory, the COC is signed by the laboratory and returned with the test results as part of the data package submittal.

4.1 ANALYTICAL SAMPLE TRACKING

Tracking of samples commences at the time of sample collection. A project-specific database of anticipated sample collection is created as COCs are received from the field. The Technical Lead or sampling event lead will communicate with the laboratory during the sampling event to verify that each group of samples that are shipped are received at the laboratory. Immediately after sample receipt, the laboratory will provide the leads a summary of samples received at the laboratory and assigned analytical methods. The leads will review the sample receipt documentation to verify that all samples and analytical methods were identified by the laboratory. Missing samples or incorrect information is corrected by the appropriate technical leader.

4.2 ANALYTICAL SAMPLE SHIPPING

Packing. Sample containers are generally packed in metal or hard plastic, insulated coolers for shipment. Bottles are packed tightly to minimize motion. Styrofoam, vermiculite, and "bubble pack" are suitable packing material for most instances. Ice is placed in double Ziploc® bags and added to the cooler along with all paperwork which is sealed in a separate Ziploc® bag. The cooler top is then taped shut. The samples are shipped to the laboratory together with the COC documents and the ARFs.

Shipping. The standard procedure for shipping environmental samples to the analytical laboratory is as follows:

1. All shipping of environmental samples collected by MACTEC Environment and Infrastructure personnel must be done through FedEx, or equivalent overnight delivery service. Receipts are retained as part of the COC documentation. Samples will be shipped to the laboratory within 24 to 48 hours of sampling unless other arrangements are made with the laboratory.
2. If prompt shipping and laboratory receipt of the samples cannot be guaranteed, (e.g., Sunday arrival), the samplers will be responsible for proper storage and custody of the samples until adequate shipping arrangements can be made.

The site leader keeps the laboratory informed of all field sampling activities. This communication is critical to allow the laboratory enough time to prepare for the sample shipment arrival.

5.0 CALIBRATION PROCEDURES

5.1 FIELD INSTRUMENT CALIBRATION

Each piece of equipment will be calibrated daily prior to use or as specified by the manufacturer. In addition, field instruments will be calibrated at the end of the day to monitor instrumental drift subsequent to field activities. Field instruments used to measure water quality parameters in support of groundwater sampling should be calibrated following calibration procedures and corrective actions are summarized on **Table 3.** Calibration data is recorded on site forms located in Appendix H of the SMP. The manufacturer and lot number of all standards will be noted on the field instrument QA record. The types of field measurements that may be made include but are not limited to the following:

- pH;
- Specific conductance;
- Temperature;
- DO;
- ORP;
- Organic vapors; and
- Turbidity.

Table 3: Field Instrument Calibration

Instrument	Activity	Frequency of .Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA
pH Probe	Calibrate probe with up to three temperature-equilibrated standards to bracket expected pH values on site.	Daily-before use Calibration check - at end of day, or if instrument gives erratic results	Stable readings ± 0.1 pH units within 3 minutes	If probe reading fails to stabilize, do not use. Check/replace membrane and recalibrate or service as necessary. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Task Leader and Field Samplers
DO Probe	Calibrate with 2 standards – saturated DO standard and 0.0 mg/L DO standard	Daily-before use Calibration check - at end of day, or if instrument gives erratic results	± 0.2 mg/L before use. ± 0.5 mg/L for end of day calibration check.	If DO reading exceeds criterion, recalibrate or service as necessary. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Task Leader and Field Samplers
Specific Conductance Electrode	Calibrate electrode with a standard solution close to expected sample values.	Daily-before use Calibration check - at end of day, or if instrument gives erratic results	± 5% of standard or ± 10 mS/cm of standard (whichever is greater)	If sp. conductance electrode reading exceeds criterion, then clean probe or service as necessary and recalibrate. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Task Leader and Field Samplers
Thermistor-Temperature Sensor	Calibrate against NIST-certified thermometer annually.	Calibration check –prior to onset of program	± 0.2 ºC of NIST certified thermometer.	If temperature sensor reading exceeds criterion, then clean probe, or service as necessary and recalibrate. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Task Leader and Field Samplers

Instrument	Activity	Frequency of .Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA
Turbidimeter	Hach-calibrate with <0.1, 20, 100, and 800 NTU standards.	Daily-before use Calibration check-at end of day, or if instrument gives erratic results	± 5% per scale.	If turbidity reading exceeds criterion, then calibrate or service as necessary. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Task Leader and Field Samplers
ORP/ Eh Probe	Calibrate against a Hanna solution.	Daily-before use Calibration check -at end of day, or if instrument gives erratic results	± 10 mV of standard	If ORP/Eh reading exceeds criterion, then have manufacture recalibrate. Repeat analysis of affected samples or qualify data if analysis cannot be repeated.	Task Leader and Field Samplers
FID	Calibrate with 100 ppmV methane standard. Blank: zero air check	Daily-before use Calibration check – at end of day, or if instrument gives erratic results	± 10% of true value	Recalibrate or service; rerun affected sample.	Task Leader and Field Samplers
PID	Calibrate with 100 ppmV isobutylene standard. Blank: zero air check	Daily-before use Calibration check – at end of day, or if instrument gives erratic results	± 10% of true value	Recalibrate or service; rerun affected sample.	Task Leader and Field Samplers

6.0 ANALYTICAL PROGRAM

6.1 SELECTION OF PARAMETERS

Laboratory analyses will be scheduled based on project objectives described in the WP, the SMP, and this QAPP.

6.2 SELECTION OF PROCEDURES

The detailed sampling program and associated analytical methods is described in the WP. The subcontract laboratory analytical procedures to be used for this program will be selected from USEPA SW-846 (USEPA, 1996).

6.2.1 Off-Site Subcontract Laboratory Analytical Methods

The analytical methods listed below will be used during the remedial action and groundwater monitoring:

<u>LNAPL Characterization</u>

- PCBs by Method 8082A
- Hazardous Characteristics including ignitability by Method 1010A, corrosivity by Method 9045, reactivity using total cyanide Method 9012B and sulfide Methods 9030 and 9034.

<u>Groundwater</u>

- TCL VOCs by Method 8260B
- TCLSVOCs by Method 8270D
- TAL Metals by Methods 6010C/6020A and 7471B

<u>Treatment System Effluent Air</u>

- VOCs by PID

<u>USEPA Waste Water Methods</u>

- VOCs by Method 624
- SVOCs by Method 625
- Pesticides/PCBs by Method 608

A summary of sample types that will be collected during remediation activities and monitoring is provided on **Table 2.**

6.3 LABORATORY CERTIFICATION

Analyses will be performed by TestAmerica, a NYSDOH ELAP certified laboratory located in Edison, New Jersey.

6.4 LABORATORY DATA PACKAGE DELIVERABLES

Data packages for LNAPL and waste water will be reported as Category A deliverables as defined in the ASP (NYSDEC, 2005).

Data packages for groundwater and air samples will be reported as Category B deliverables as defined in the ASP (NYSDEC, 2005).

6.5 DATA MANAGEMENT & LABORATORY ELECTRONIC DATA DELIVERABLE

MACTEC uses a standardized data management process to capture analytical data and supporting field information in a permanent database. MACTEC has developed the Technical Environmental Database (TED), a SQL Server based relational database. MACTEC requires the laboratories to submit analytical results in an EQuIS-based TED electronic data deliverable (EDD) format for uploading into TED. A description of the TED EDD format is presented in **Table 4**.

Table 4: Electronic Data Deliverable Requirements

EQuIS "EZEDD01" Field Name	Data Type	Required For "EDD"	Description	"TED" Table	"TED" Column
project_code	1 Text20	X	This field contains the internal project_code used by TED to identify a unique site. This will be provided to the lab on a per project basis.	Location	Site_id
sample_name	2 Text30	X	This field contains the sample number as written in the Analysis Request and Chain of Custody (AR/COC) form sent to the laboratory with the field samples for analysis. This is a unique number assigned to each sample by sampling personnel. For laboratory samples enter "LAB QC".	sample_collection	field_sample_id
sys_sample_code	3 Text20				
sample_date	4 Date	X	mm/dd/yyyy. Date sample was collected in the field. Date information must be identical with the date from the AR/COC form. Leave blank for lab samples. Year may be entered as yyyy.	sample_collection	field_sample_date
sample_time	5 Time				
analysis_location	6 Text2				
lab_name_code	7 Text10	X	Laboratory that performed the analysis.	sample_analysis	lab_id
lab_sample_id	8 Text20	X	Unique sample ID internally assigned by the laboratory.	sample_analysis	lab_sample_id

EQuIS "EZEDD01" Field Name	Data Type	Required For "EDD"	Description	"TED" Table	"TED" Column
sample_type_code	9 Text10	X	Specifies sample type. For field samples, enter FS (regular environmental sample), otherwise, use values listed in the LOV. For example, normal field samples must be distinguished from laboratory method blank samples, etc.	sample_collection	qc_code
Lab_Del_Group	10 Text20	X	Tracking code used by the laboratory. Commonly called Sample Delivery Group (SDG).	sample_analysis	lab_sample_delivery_group
Lab_Batch_Number	11 Text20		Tracking number used by the laboratory to identify a group of samples analyzed in the same batch. This field, in conjunction with laboratory blank ID, is used to link the relationship between field samples and laboratory blank and other QC samples.		
lab_anl_method_name	12 Text35	X	Test method used in the analysis of the analyte.	sample_analysis	analysis_method
cas_rn	13 Text15	X	Unique analyte identifier. Use assigned CAS number when one is identified for an analyte. Tentatively Identified Compounds (TICs) and a number of other analytes are not assigned a standard CAS number. The laboratory is required to assign a UNIQUE identifier for all chemical_names.	sample_analysis_results	casno
chemical_name	14 Text60	X	Name of analyte or parameter analyzed.		

EQuIS "EZEDD01" Field Name	Data Type	Required For "EDD"	Description	"TED" Table	"TED" Column
result_value	15 Text20	X	Must only be a numeric value. It is stored as a string of characters so that significant digits can be retained. Must be identical with values presented in the hard copy. Analytical result is reported left justified. Reported as the reporting_detection_limit for non-detects.	sample_analysis_results	lab_result
lab_qualifiers	16 Text7	X	Qualifier flags assigned by the laboratory.	sample_analysis_results	lab_qualifier
result_unit	17 Text15	X	This format assumes that the result value and detect limit have the same units.	sample_analysis_results	result_uom
result_type_code	18 Text10	X	Type of result (TIC, target analyte, etc.)	sample_analysis_results	result_type
detect_flag	19 Text2	X	Enter “Y” for detected analytes or “N” for non-detected analytes.	sample_analysis_results	report_hit_flag
reporting_detection_limit	20 Text20	X	Must only be a numeric value. Use the value of the Reported Detection Limit (RDL), Practical Quantitation Limit (PQL), or Contract Required Quantitation Limit. Value is stored as a string to retain significant figures. Unit of measure must be identical with result_unit value.	sample_analysis_results	detection_limit
dilution_factor	21 Text6	X	Must be a numeric entry. The factor by which the sample was diluted as part of the preparation process. If no dilution was done, enter the value 1. Value is stored as a string to retain significant figures.	sample_analysis	dilution_factor

EQuIS "EZEDD01" Field Name	Data Type	Required For "EDD"	Description	"TED" Table	"TED" Column
sample_matrix_code	22 Text10	X	Code which distinguishes between different types of sample matrix. For example, soil samples must be distinguished from ground water samples, etc. Valid codes for HESE are "G" (gas), "L" (liquid), "S" (solid), and "P" (free or raw liquid product).	sample_collectio n	matrix
total_or_dissolved (or fraction)	23 Text1	X	Must be “T” for total metal concentration, “D” for dissolved or filtered metal concentration, or “N” for organic (or other) parameters for which neither “total” nor “dissolved” is applicable. Also, HESE requires "C" for TCLP and "S" for SPLP fractions.	sample_analysis	fraction
basis	24 Text10				
analysis_date	25 Date	X	mm/dd/yyyy. Date sample was analyzed.	sample_analysis	analysis_date
analysis_time	26 Time				
method_detection_limit	27 Text20				
lab_prep_method_name	28 Text35		Description of sample preparation or extraction method.	sample_analysis	prep_method_name
prep_date	29 Date	X	mm/dd/yyyy. This field is used to determine whether holding times for field samples have been exceeded.	sample_analysis	extraction_date
prep_time	30 Time				
test_batch_id	31 Text20				
result_error_delta	32 Text20				
TIC_retention_time	33 Text8				
qc_level	34 Text10		Laboratory QC level associated with the analysis	sample_analysis	qc_level
result_comment	35 Text255		Any comments related to the analysis.	sample_analysis _results	comments

EQuIS "EZEDD01" Field Name	Data Type	Required For "EDD"	Description	"TED" Table	"TED" Column
sample_quantitation_limit (may be REQUIRED FIELD for certain projects)	36 Text20		Must only be a numeric value. Use the value of the Sample Quantitation Limit (SQL). Value is stored as a string to retain significant figures. Unit of measure must be identical with result_unit value.	sample_analysis_results	TBD
Note: All "X" marked fields are minimum data required to load data to "TED".					

7.0 DATA REDUCTION, VALIDATION AND REPORTING

General procedure for chemistry reviews of lab data generated during remedial actions and monitoring are specified in this WP/QAPP. The level of data review and validation is based on the expected use of the data for each type of media. Data management and data validation review procedures are described in the following sections.

7.1 REDUCTION

Data reduction includes receipt of analytical laboratory reports and the supporting EDD, data review, establishing a final database for use in project reports. Upon receipt, analytical laboratory data packages are saved in a project directory as Adobe Acrobat files where they are available for project use. EDD data are downloaded directly to the TED. During the data review process the electronic data are checked against the hardcopy data package to verify that no systematic error occurred at the lab during the production of the electronic deliverable. For those project requiring a DUSR, the TED is used to produce a variety of data tables that are used in the data review process.

- Sample Summary – listing of lab sample delivery groups (lab reports), sample locations and field sample ID, and analytical methods
- Validation File - spreadsheet or results used to check database vs. hardcopy and to enter any data corrections and data qualification actions.
- Validation Action Summary – a table of results that summarize results that have been changed or qualified during the data review
- Final Results Summary – complete tabulation of final results for the sampling event.

7.2 DUSR AND VALIDATION

It is expected that the following sampling events and media will be sampled:

- Groundwater Monitoring
- LNAPL and Soil Hazardous Characteristics
- Effluent Wastewater

The majority of these samples including LNAPL, soil, air, and effluent water are being tested in support of hazardous waste classification, engineering design evaluations, or wastewater disposal.

These media will not require a DUSR review. For groundwater samples collected under the groundwater monitoring task, a data usability review will be completed in accordance with NYSDEC Division of Environmental Remediation guidance DER-10, Appendix 2B for Data Usability Summary Reports (NYSDEC, 2010a). During the DUSR the following items are reviewed:

- Lab Report Narrative Review
- Data Package Completeness and COC records (Table 1 verification)
- Sample Preservation and Holding Times
- Initial and Continuing Calibration (including tunes for GC/MS)
- QC Blanks
- Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)
- Matrix Spike/Matrix Spike Duplicates (MS/MSD)
- Surrogate Spikes
- Internal Standard Response and Retention Times
- Laboratory Duplicates
- Field Duplicates
- Raw Data (chromatograms), Calculation Checks and Transcription Verifications
- Reporting Limits
- Electronic Data Qualification and Verification

Additional data qualifiers may be added to the results using professional judgment of the project chemist and general procedures specified in *National Functional Guidelines for Organics Review*, (USEPA, 1999) and *Laboratory Data Validation, Functional Guidelines for Evaluating Inorganics Analyses* (USEPA, 2004), as well as the appropriate USEPA Region II revisions to these protocols.

A DUSR is prepared for each project sampling task by the project chemist or scientist. The MACTEC QAO, or designee, completes a final review of the DUSR before data are finalized. The DUSR includes the following information:

- Project and Sampling Event
- Subcontract Laboratory Name and Location
- Summary of Samples and Analytical Methods

- Data Quality Observations and Data Qualification Summary
- Table of Final Results and Qualifiers

7.3 DATA MANAGEMENT AND NYSDEC EDD REPORTING

MACTEC TED will be used for all analytical data generated as part of the NYSDEC program. TED contains fields to store raw laboratory results, final validated laboratory results, site spatial data and geotechnical information. Federal and NYS project-specific regulatory standards have also been included in the database and are available to project for comparison to laboratory results.

Computerized routines in TED are used to produce temporary data spreadsheets for data review and data qualification during completion of DUSRs. These spreadsheets are used to input final results and qualifiers into the TED once data review is completed. Final cross tabulation data tables including complete results for all samples and methods are produced with each DUSR directly from the TED.

Data outputs that support project reporting goals can be created from data in TED. These include detected contaminant crosstab tables (hit tables), and comparison to applicable or relevant and appropriate requirements crosstab tables (Exceedance tables). Analytical results in TED can be used in a variety of GIS data graphics and plotting programs including CADD. The following tables are often prepared to present data in site reports:

- Hits Only Cross Tabulation Tables
- Analyte Frequency and Concentration Summary Tables
- Data Comparisons to Regulatory Standards

User access to TED projects is password protected. Users are assigned roles which limit their ability to modify data. The majority of users have only read capability. TED files are fully backed up on a nightly schedule, with incremental backups scheduled throughout the day. Updates and Deletes to the database are recorded and preserved for tracking, along with a date stamp and the users initials.

7.3.1 NYSDEC Electronic Data Deliverable

Project information, laboratory data, and other required associated data collected during the groundwater monitoring will be submitted to the NYSDEC in an electronic format in accordance with the NYSDEC Electronic Document Standards (EDS) and EDD that complies with the Department's Electronics Data Warehouse Standards.

All final data sets shall be provided in a NYSDEC EQuIS EDD format that complies with the most recent guidance at the NYSDEC EDD Submission Website (http://www.dec.ny.gov/chemical/62440.html). A computerized routine is used to convert the TED data directly into the NYSDEC EQuIS EDD format. The MACTEC PM will identify the need for an NYSDEC EQuIS EDD prior to initiating field activities.

8.0 INTERNAL QUALITY CONTROL

8.1 FIELD QUALITY CONTROL

A routine process of collecting field QC samples will be incorporated into the groundwater monitoring program. Field QC samples to be submitted to the laboratory include:

- Trip blanks (VOCs: 1 per cooler or sampling event)
- Equipment blanks (SVOCs, Metals: 1 per 20 samples)
- Field duplicates (1 per 20 samples)
- Matrix spikes (standard laboratory MS/MSDs)

Field QC samples may also be collected in association with the LNAPL or air samples based on the judgment of the Task Leader.

Trip Blanks. Trip blanks are required for assessing the potential for contaminating aqueous VOC samples during sample shipment. The trip blank consists of a VOC sample container filled by the laboratory with reagent water and is shipped to the site with other VOC sample containers. A trip blank is included with each shipment of water samples scheduled for VOC analysis and will be analyzed with the other VOC samples.

Soil samples that are collected as unpreserved samples will utilize a water trip blank. Soil samples that are preserved in the field will utilize a trip blank that is prepared with the preservation fluid used in the actual samples (sodium bisulfate or methanol).

Field Duplicates. Field duplicates of soil and water samples will be submitted for analysis of all project-specific parameters at a rate of 5 percent of the samples collected. These duplicates are intended to assess the homogeneity of the sampled media and the precision of the sampling protocol.

Equipment Blanks. Equipment blanks (i.e., rinsate blanks) for the bailer, sampling pump, and/or tubing assembly are scheduled during monitoring well sampling at a rate of 5 percent of the samples collected. VOCs and SVOCs or inorganics present within the bailer, pump apparatus, or discharge tubing are assessed by collecting a sample of reagent water passed through the sampling apparatus after washing with the decontamination solution followed by at least one rinse with reagent water.

Matrix Spike/Matrix Spike Duplicates (MS/MSD). If required, the task leader will select samples for MS/MSD analyses and will provide additional sample volume to the laboratory.

9.0 REFERENCES

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