Final Engineering Report

Operations and Maintenance Manual

Long Island Rail Road

Morris Park Yard

Richmond Hill, Queens, NY

NYSDEC Spill #92-12990

March 2011

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Part I: Description

Jamaica Station
Jamaica, NY 11435-4380
718 558-7400

Helena E. Williams
President

Long Island Rail Road

January 30, 2009

Mark C. Tibbe
Environmental Program Specialist
New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 2
47-40 21st Street, Long Island City, NY 11101

Re: Final Engineering Report
Bioremediation, Bioventing and LNAPL Recovery Systems
Morris Park Yard
Long Island Rail Road

Dear Mr. Tibbe:

The Long Island Rail Road (LIRR) is submitting this Final Engineering Report and enclosed attachments for bioamendment, bioventing, and LNAPL recovery systems (collectively the Remediation System) at the Morris Park Yard Site in Jamaica, Queens (Site).

LIRR has completed installation of the Remediation Systems at the Site. A Notice of Award and a Notice to Proceed were issued to the Franklin Company on December 27, 2006 and March 16, 2007, respectively, for construction of the Remediation Systems. The Remediation Systems were installed in accordance with the NYSDEC approved remediation design, dated October 16, 2006 and Addendum No. 3 dated November 14, 2006 with the following exceptions:

1. The bioamendment system piping was installed using horizontal drilling. As a result, the piping was not installed as depicted on Drawing No. C-3, *Bioventing System and Bioamendment Infiltration System Piping Plan.* The approximate locations of the bioamendment piping system can be found on the As-Built Drawing *IP Piping.*

2. Portions of the horizontal bioventing piping system were installed in the same borehole as the bioamendment system piping and not as depicted on Drawing No. C-3, *Bioventing System and Bioamendment Infiltration System Piping Plan.* The approximate locations of the bioventing piping system can be found on the As-Built Drawing *Biovent Well Piping.*

3. During the time of installation of bioamendment system piping, a retaining wall adjacent to the passenger railroad track had collapsed and was under construction. As a result, underground bioamendment system infiltration piping line IP-401 was not installed and bioventing wells BVW-4 and BVW-5 were installed north of the proposed location illustrated on Drawing No. C-3, *Bioventing System and Bioamendment Infiltration System Piping Plan*. The approximate locations of the bioventing piping system can be found on the As-Built Drawing *Biovent Well Piping*.

4. Bioventing wells BV-9 and BV-10 were installed north of the locations depicted on contract Drawing No. C-3, *Bioventing System and Bioamendment System Piping Plan*. The wells were relocated in the field approximately 35 feet to the north. The approximate locations of the bioventing piping system can be found on the As-Built Drawing *Biovent Well Piping*.

5. On Drawing No. C-3, *Bioventing System and Bioamendment Infiltration System Piping Plan* for underground bioamendment infiltration piping use of perforated 1-inch diameter SDR-11 HDPE pipe is specified. In accordance with paragraph 2.1.2 of Specification Section 15060, *Piping*, 1/8-inch diameter perforations spaced as indicated on the drawings is specified. The installed underground bioamendment system infiltration piping is slotted 2-inch diameter SDR-11 HDPE pipe. The slots are 0.020-inches by 0.375-inches. The infiltration pipe slots are spaced as follows:

Zone Infiltration Pipe ID No.	Slots per 10-feet of Pipe
IP-102	49
IP-105	49
IP-106	49
IP-201	5
IP-202	5
IP-203	5
IP-204	5
IP-205	5
IP-206	4
IP-209	4
IP-210	5
IP-301	11
IP-302	11
IP-303	11
IP-402	9
IP-403	9

6. On Drawing No. C-3, *Bioventing System and Bioamendment Infiltration System Piping Plan*, the control valves for the bioamendment system shown are outside

the Remediation System Building (Building). In addition, the bioamendment system lines are shown manifolded outside the Building. In lieu of this approach, the bioamendment system control valves were installed and the bioremediation lines were manifolded inside the Building.

7. On Drawing No. A-2, *Remediation System Building Layout Plan,* the fence opening to the petroleum storage tank is shown east of the tank. The fence opening was relocated west of the tank on account of limited access east of the tank.

8. The remediation system equipment was not arranged as illustrated on Drawing No. A-2, *Remediation System Building Layout Plan* on account of limited space in the Building. The layout of the building is depicted on the As-Built Drawing *Remediation System Building Layout.*

9. In Paragraph 2.4.4 of Specification Section 11309, *Process Equipment*, a double helix mixer for the bioamendment solution tank was specified. The mixer installed is a single helix since the use of the double helix caused excessive torque and affected the stability of the tank. The second helix is stored in the Building.

10. On Drawing No. A-2, *Remediation System Building Layout Plan,* bollards are shown spaced 8-feet 10.5-inches on center north of the Building and 10-feet 6-inches on center west of the Building. In lieu of the approach illustrated on Drawing No. A-2, bollards were installed approximately 6-feet on center north of the Building and, because the Remediation System Building is situated near a building to the west, a bollard was installed north and south of the alley between the Building and the building to the west.

11. Due to the presence of a water main directly below the southeast Building footing, the footing dimensions were altered from the design to 4-feet by 18-feet by 12-inches deep. A sand layer was installed over the water main pipe crown. Styrofoam was installed on top of the sand layer and the bottom of the southeast Building footing was installed on top of the styrofoam. The dimensions of the Styrofoam are 18-inches by 4-feet by 4-inches deep.

The Franklin Company prepared the following documents, which are attached for reference:

- Treatment System Sampling and Analysis Plan, dated June 20, 2008

- Initial Operations and Maintenance Manual (Start-Up Procedures), dated July 30, 2008

- Operations and Maintenance Manual, dated March, 2008, and

- As-Built Drawings; PRW Piping, IP Piping, Biovent Well Piping, and Remediation System Building Layout Plan.

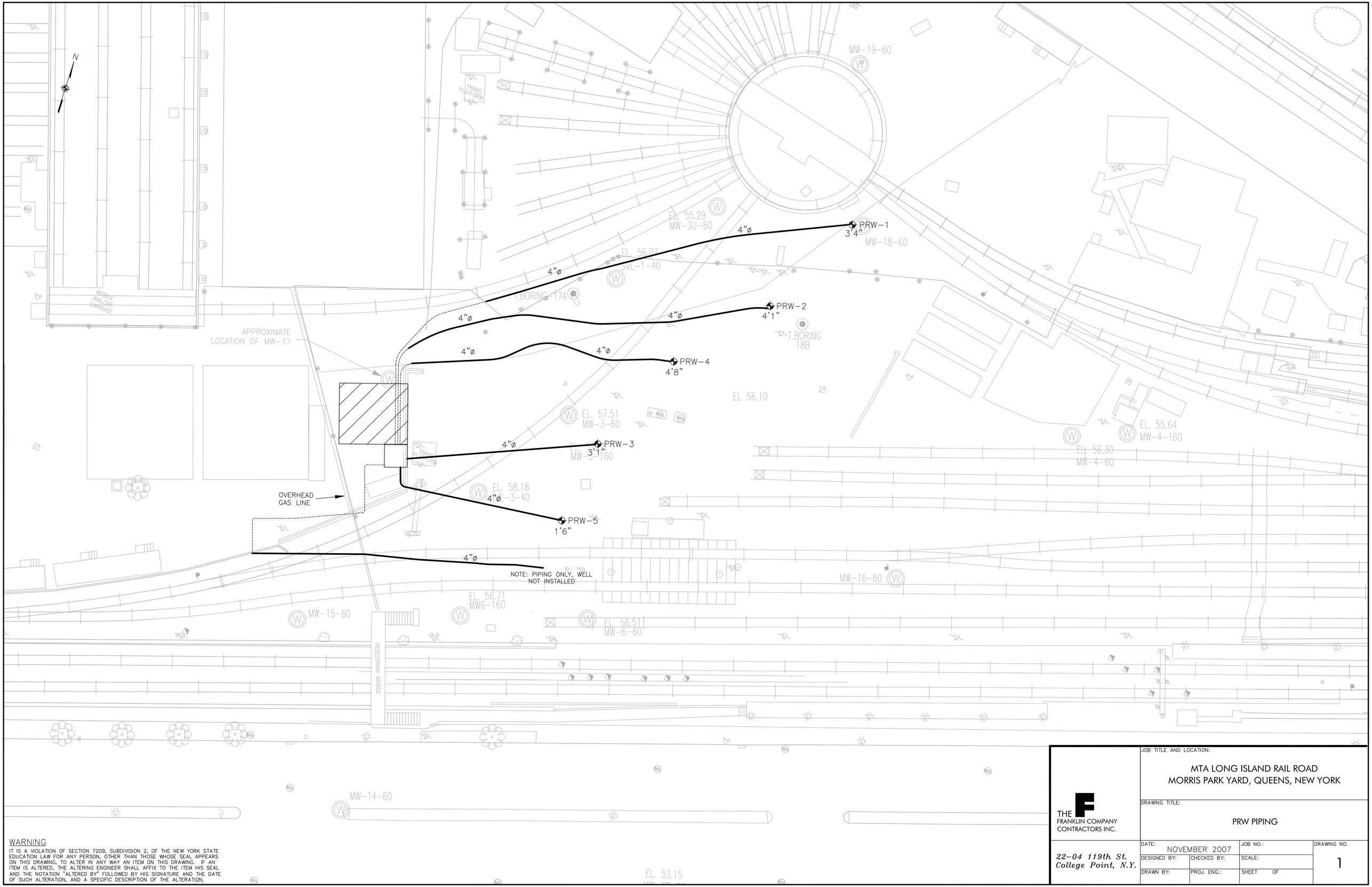
Please do not hesitate to contact me if you have any questions or require additional information.

Sincerely,

Andrew Wilson, PE

cc: A. Albano, System Safety (w/o attachments)
C. Channer, MTA Legal (w/o attachments)
F. Denker, CPM (w/o attachments)
J. DiPlato, TRC (w/o attachments)
M. Hall, CPM (w/o attachments)
P. Manske, System Safety (w/o attachments)
G. Russo, System Safety (w/o attachments)
J. Urda, NYSDEC (w/o attachments)

Attachments:
As-Built Drawings
Treatment System Sampling and Analysis Plan
Initial Operations and Maintenance Manual (Start up procedures)
Operations and Maintenance Manual



WARNING

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THE FRANKLIN COMPANY CONTRACTORS INC.

22-04 119th St.
College Point, N.Y.

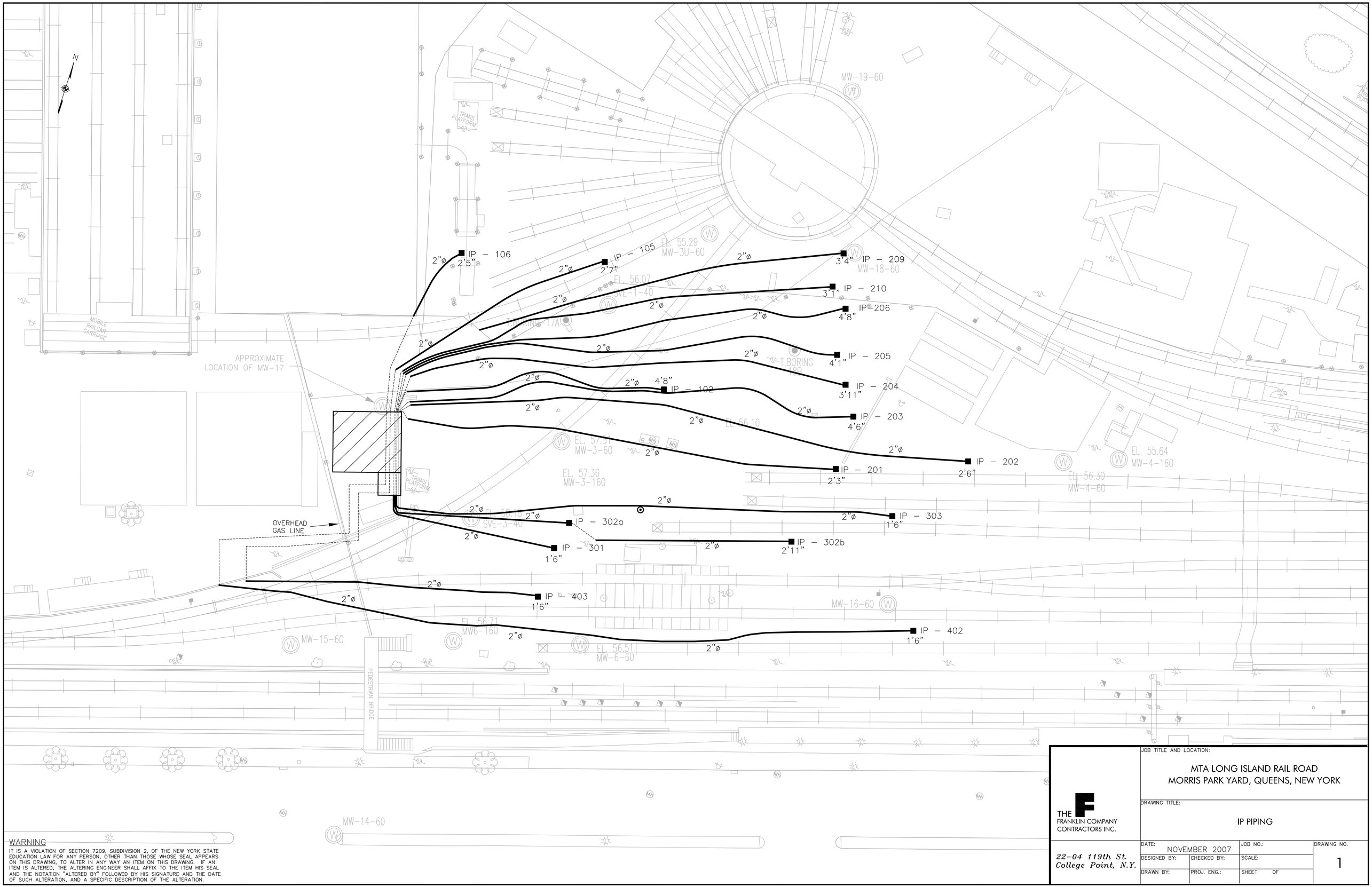
JOB TITLE AND LOCATION:

MTA LONG ISLAND RAIL ROAD
MORRIS PARK YARD, QUEENS, NEW YORK

DRAWING TITLE:

PRW PIPING

DATE: NOVEMBER 2007		JOB NO.:	DRAWING NO.
DESIGNED BY:	CHECKED BY:	SCALE:	1
DRAWN BY:	PROJ. ENG.:	SHEET OF	



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THE FRANKLIN COMPANY CONTRACTORS INC.

22-04 119th St.
College Point, N.Y.

JOB TITLE AND LOCATION:

MTA LONG ISLAND RAIL ROAD
MORRIS PARK YARD, QUEENS, NEW YORK

DRAWING TITLE:

IP PIPING

DATE: NOVEMBER 2007		JOB NO.:	DRAWING NO.
DESIGNED BY:	CHECKED BY:	SCALE:	1
DRAWN BY:	PROJ. ENG.:	SHEET OF	

N

MOBILE RAILCAR CARRIAGE

APPROXIMATE LOCATION OF MW-17

REMEDIATION SYSTEM BUILDING

OVERHEAD GAS LINE

PEDESTRIAN BRIDGE

TRANS PLATFORM

MW-19-60

EL. 55.29
MW-3U-60

MW-18-60

EL. 56.07
SVE-1-40

T.BORING-17A

T.BORING
18B

EL. 56.10

EL. 57.51
MW-3-60

EL. 57.36
MW-3-160

EL. 55.64
MW-4-160

EL. 56.30
MW-4-60

EL. 56.15
SVE-3-40

MW6-160

EL. 56.71

EL. 56.51
MW-6-60

MW-16-60

MW-15-60

MW-14-60

EL. 53.15
MW-3D-60

5.97
2D-60

T.BO

BVW-1 & 2
3'

BVW-3
1'6"

BVW-4
1'6"

BVW-5
1'6"

BVW-6
1'6"

BVW-7
1'6"

BVW-8
1'6"

BVW-9
2'11"

BVW-10
2'11"

BVW-11
1'6"

BVW-12
3'

BVW-13
2'6"

BVW-14
2'6"

BVW-15
1'6"

1'6"

4"ø

6"ø

WARNING

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THE FRANKLIN COMPANY CONTRACTORS INC.

22-04 119th St.
College Point, N.Y.

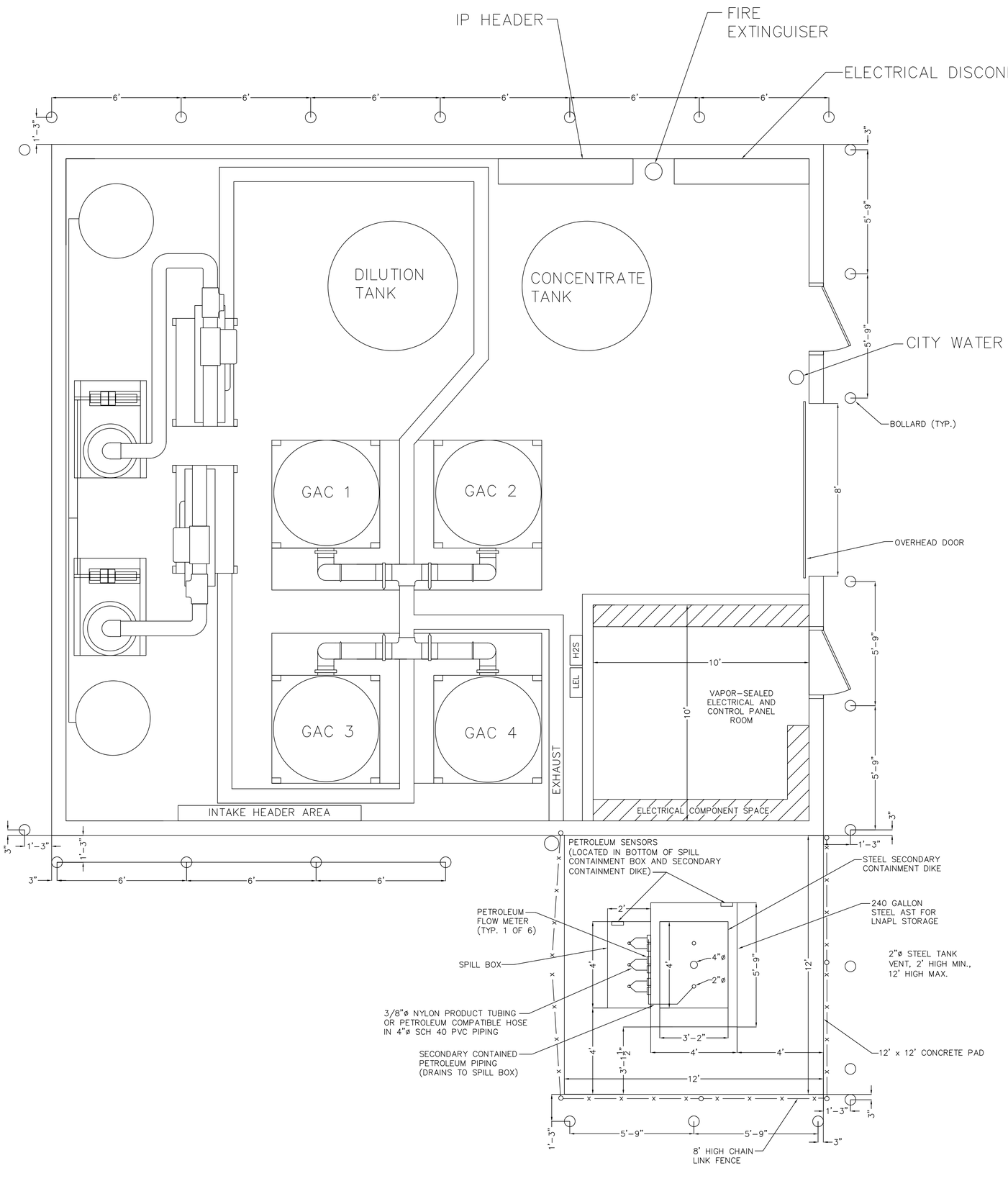
JOB TITLE AND LOCATION:

MTA LONG ISLAND RAIL ROAD
MORRIS PARK YARD, QUEENS, NEW YORK

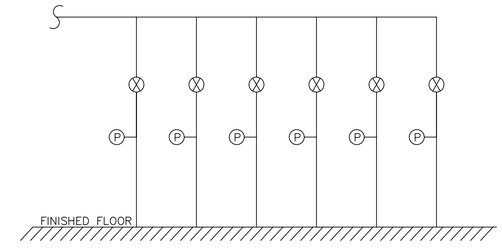
DRAWING TITLE:

BIOVENT WELL PIPING

DATE: NOVEMBER 2007		JOB NO.:	DRAWING NO.
DESIGNED BY:	CHECKED BY:	SCALE:	1
DRAWN BY:	PROJ. ENG.:	SHEET OF	



INDIVIDUAL PIPING NOT SHOWN FOR CLARITY



1 / A-2 | A-2 INFILTRATION SYSTEM PIPING MANIFOLD
NTS

NORTH

0 3' 6'
GRAPHIC SCALE

WARNING

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THE FRANKLIN COMPANY CONTRACTORS INC.

CORE ENVIRONMENTAL
Core Environmental
46-11 54th Avenue
Maspeth, NY 11378

JOB TITLE AND LOCATION:
MTA LONG ISLAND RAIL ROAD
MORRIS PARK YARD, QUEENS, NEW YORK

DRAWING TITLE:
REMEDIATION SYSTEM
BUILDING LAYOUT PLAN

DATE:		JOB NO.:	DRAWING NO.
DESIGNED BY:	CHECKED BY:	SCALE:	
DRAWN BY:	PROJ. ENG.:	SHEET OF	

Part II: Equipment Maintenance Overview

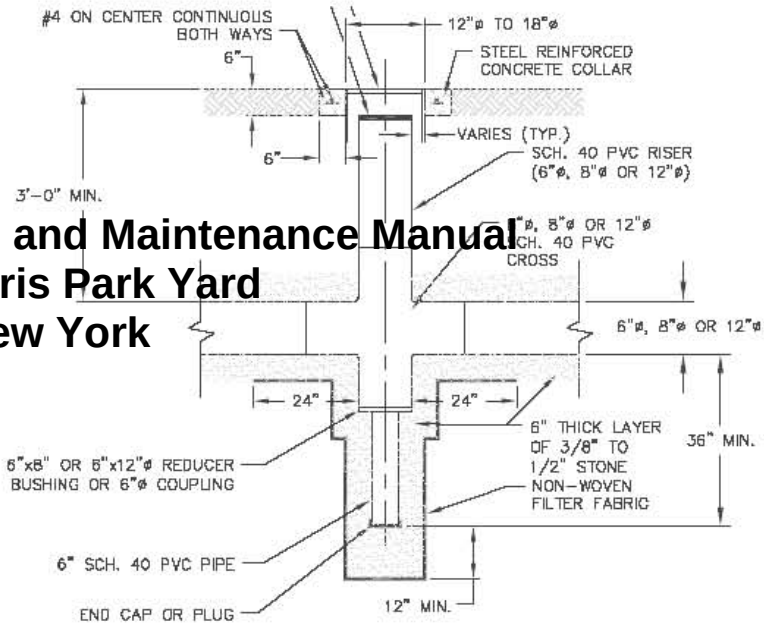
EQUIPMENT MAINTENANCE GUIDE

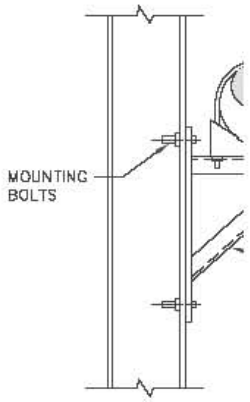
LIRR MORRIS PARK YARD CONTRACT NO. 5963

EQUIPMENT DESCRIPTION	MAINTENANCE REQUIRED	COMMENTS
Roots 615 URAI Blower	Based on RPM and operating hours the grease lubricated drive end of the blower should be greased once a week. The oil in the splash lubricated gear end should be changed every 6000 hours due to operating conditions and the nature of the synthetic oil that is used. The belt tension and condition should be checked once a week when routine greasing is being carried out and adjusted or replaced as needed.	The grease to be used is Shell Darina SD NLGI 2. The oil to be used is mobilgear SHC 630. The belt to be used is Dayton part no. 2L433.
Blower drive motor (WEG 3 phase induction motor r)	Motor bearing lubrication interval is 20000 hours. A periodical inspection of winding insulation levels and temperature rises is recommended	The grease to be used is Shell Stamina RL 2.
Solberg inlet air filter CT-275-600C	Periodical cleaning of media. Interval to be determined.	
Kunkle valves 215V&337	An initial inspection interval of 12 months is recommended	
Moisture separator transfer pump Moyno 500 series 300	No maintenance required	All pumps will be changed out as a unit as this is more cost and time effective
Moisture separator ACS demister A12276	Periodical cleaning or replacement of media as needed. Periodical cleaning of sightglass as needed. Intervals to be determined	ACS Industries Mistmaster media pad style 7CA
Tetrasolv VFV-3000 vapor phase carbon vessel	Periodical replacement of spent carbon is necessary the spent carbon is removed using a vacuum removal method. The new carbon is loaded using 100 lb. bags to proper levels. Interval to be determined.	General carbon will be used as supplier.
Condensate tanks 500 gallon	Periodical testing of level sensors is necessary	
Dilution tank	Periodical testing of level sensors is necessary	
Concentrate tank	Periodical testing of level sensors is necessary	
Dilution tank transfer pump Goulds NPE 2ST1H7B4	No maintenance required	All pumps will be changed out as a unit as this is more cost and time effective
Concentrate tank transfer pump Goulds NPE 1ST1E7D4	No Maintenance required	All pumps will be changed out as a unit as this is more cost and time effective
Chemical feed pump LMI Milton Roy E721-75S	No Maintenance required	All pumps will be changed out as a unit as this is more cost and time effective
Dilution tank solenoid valve ASCO EF-8210G100	Periodical testing and cleaning necessary	
Inline static mixer EMI P2-6F-P	No maintenance required	No moving parts so no parts needed
Concentrate tank mixer EMI APD-4	Mixer oil should be changed every 20000 hours due to the nature of the synthetic oil. Shaft bearing should be greased monthly	Oil to be used Mobilgear SHC630. Grease to be used Shell Stamina RL 2
SVE differential pressure transmitter Dwyer MS-111	Annual recalibration necessary	
SVE high vacuum and high pressure swithes Dwyer models 1950P-8 &1950P-2	Periodically the vent drain plug should be rotated then returned to it's original position to dislodge any deposits which may have accumulated.	
Inline flow sensors Dwyer DS-300-6	No maintenance required	
Discharge flow indicator Dwyer model 2005	Periodically disconnect pressure lines to vent both sides of guage to atmosphere and rezero guage	Magnehelic differential pressure guage
Moisture separator flow meter Badger model RCDL40	Periodically inspect meter for damage and clean meter	
Recordall electronic transmitter Badger model RET	Periodic battery replacement (approx. 6 years)	1 lithium 2.4 A hr battery
Dilution tank level transmitter Gems model LX-T8001	Periodic testing necessary	
Level switch (conductive) Gems series 3G	Periodic testing necessary	
Condensate tank level switch Conery 2900 series	Periodic testing necessary	
Spill box level switch W.E. Anderson model F7-SB	Periodic testing necessary	
LEL monitor ATI model C12-17	Periodic calibration necessary (3 to 6 months s)	
H2S monitor ATI series A12 UNISENS	Periodic calibration necessary (3 to 6 months)	
Oriface plate flow meter Dwyer model PE-J-3	No maintenance required	
All butterfly, ball, and gate valves	All valves should be exercised at least once monthly	

Part III: O&M and Sampling Procedures

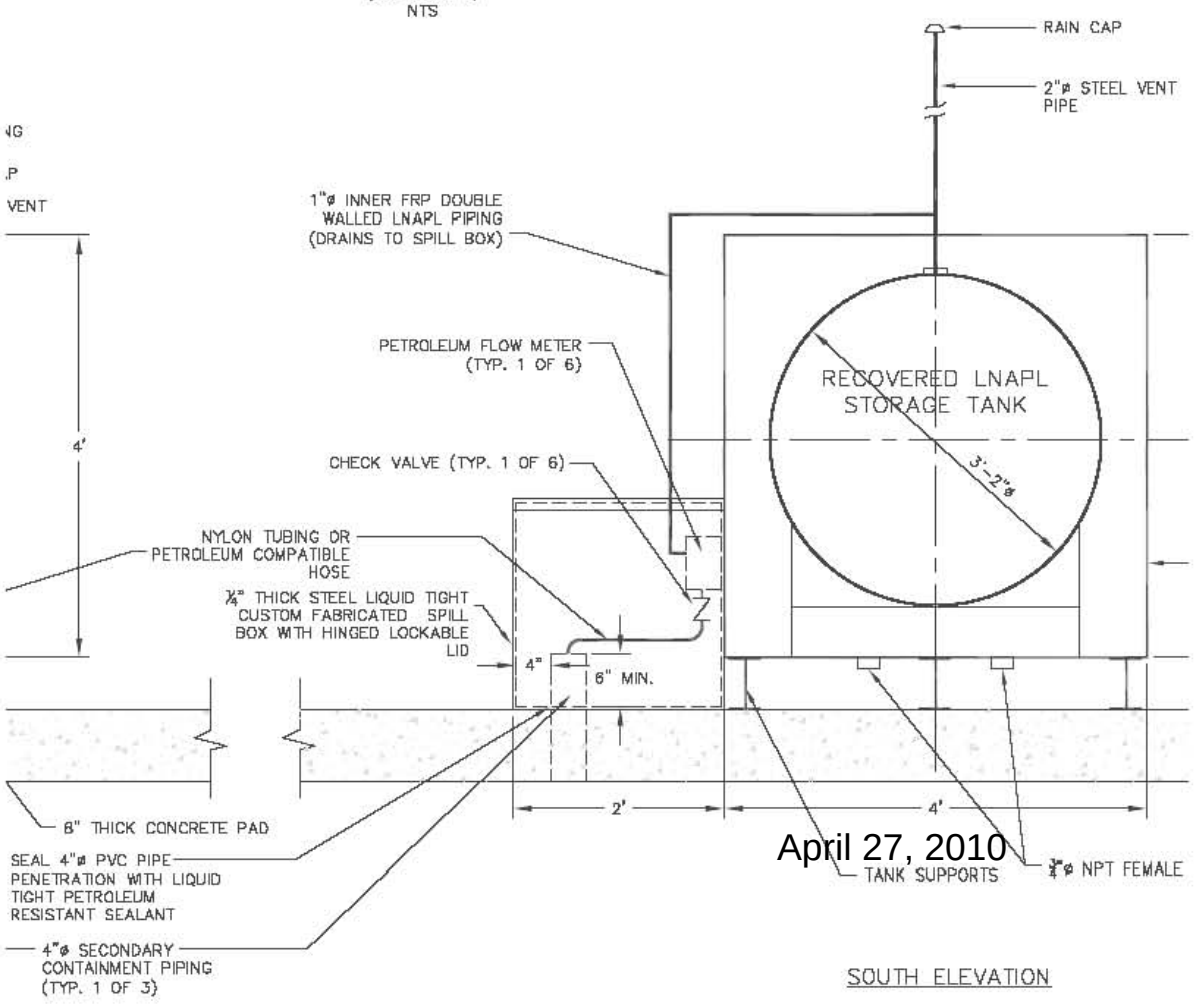
Operations and Maintenance Manual for the Morris Park Yard Queens, New York





4 C-7 C-7 **BIOVENTING SYSTEM HEADER DRAIN SUMP**
(SEE NOTE 2)
NTS

5 C-7 C-7 **TYPICAL WALL HANG**
(SEE NOTE 1)
NTS



LNAPL STORAGE TANK DETAIL

April 27, 2010

TABLE OF CONTENTS

FIGURE

DRAWING

ATTACHMENTS

1.0 INTRODUCTION

This Initial Operations and Maintenance (O&M) Manual has been prepared as a guide for monitoring and maintaining the performance of the remediation system at the Morris Park Yard located in Queens, New York City, New York. The O&M Manual will be used as a guide for startup during the shakedown period phase of the work. The project site is part of an ongoing voluntary remediation being undertaken by the owner of the site, the Metropolitan Transportation Authority (MTA) Long Island Rail Road (LIRR).

1.1 Site Location

The Morris Park Yard is located in the Richmond Hill Section of Queens, New York. Morris Park Yard is bounded by the Richmond Hill Yard to the north, the Van Wyck Expressway to the east, Atlantic Avenue to the south, and 121st Street to the northwest. The surrounding neighborhood is mixed use; industrial, commercial and residential. The site is approximately 23 acres in total area. A site location map is included as Figure 1 and an Existing Site Plan is included as Drawing C-1.

1.2 Background

For at least ninety years the Morris Park Yard site has operated as a rail yard; initially to support steam, coal-fired and electric locomotives followed by diesel locomotives. Currently the 23-acre Morris Park Yard is almost entirely utilized for LIRR operations. Operations conducted at the yard include the service and maintenance of diesel locomotives which includes mechanical servicing, lubrication and fueling.

Based on a previous site observations and a remedial investigation (RI), it was apparent that the site was impacted by the fueling and maintenance operations in the areas of petroleum storage and/or transfer. An initial RI and pilot tests were conducted at the site and additional investigation tasks were also completed subsequent to the initial RI. The RI sought to supplement the existing subsurface information data from the previous investigation, characterize soil quality, determine the horizontal extent of the light, non-aqueous phase liquid (LNAPL) floating on the water table, characterize shallow and deep groundwater quality both on and off-site, and confirm the presence/absence of any dense, nonaqueous phase liquid (DNAPL) within the aquifer, characterize the aquifer's hydraulic conditions, conduct pilot tests for evaluating feasible remedial technologies and formulate a remedial action plan.

The RI recommended remediation of the site through a combination of remedial technologies including LNAPL pumping to remove the liquid phase petroleum product and bioventing to remediate the petroleum impacted, unsaturated soils.

Information on the Bioventing remediation system and LNAPL Recovery System from the Summary of Work is as follows:

The Bioventing System consists of fifteen (15) bioventing wells (BVWs); well head controls; subsurface conveyance piping; a remediation equipment building and concrete foundation; bioventing blower(s); moisture separators; condensate storage tanks; transfer pumps and carbon adsorption treatment vessels; electrical components; interior piping; and system controls.

The LNAPL Recovery System includes four (4) new product recovery wells (PRWs); one (1) retrofit existing monitoring well; wellhead vaults and controls; down-well product pumps and sensor array, an automatic water/product interface tracking reel, subsurface conveyance and electrical conduit; a

secondarily contained product storage tank; a piping manifold spill box, electrical components, and system controls.

The bioamendment system includes water dilution and mixing tanks, injection and metering pumps, mixers, header piping, injection laterals, control valving, electrical components, and system controls.

The remediation equipment is housed at the remediation system compound. The compound consists of a 32' x 36' building and an adjacent 12' x 12' concrete pad surrounded by an 8' high chain link fence. The building is divided into two parts. The main part of the building houses the process equipment. All components in this area are suitable for installation in a Class I Division II hazardous environment. The remainder of the building includes a 10' x 10' electrical and control room. The product recovery tank and dike are located on the adjacent 12' x 12' concrete pad.

The Contract includes providing O&M services for the remediation system for a period of five (5) years after system acceptance. The O&M services will include system Start-up, Checkout and shakedown to demonstrate proper installation and operation of all system components.

1.3 Purpose

The purpose of the Initial O&M Manual is to describe normal operation and maintenance, potential operating problems, discharge permit requirements and monitoring and laboratory testing, alternative operation and maintenance. Furthermore, the O&M Manual also includes information on the safety plan and equipment maintenance.

2.0 SCOPE OF MANUAL

The scope of manual has been outlined to address the operation and maintenance of the remediation system.

Specifically the O&M Manual includes the following items:

a. Description of normal operation and maintenance;
b. Description of potential operating problems;
c. Description of discharge permit requirements and monitoring and laboratory testing;
d. Description of alternative operation and maintenance;
e. Safety Plan; and
f. Equipment Maintenance.

2.1 Normal Operation and Maintenance

2.1.1 Prescribed Conditions

The bioventing system will be operated such that 200 standard cubic feet per minute (scfm) of soil gas is extracted from bioventing wells BVW-6, 11, 12, and 15, and 84 scfm of soil gas is extracted from the remaining bioventing wells. Adjustments to flow rates at individual wells will be made at the curb stop located at each well head. Flow rate measurements will be taken by measuring the differential pressure across the orifice plate located at the well head. The well head vacuum will be measured at the upstream (pre-orifice plate) port.

The product recovery wells will be gauged using a petroleum interface probe to determine the depth to petroleum and depth to water in each well. The Contractor will visually inspect the spill box and

wellhead secondary containment piping for signs of leakage. The Contractor will inspect and record all readings on the petroleum totalizer flow meters. Based on the assumptions included in the specifications the off-site transport and disposal is expected to be an average of 150 gallons of recovered LNAPL per month.

The bioamendment infiltration system includes the use of concentrate and dilution tanks. The water level in the dilution tank is controlled by level sensors that open and close an automatic solenoid control valve. The level and dilution of the concentrate in the tank is manually controlled by the operator by manual ball valves and manual transfer to the tank. The flow of water and concentrate from the tanks to the injection wells is controlled by way of core isolation valves and throttle valves immediately after the flow meters. It is expected that the bioamendment infiltration system will be operated once weekly for a period of one year.

Following system startup, the Contractor will monitor, record, and report the following parameters:

a. Biovent well flow rates (scfm);
b. Biovent wellhead vacuum (inches wc);
c. Total blower assembly flow rate (scfm);
d. Blower inlet vacuum (inches wc);
e. Blower outlet and carbon unit inlet and outlet pressures (inches wc);
f. Blower outlet temperature (degrees F);
g. VOC concentration in air stream effluent from each carbon unit;
h. Water levels in moisture separators (inches); and
i. Water levels (inches) and total volume (gallons) in condensate storage tanks.

Measurements of VOCs, O2, CO2, CH4 and LEL concentrations from the system effluent, and air flow and temperature measurements will be performed twice daily during the first two weeks (performance testing), at least weekly during the next 42 days (initial operating period), followed by at least two times per month for the remainder of the operation (routine operating period). A running total of mass of VOCs and volume of air will be maintained for each carbon adsorption unit until it is taken off line. A new running total will be started each time a carbon adsorption unit is replaced. The time and date when each granular activated carbon (GAC) unit is replaced will be recorded. This information will be submitted to the Railroad as part of each Progress Monitoring Report.

2.1.2 System Operation Tasks

Based on the specifications, the Contractor will provide the description of tasks required to successfully perform system operation. Specifically, system startup and shut down sequences for both the Bioventing System and the LNAPL Recovery System are included in the tables on the following page.

Table 1 Bioventing System Startup and Shutdown Sequences

Startup Item	Description
1.	Inspect system components including the well seals, blower belt, pump and air filter to ensure system is ready.
2.	Check oil level in blower motor, and add if necessary.
3.	Check the circuit breakers to ensure they are in the appropriate position.
	Make sure that all switches are in the automatic position in the switch panel box.
	Energize the system by pulling the red button switch in the switch panel box.
	Inspect system components including the well seals, blower belt, pump and air filter to ensure system is operating as designed.
	Check all gauges to ensure that the system is operating within designed parameters.
	Secure building before leaving site.
Shutdown Item	**Description**
1.	De-energize the system by pushing the red button switch in the switch panel box.
2.	Inspect system components including the well seals, blower belt, pump and air filter to ensure system is off.
3.	Check the oil level in blower motor.
4.	Secure building before leaving site.

Table 2 LNAPL Recovery System Startup and Shutdown Sequences

Startup Item	Description
1.	Inspect system components including the well heads, pumps, filters storage tanks to ensure system is ready.
2.	Check oil level in tank.
3.	Check the circuit breakers to ensure they are in the appropriate position.
4.	Energize the system by pushing the 'system power' switch on front panel of each PRW control box. A product pump and power test is required prior to placing the pump into the PRW for the first time. Refer the manufacturer's operations manual for details.
5.	Inspect system components including the well heads, pumps, filters storage tanks to ensure system is operating as designed.
6.	Secure building before leaving site.
Shutdown Item	**Description**
1.	De-energize the system by pushing the 'system power' switch on front panel of each PRW control box. .
2.	Inspect system components including the well seals; pump and air filter to ensure system is off.
3.	Check the oil level in the tank.
4.	Secure building before leaving site.

Table 3 Bioamendment Infiltration System Startup and Shutdown Sequences

Startup Item	Description
1.	Inspect system components including the well heads, pumps, and, storage tanks to ensure the system is ready.

2.	Check concentrate and water level in tanks.
3.	Check the circuit breakers to ensure they are in the appropriate position.
4.	Energize the system by turning the transfer pump power switch on main panel for each transfer pump. Refer to the manufacturer's operations manual for details.
5.	Inspect system components including the well heads, pumps, and storage tanks to ensure system is operating as designed.
6.	Secure building before leaving site.
Shutdown Item	**Description**
1.	De-energize the system by turning the transfer pump power switch on main panel for each transfer pump.
2.	Inspect system components including the well transfer pumps and pressure gauges to ensure system are off.
3.	Check the concentrate and water level in the tanks.
4.	Secure building before leaving site.

2.1.3 Maintenance Tasks

Based on the specifications, the routine maintenance items for the Bioventing System and LNAPL Recovery System are listed in the tables below. The successful completion of the tasks will be recorded on the Bioventing Remediation System Monitoring Weekly / Monthly Report System Operating and Monitoring Requirements Form and the LNAPL Recovery System Remediation System Monitoring Weekly / Monthly Report System Operating and Monitoring Requirements Form. These forms are included as Attachmenst A, B and C.

Table 4 Bioventing System Routine Maintenance Items

Item	Action
Gauge Air Flow	Measure the airflow to ensure appropriate levels are achieved. Check the wells for blockage, check pipes and connectors.
Grease Blower	Approximately every 500 hours re-grease the blower according to the manual.
Check Oil Level	Check that the oil level is within the appropriate range.
Changed Oil in Blower	Approximately every 1,500 hours (9 weeks), change oil in blower assembly, adding oil suitable to ambient conditions for the next period.
Check Transfer Pump	Verify that the transfer pump is working properly. Listen for abnormalities.
Check Valves	Check the valves to make sure they are in the appropriate position and no leaks have occurred.
Check Wire	Inspect connections to ensure they are snug or complete and look for signs of damaged wire or wire insulation.
Check Drain Sump	Inspect for signs of leakage and integrity of the structure.
Check Piping	Check for leaks, especially at joints and connection points. Verify pipe positions have not changed.
Check GAC Filter	Check for fouling or clogging. Change out as needed. Periodically drain water. A tube will be placed on the valve equipped with a manual pump and the discharge tube will be placed in the closest condensate storage tank.
Check Well Covers	Check for signs of damage or water infiltration and remove any debris that may have accumulated in or around the cover, seal and mounting hardware.
Check Electric Panel	Ensure the cover closes properly and no liquids are coming into contact with the panel. Also check breakers are working.
Check Doors & Locks	Complete a walk around to inspect for signs of water or physical damage.

Item	Action
	Inspect locks and door.
Check Moisture Separator Tank	Inspect for signs of warping or possible implosion, check for rust and corrosion. Inspect the site tube and assembly for signs of damage or failure. Inspect connections.
Check Moisture Separator Drain	Check the valve to make sure it is in the appropriate position and no leaks have occurred.
Check Exhaust Fan Operation	Verify that the fan is working properly. Listen for abnormalities.
Check Lights	Make sure all lights are working.
Clean Building	Check floor for signs of leaks and broom clean the area. Put away any items used and ensure a tidy work area is maintained.

GAC – Granular Activated Carbon

Table 5 LNAPL Recovery System Routine Maintenance Items

Item	Action
Check Front Panel LED	Check for yellow lights indicating tank is full, reel high or low limit, or pump circuit overload. Listen for audio enunciator tones; look for lights.
Check Each Flow Meter	Inspect for signs of rust and corrosion. Inspect the meter and assembly for signs of damage or failure. Record value as needed.
Check Each Control Panel	Ensure the cover closes properly and no liquids are coming into contact with the panel. Test panel using test switch.
Check Each Seeker Reel	Inspect for signs of damage or failure. Ensure line is free to move and not knotted or tangled. Check wire connections make sure complete.
Check Piping Spill Box	Check spill box for signs of leaks and signs of imminent failure. Keep box clean so leaks are easily detectable.
Check Piping	Check for leaks, especially at joints and connection points. Verify pipe positions have not changed.
Check Connections	Inspect connections to ensure they are snug or complete and look for signs of damage to insulation.
Check Wiring	Inspect connections to ensure they are snug or complete and look for signs of damage to wire or wire insulation.
Check Doors & Locks	Complete a walk around to inspect for signs of water or physical damage. Inspect locks and door.
Check Shut Off Switch	Inspect switch and assembly for signs of damage or failure
Check Product Piping	Check for leaks, especially at joints and connection points. Verify pipe positions have not changed.
Check Piping Drop Tube	Inspect for signs of damage or failure. Ensure tube is measuring as tank levels indicate and clean as needed.

Check Product Tank	Check floor for signs of leaks. Inspect tank for signs of imminent failure. If the tank is at 75% capacity then contact the oil removal contractor to pick up the oil for off site treatment, disposal or destruction.
Check Lights	Make sure all lights are working.
Clean Building	Check floor for signs of leaks and broom clean the area. Put away any items used and ensure a tidy work area is maintained.

Table 6 Bioamendment Infiltration System Routine Maintenance Items

Item	Action
Check Main Panel	Check for yellow or red lights indicating tank are at high or low limit, or pump circuit overload. Listen for audio enunciator tones; look for lights.
Check Each Flow Meter Pump	Inspect for signs of rust and corrosion. Inspect the meter and assembly for signs of damage or failure. Record value as needed.
Check Each Control Switch	Ensure each switch operates properly.
Check Each Seeker Reel	Inspect for signs of damage or failure. Ensure line is free to move and not knotted or tangled. Check wire connections make sure complete.
Check Piping Spill Box	Check spill box for signs of leaks and signs of imminent failure. Keep box clean so leaks are easily detectable.
Check Piping	Check for leaks, especially at joints and connection points. Verify pipe positions have not changed.
Check Pump Connections	Inspect connections to ensure they are snug or complete and look for signs of damage to insulation.
Check Pump Wiring	Inspect connections to ensure they are snug or complete and look for signs of damage to wire or wire insulation.
Check Doors & Locks	Complete a walk around to inspect for signs of water or physical damage. Inspect locks and door.
Check Shut Off Switch	Inspect switch and assembly for signs of damage or failure
Check Infiltration Piping	Check for leaks, especially at joints and connection points. Verify pipe positions have not changed and no impacts have occurred. Exercise all ball valves.
Check Level Sensors	Inspect for signs of damage or failure. Ensure sensors are measuring as tank levels indicate and clean as needed.
Check Concentrate & Dilution Tanks	Check floor for signs of leaks. Inspect tanks for signs of imminent failure. If the tank is at 20% capacity then contact the chemical contractor for delivery.
Check Lights	Make sure all lights are working.
Clean Building	Check floor for signs of leaks and broom clean the area. Put away any items used and ensure a tidy work area is maintained.

2.1.4 Frequency of Tasks

The frequencies of each O&M tasks are as follows:

- ❒ Daily monitoring of total system for first week, weekly for first month. System parameters measured at least monthly following first month after Railroad approval.

- ❒ Maintenance items listed in Tables 3 and 4 in the previous section, as well as on the forms included as Attachments A and B detail the items to be completed on a weekly basis.

- ❒ The maintenance items are then to be completed at least monthly following first month after Railroad approval.

- ❒ After one year of routine operations and each year thereafter for the length of the contract, the Contractor will provide a hollow stem auger drill rig to perform up to ten (10) soil borings at on-site locations selected by the Railroad. This tasked is discussed in detail in the Treatment System Sampling and Analysis Plan (SAP).

2.2 Potential Operating Problems

2.2.1 Bioventing Problems, Considerations and Remedies

There are several mechanical components to a Bioventing system which are subject to operating problems. Many of these become apparent at start-up, but others appear later if the system is not properly maintained. These parts of the system will be considered in order of flow.

a. Blower. As long as the blower is properly lubricated and operating in accordance with speed and pressure ratings, then the blower should not experience operating problems. The blower requires oil lubrication on the gear end and grease lube on the drive end. Potential problems include no flow which could be the result of to low of a blower speed, the wrong rotation, or an obstruction in piping. Each of the remedies requires system shutdown and include performance checks, rotation confirmation and piping inspections and clean outs. Additional problems may include low capacity, excessive power and vibration. The considerations and remedies for these types of problems, as well as others are included in the manufacturers troubleshooting checklist.

Performance checks against the vacuum performance curve should be conducted regularly during start-up to make sure airflow and vacuum levels meet expectations. Also the amount of current (amps) drawn by the blower should be measured.

b. Moisture Separator. The unit includes a rugged pump and steel tank that should not experience operating problems. In the event the pump fails then the system should be shut down for servicing. The belt or coupling may have slipped, a stator damaged or torn or the pump is set to the wrong rotation. The pump should be primed according to manufacturer's recommendations that include wetting specific elements. If the pump won't prime then check for an air leak on the suction side. Additional considerations and remedies for problems with the pump, as well as others are included in the manufacturers troubleshooting guide. Lubrication of the pump with grease to the zerk fittings is required after servicing.

c. GAC Air treatment. The operating problems associated with carbon systems are usually minimal as long as the air is filtered and dehumidified. The carbon exhaust should be monitored periodically i.e., daily during for the first week, at least weekly during the first month, followed by at least monthly after Railroad approval, to ensure that the air being discharged meets the requirements set forth in the specifications. Periodically or in the event the system is shutdown for an extended period of time it is recommended that the GAC unit be drained of water. A tube will be placed on the valve equipped with a manual pump and the discharge tube will be placed in the closest condensate storage tank (T-900 or T-1000). The discharged water will be transferred to the condensate storage tank for periodic characterization and off site disposal.

d. Control systems. Operating problems with control systems may occur due to malfunction of electrical components (which usually requires a service call by the equipment supplier), damage to buried wiring by burrowing rodents, or by exposure of components to weather extremes for which they were not designed. Enclosing the control systems in a heated (or cooled) shed will prevent damage from exposure to temperature extremes.

Table 7 Bioventing System Operation Strategy and Troubleshooting Guide

Potential Operating Problems	Information Sources and Considerations	Common Remedies
Vadose zone air flow rates in the area of concern are insufficient or not as predicted	The soil may be less permeable in some locations or there may be preferential flow pathways	Further subsurface investigation Readjust flows Install additional wells Check wells for clogging Check for short-circuiting
Vacuum levels, and therefore pore gas velocities, are spatially inconsistent	There may be preferential flow or heterogeneities	Further subsurface investigation Install additional wells Seal preferential pathways
The VOC concentrations have been reduced in some but not all wells	Treatment may be completed in some areas of the site	Reduce flow to/from wells where remediation appears complete Take some wells offline Check for ongoing sources of contamination
The VOC concentrations remain consistently high despite high mass removal rates	Undiscovered groundwater contamination, free-phase product, or continuing source	Further investigation (particularly for continuous source) Product recovery Groundwater remediation Air sparging[1]
Low concentrations of VOCs are extracted during operation, but high concentrations reappear when system is shut off	Diffusion limitations, water table upwelling, seasonal water table fluctuations, flow short-circuiting due to preferential flow, soils too moist, airflow rates higher than necessary	Dual phase extraction Pulse venting[2] In situ thermal treatment Excavation of “hot spots” and ex-situ soil treatment
Continued high levels of less volatile components	This is likely to occur when air is applied to a contaminant mixture with a large range of volatility	Concentrate on bioventing Pulsed venting Soil heating enhancements
Poor Bioventing performance following large rain events	The system is sensitive to the effects of soil moisture on air permeability and aeration	Cap site to reduce infiltration Dual phase (groundwater) recovery Shut off system following major rain events
Unexpectedly high vapor concentrations at or near explosive levels	Free-phase product; Accumulation of methane or other VOCs	Dilute intake air Alter system to be explosion-proof Check for new sources of contamination

[1] Air Sparging is the injection of contaminant-free air into the subsurface saturated zone, enabling a phase transfer of hydrocarbons from a dissolved state to a vapor phase. The air is then vented through the unsaturated zone.

[2] Pulsed venting is a mode of operation for the Bioventing system whereby the airflow is turned off for some period of time and subsequently turned back on. Reasons for pulsed venting include the following:
(1) Cycling between wells would allow a single blower and treatment system to operate a multiwell system without dividing the total flow rate among the wells. Cycling among wells also helps to avoid the establishment of stagnation points.
(2) In diffusion-limited soils, the concentrations will tend to rebound when the system is shut off.
Although the total project duration would increase, the operating time of the system may decrease.
(3) As volatile components are removed, meeting the oxygen requirements of may not require continuous injection of air.
(4) Studies indicate that pulse venting may be more efficient than continuous operation in removing contaminant mass.

2.2.2 LNAPL Recovery System Problems, Considerations and Remedies

There are several mechanical components to a LNAPL Recovery system which are subject to operating problems. Many of these become apparent at start-up, but others appear later if the system is not properly maintained. These parts of the system will be considered in order of flow.

The LNAPL Recovery System includes four (4) new product recovery wells (PRWs); one (1) retrofit existing monitoring well; wellhead vaults and controls; down-well product pumps and sensor array, an automatic water/product interface tracking reel, subsurface conveyance and electrical conduit; a secondarily contained product storage tank; a piping manifold spill box, electrical components, and system controls.

There are several mechanical components to a LNAPL Recovery system which are subject to operating problems. Many of these become apparent at start-up, but others appear later if the system is not properly maintained. These parts of the system will be considered in order of flow.

The LNAPL Recovery System includes four (4) new product recovery wells (PRWs); one (1) retrofit existing monitoring well; wellhead vaults and controls; down-well product pumps and sensor array, an automatic water/product interface tracking reel, subsurface conveyance and electrical conduit; a secondarily contained product storage tank; a piping manifold spill box, electrical components, and system controls.

a. Probe Sensors. Operating problems with sensor systems may occur due to fouling with a layer of biological growth, emulsions or other materials. The probe can be carefully cleaned paying special attention to not damage the probe and sensor bands. System shutdown is not required to clean the probe, but rather the controller at the PRW can be used to take the pump off line and de-energized allowing it to be removed. The probe should be cleaned according to manufacturer's recommendations that include using a spray cleaner or mild dish soap in warm water and a cloth or soft bristle brush.

Damage of wiring may occur causing a malfunction of electrical components, which will usually require a service call by the equipment supplier for diagnostics and repair.

b. Down well product pumps. The pump is a rugged and chemically resistant unit that should not experience operating problems. The pump can withstand a certain amount of solids including dirt which will pass through it. In the event the pump fails then it can be carefully cleaned after removal. System shutdown is not required to clean the pump, but rather the controller at the PRW can be used to take the pump off line and de-energized allowing it to be removed. The pump should be cleaned according to manufacturer's recommendations that include using a supplied pump removal tool, cleaning a filter, contacts and interior with a soft bristle brush. Lubrication of the pump with WD-40 or equivalent will be required after disassembly.

Performance checks against the pump curve should be conducted regularly during start-up to make sure pump flow rate levels meet expectations. The manufacturer specifications include the pump performance curve for reference.

c. Nylon Tubing. The nylon tubing in the PRW manhole and recovery well that carries the LNAPL from the pump to 4" HDPE buried pipe and then to the PVC riser is subject to damage because of its construction. The nylon allows for high pressure operating conditions as well as being flexible; however the nylon may rip or tear if a technician is not careful when working in the manhole. The tubing can be replaced if needed. Once again system shutdown is not required to change the

tubing, but rather the controller at the PRW can be used to take the pump off line by de-energizing it. The tubing should be cleaned according to manufacturer's recommendations.

d. Tube Reel. The tube reel that lowers the probe/pump up and down the PRW may experience problems. In the event the tube reel experiences a problem then it can be removed fro service. System shutdown is not required to remove the pump and reel, but rather the controller at the PRW can be used to take it off line and de-energized allowing it to be removed. The tubing can be replaced if needed and the auto seeker re-synchronized. The auto seeker controls the movement of the probe/pump up and down by the reel to locate and pump the LNAPL. Servicing the product tubing on the reel requires it be fully removed from the reel. The tubing should be removed, reinstalled and cleaned according to manufacturer's recommendations.

e. Subsurface Conveyance. The 4" HDPE buried pipe and the PVC pipe is less subject to damage because of its construction. However, the pipes may be damaged if above or belowground activities impact the piping or a failure occurs. The piping can be replaced if needed and system shutdown will be required to repair or replace piping.

f. Product Storage Tank. The LNAPL from the well is conveyed to the storage tank which has a level indicator and automatic float style shut off. The tank should be inspected to make sure the float is operating freely. In the event the float sticks or requires cleaning or servicing then the system should be shut down and repairs should be made.

g. Control systems. Operating problems with control systems may occur due to malfunction of electrical components (which usually requires a service call by the equipment supplier), damage to buried wiring by burrowing rodents, or by exposure of components to weather extremes for which they were not designed. Always disconnect the AC power to the control panel before connecting or disconnecting any wires at the terminal block to avoid electrical shock and/or system damage.

Table 8 LNAPL System Operation Strategy and Troubleshooting Guide

Potential Operating Problems	Information Sources and Considerations	Common Remedies
Pump flow rates in the area of concern are insufficient or not as predicted	The soil may be less permeable in some locations or there may be preferential flow pathways	Further subsurface investigation Readjust flows Install additional wells Check wells for clogging Check for short-circuiting
Pressure levels are inconsistent	There may be preferential flow or heterogeneities	Further subsurface investigation Install additional wells Seal preferential pathways
The LNAPL concentrations have been reduced in some but not all wells	Treatment may be completed in some areas of the site	Reduce flow to/from wells where remediation appears complete Take some wells offline Check for ongoing sources of contamination
The LNAPL concentrations remain consistently large removal amounts	Undiscovered groundwater contamination, free-phase product, or continuing source	Further investigation (particularly for continuous source) Product recovery

Potential Operating Problems	Information Sources and Considerations	Common Remedies
Low concentrations of LNAPL are extracted during operation, but high concentrations reappear when system is shut off	Diffusion limitations, water table upwelling, seasonal water table fluctuations, flow short-circuiting due to preferential flow, soils too moist, airflow rates higher than necessary	Dual phase extraction Pulse venting In situ thermal treatment Excavation of "hot spots" and ex-situ soil treatment
Poor LNAPL recovery system performance following large rain events	The well seal is not functioning properly and infiltration is occurring.	Repair well seal Replace well with newly constructed well Shut off system following major rain events

2.2.3 Bioamendment Infiltration System Problems, Considerations and Remedies

There are several mechanical components to the bioamendment infiltration system that are subject to operating problems. Many of these become apparent at start-up, but others appear later if the system is not properly maintained. These parts of the system will be considered in order of flow.

The bioamendment infiltration system includes four (4) zones of infiltration wells, wellhead test points and controls; transfer pumps and tank level sensors, subsurface conveyance, piping manifold, electrical components, and system controls.

a. Concentrate and Dilution Tanks. The water level in the dilution tank is controlled by level sensors that open and close an automatic solenoid control valve. Testing of the sensors and solenoid is required periodically. Solenoid failure would require replacement of the solenoid. The level and dilution of the concentrate in the tank is manually controlled by the operator by manual ball valves and manual transfer to the tank. The flow of water and concentrate from the tanks to the injection wells is controlled by way of core isolation valves and throttle valves immediately after the flow meters.

b. Level Sensors. Operating problems with sensor systems may occur due to fouling with a layer of biological growth, emulsions or other materials. The probe can be carefully cleaned paying special attention to not damage the probe and sensor. System shutdown is required to clean the probe. The probe should be cleaned according to manufacturer's recommendations that include using a spray cleaner or mild dish soap in warm water and a cloth or soft bristle brush. Damage of wiring may occur causing a malfunction of electrical components, which will usually require a service call by the equipment supplier for diagnostics and repair.

c. Mixers. The inline mixer does not have any moving parts and requires no maintenance. An inspection for signs of a leak should be conducted. The APD mixer has many moving parts that are subject to stresses and potential failures. The unit will exhibit tell tale signs of problems, i.e.; If the unit runs hot, then it is overloaded or improperly lubricated. If the unit runs noisy then the foundation bolts are loose, the RV disc is worn, the bearings have failed or insufficient lubrication is the cause. In the event the output shaft does not turn at all, then there are broken internal parts. If oil leakage appears, then worn seals are the cause. In the event of complete mixer failure the entire unit will be replaced.

d. Transfer Pumps. The pumps are rugged and chemically resistant units that should not experience operating problems. The pumps can withstand a certain amount of solids including dirt which will pass through. In the event a pump fails then they can be carefully cleaned after removal. System shutdown is required to clean the pump. The control switch can be used to take the pump

off line allowing it to be removed. The pump should be cleaned according to manufacturer's recommendations. In the event of complete pump failure the entire pump motor assembly will be replaced.

Performance checks against the pump curve should be conducted regularly during start-up to make sure pump flow rate levels meet expectations. The manufacturer specifications include the pumps performance curves for reference.

e. Subsurface Conveyance. The 1" and 2" buried PVC pipe is less subject to damage because of its construction. However, the pipes may be damaged if above or belowground activities impact the piping or a failure occurs. The piping can be replaced if needed and system shutdown will be required to repair or replace piping.

f. Control systems. Operating problems with control systems may occur due to malfunction of electrical components (which usually requires a service call by the equipment supplier). Always disconnect the AC power to the control panel before connecting or disconnecting any wires at the terminal block to avoid electrical shock and/or system damage.

Table 9 Bioamendment Infiltration System Operation Strategy and Troubleshooting Guide

Potential Operating Problems	Information Sources and Considerations	Common Remedies
APD Mixer runs hot	Overloaded or improper lubrication.	Check capacity of unit to see if below levels and check for proper lubrication.
APD mixer runs noisy	Loose bolts, worn RV disc, bad bearings or overloaded.	Tighten bolts, replace RV disc, replace bearings and check unit capacity.
APD mixer does not turn	Internal parts are broken.	Initiate shut down and replace mixer.
Pump flow rates in the area of concern are insufficient or not as predicted	The soil may be less permeable in some locations or there may be preferential flow pathways	Further subsurface investigation Readjust flows Install additional wells Check wells for clogging Check for short-circuiting
Pressure levels are inconsistent	There may be preferential flow or heterogeneities	Further subsurface investigation Install additional wells Seal preferential pathways
Dilution tank not auto filling	Solenoid or sensor failure. No city water	Clean sensors and/or replace solenoid then restore water supply at shot off valve.
Desired flow rate not attainable	Pump issues, clogged well screen	Further investigation (particularly for continuous source). Repair or replace pump, flush well or install new well

2.3 Permit Requirements, Monitoring and Laboratory Requirements

2.3.1 Permit Requirements

The contractor shall serve as the operator on all required permits and shall also be responsible for any fees associated with permits the Contractor will be solely responsible for obtaining all required permits and approvals and for complying with all terms and conditions. The Contractor will be responsible for securing all necessary permits to construct and operate the remediation system. Applicable permits include: building permits, plumbing permits, electrical permits, and an air permit. Furthermore, the Contractor will operate the system for a period of five years in compliance with all applicable regulations and permits and submit monthly status reports regarding the system operations.

2.3.2 Monitoring Tasks

Following system startup, the Contractor will monitor, record, and report the following parameters:

1. flow meter readings from each pump and blower assembly;
2. the instantaneous flow rate and vacuum at each bioventing point;
3. biovent blower assembly operational data including temperatures and pressures;
4. VOC (FID), CO_2, O_2, CH_4 and LEL concentration readings;
5. description of samples collected for laboratory analysis;
6. analytical testing results;
7. bioamendment system pressure readings including pressure readings at infiltration laterals;
8. instantaneous bioamendment flow rates (dilution water and nutrient);
9. bioamendment infiltration volume supplied to each zone;
10. maintenance performed (routine and non-routine); and
11. additional site observations.

Daily monitoring of VOC concentrations in system effluent (prior to any off-gas treatment) performed with a portable meter, preferably with a FID, for first week, and weekly for the first month. VOC monitoring of system effluent should be performed at least monthly after startup, concurrently with air flow and temperature.

Off-gas VOC composition sampling and analysis performed by analytical laboratory (for VOCs and Chloroflourocarbons) shall occur at start-up, and at the required frequency following start-up. According to the Section 3.2.1 of Specification 13999, the Contractor will be responsible for performing and reporting the results of future air sampling and laboratory analysis monthly for a period of five years. Reporting will only be submitted to the NYSDEC upon acceptance of the report by the Railroad, only then will the report will be submitted by the Railroad to the NYSDEC for evaluation and determination of the scope and frequency of future sampling during later phases of the system operation.

A running total of mass of VOCs and volume of air will be maintained for each carbon adsorption unit until it is taken off line. A new running total will be started each time a carbon adsorption unit is replaced. Also, the time and date when each GAC unit was replaced will be recorded. This information will be submitted to the Railroad as part of each Progress Monitoring Report. When sampling indicates that the total concentration of VOCs at the outlet of any primary carbon adsorption unit exceeds 1 ppm, the Contractor will shutdown the Bioventing System and replace the carbon in all primary units. Prior to restarting the Bioventing System, the Contractor will divert the flow such that the primary units become the secondary units. The replacement, redirecting of flow and restarting of the Bioventing Systems will be completed within 72 hours of detecting a total VOC concentration of greater than 1 ppm. Change out will be performed by the Contractor in

accordance with the specification and approved O&M Manual. The Contractor will be responsible for identifying and complying with all local, state and federal requirements pertaining to the storage, transfer, transportation, and disposal of the spent carbon.

2.3.3 Laboratory Tests

Within seven (7) calendar days of the beginning of the Performance Test Phase, the Contractor will measure VOC concentrations at the blower discharge, between carbon units, and following the final carbon unit in each train using a photoionization detector (PID). Following screening with the PID, the Contractor will collect a sample from the pre-carbon train and the post-carbon train locations of each blower assembly to be submitted for laboratory analysis. Laboratory analysis for gas samples will be conducted in accordance with EPA Method TO-15 (for VOCs and Chloroflourocarbons). All sampling and analytical methodologies are included in the Treatment System Sampling & Analysis Plan.

Condensate water containing dissolved petroleum contaminants will be sampled for characterization, transported, and disposed off-site on a batch-by-batch basis at an average frequency of 1,000 gallons per month. Sampling methodologies will be included in the Contractor's approved Treatment System Sampling & Analysis Plan. Table 2 of the Treatment System Sampling and Analysis Plan (SAP) includes the analytical requirements. The table includes the sample media, parameters, sample matrix, EPA methods and data use

2.3.4 QA/QC

A QA/QC Program is designed to ensure that services offered meet all required standards of performance, reliability, validity, and quality, while remaining unaffected by cost or schedule considerations. The Contractor's QA/QC program guides the management and integration of quality assurance functions into all project activities. The project QA/QC procedures are designed to meet all current government, industry, and national standards and specifications.

For a major project like the MPY remediation, a site-specific Quality Management System Manual (QMSM) has been prepared, submitted and approved. The manual includes written policies, procedures and/or instructions and the organization necessary to assure adequate control over those activities, which may affect quality.

This section is consistent with the overall QA/QC program and the Treatment System Sampling and Analysis Plan (SAP) which includes the procedures for sample collection, chain-of-custody, analytical methods, and deliverable requirements. All the Contractor's subcontractors and consultants retained for a project must meet the minimum requirements of the QA/QC program. The analytical reports will include all chain-of-custody records and QA/QC results provided by the laboratory at the prescribed basis according to the laboratory program. The project specific level of QC effort provided by the laboratory will be according to the level specified in the table below.

Table 10 QA/QC Samples

Activity	Frequency	Benefit
Equipment Blank	NA	A volume of solution typically laboratory-grade water) that is used to rinse a sampling tool after decontamination. The rinse water is collected and tested to verify that the sampling tool is not contaminated. Equipment blank samples are collected, as needed, to verify the effectiveness of the decontamination procedures on non-dedicated or reusable sampling equipment
Trip Blank	Each shipment	They are provided with each shipping container of samples to be analyzed for volatile organic compounds (VOCs). Analysis of trip blanks shows whether a sample bottle was contaminated during shipment from the manufacturer, while in bottle storage, in shipment to a contract analytical laboratory, or during analysis at a lab. Trip blanks consist of an aliquot of laboratory-grade water sealed in a sample bottle, usually prepared by the analytical laboratory prior to shipping the sample bottles. If trip blanks are not provided by the lab, then field sampling technicians will prepare trip blanks before they collect the samples
Field Blanks	1 in 20	These are collected to check for cross-contamination that may occur during sample collection. For the groundwater monitoring program, one field blank is collected for every 20 samples, or one per sampling round, whichever is more frequent. Field blanks are analyzed for the same parameters as the groundwater samples.
Field Duplicate	1 in 20	These samples are analyzed to check the reproducibility of sampling and analytical results, based on EPA guidelines (EPA 2001). For example duplicates are collected for 5 percent of the total number of samples collected for a project per sampling round or 1 in 20. Duplicate analysis results are compared to determine if the analyses met QA criteria.
Matrix Spike	As needed *	Data shows precision of laboratory analysis when compared with results of sample. Collect an additional amount (100 mL) of sample for residual chlorine analysis only as needed. Analyzed as spiked sample
Matrix Spike Duplicates	As needed *	These are performed to determine whether the sample matrix (e.g., water, soil, or air) adversely affected the sample analysis. A spike is a known amount of analyte added to a sample. Matrix spikes are performed at a rate that is typically one per 20 samples collected or on a project sample delivery group (SDG) basis.
Laboratory Duplicate	1 in 20	Data shows precision of the analytical scheme within the laboratory. The difference between this precision and that of the field duplicate represents the precision of the analytical method

* When deemed necessary by the QA supervisor or QA director.

No definitive laboratory data will be validated. Instead, the data will be reviewed on the basis of reported QC results, and determinations of data quality will be assessed from QC summaries. For this project, only field analytical data will be validated. The validation process will be abbreviated to include the review of calibration records, sample data results from readouts or field notes, and duplicate measurement precision.

Following data review, the entity responsible for sampling will be provided with the data for inclusion in the final report. In addition to the final report, all analytical data in the form obtained from the analytical services provider will be archived with the final project file.

2.3.5 Monitoring and Testing Frequencies

Operation of the Systems is divided into the phases shown on Table 1 and as follows:

Table 11 System Progress Monitoring and Reporting Frequency

Period Name	Number of Operating Calendar Days	Frequency of Progress Monitoring	Frequency of Progress Reporting
Performance Test	14	2 times per day	1 time
Initial Operating Period	42	1 time per week	Weekly
Routine Operating Period	1,825	2 times per week	Monthly

1. Phase 1 - Performance Test - The Performance Test will include, at a minimum, performing Progress Monitoring two times per calendar day during 14 consecutive calendar days of continuous operation of the System.

2. Phase 2 - Initial Operating Period - The Initial Operating Period will include, at a minimum, performing System Progress Monitoring one time per week during 42 calendar days of operation of the System.

3. Phase 3 - Routine Operating Period - The Routine Operating Period will include, at a minimum, performing Progress Monitoring two times per month during 1,825 calendar days of operation of the System

4. The requirements or length of these phases of operation may be increased or reduced if so directed by the Railroad.

2.3.6 Additional Monitoring and Testing

The additional monitoring and testing is to be determined.

2.4 Alternative Operation and Maintenance

2.4.1 Alternative Procedures

The O&M of complex remediation systems may periodically require the development of alternative procedures based on any number of occurrences that seek to improve the process or address an insufficient aspect. Any alternative procedures proposed for O&M will require a review and approval from the Railroad. Furthermore, Long Island Rail Road (LIRR) approval is required prior to implementation of any alternative procedure. Any alternative O&M will be completed and maintained in accordance with the manufacturer's requirements, as well as the Project Quality Plan, (PQP), QMSM and this O&M Manual. Alternatives proposed and ultimately selected for implementation will require a careful review of the PQP, QMSM and O&M manual to ensure the alternatives are in conformance and the necessary updates that may be required.

For example the periodic evaluation of the performance of the system, both the aboveground equipment and subsurface performance, may precipitate alternative procedures. The audit team of the project that has the responsibility to see that the evaluations are periodically done. Evaluation and optimization is best performed by an independent review team as well as a team that includes the system designers. Operational data will be made available to support the evaluation and auditing processes. Data will be collected more frequently during the early, transient stages of

operation, and the sampling and monitoring frequencies are reduced as the system moves toward steady-state.

Another aspect that may require alternative procedures is the need to optimize the system to achieve maximum contaminant removal rates at minimum costs as quickly as possible. The strategy will involve collecting data frequently enough to identify and ensure the continuity of trends. Complete and thorough data sheets will be generated, maintained and reviewed in order to track these types of trends.

2.4.2 Analysis of Vulnerability

Vulnerability analysis, also known as vulnerability assessment, is a process that defines, identifies, and classifies the system vulnerabilities.

To reduce the risks associated with system vulnerabilities, the Contractor shall address both the number of vulnerabilities in the system being installed and the number of vulnerabilities in the systems in place. Reducing the number of new vulnerabilities in the installation process is the initial focus of our efforts, while removing existing vulnerabilities of the systems in place is the focus of our vulnerability remediation work. A vulnerability remediation process involves four basic steps.

Generate – The Contractor shall generate vulnerability reports in two ways: monitoring Railroad sources of vulnerability information and process reports generated by us. After receiving reports, the Contractor shall perform an initial analysis to eliminate duplicates or false alarms, and then review the reports for necessary actions and place them in their files.

Analysis - Once the vulnerabilities are filed, the Contractor shall determine general severity, considering factors such as the number of affected systems, impact, and worst case scenarios. Based on severity and other attributes, the Contractor shall select vulnerabilities for further analysis. The analysis should include background research, real time static analysis, reproduction in a virtual area, and consultation with the Railroad, vendors and other experts.

Coordination - When handling direct reports, the Contractor shall work directly with the Railroad and with vendors to address vulnerabilities. The Contractor shall have established, secure communication channels with all their vendors, both directly and through relationships with computer security specialists. The Contractor shall have the necessary experience to successfully coordinate responses to vulnerabilities that may affect multiple vendors.

Disclosure - After coordinating with the Railroad and vendors the Contractor shall take steps to determine if there is an appropriate critical audience for disclosure of the vulnerabilities. This decision is only made after concurrence with all involved. To the best of their ability, the Contractor shall produce accurate, objective technical information focused on solutions and mitigation techniques. The Contractor will provide sufficient information to make an informed decision about risk.

2.4.3 Failure Requirements

The sampling team will be responsible for addressing failures in the sampling or measurement systems and will implement corrective action in these situations. In general, corrective action for field sampling and measurement failures include recalibration of instruments, replacement of malfunctioning measurement instruments or sampling equipment, and re-sampling or repetition of measurements.

The laboratory will conduct a routine preventive maintenance program that is part of its QA/QC program in order to minimize the occurrence of instrument failure and other system malfunctions. A record of failure conditions affecting the remediation system will be maintained and nonconformance report form and corrective action request will be prepared and submitted as per the QMSM. This report form will be logged and the request form will be addressed. Theses types of events may include area wide power failures, extraction pump failures, blower failures, releases or any natural disasters. It may also serve as a register of major emergencies or alarm conditions, with supplemental reports filed describing the occurrence, damage cause, and all emergency corrective actions taken.

2.5 General Safety Precautions

Each Safety Manager and Safety Supervisor will have successfully completed the 40-hour Occupational Safety and Health Administration (OSHA) course on OSHA's Hazardous Waste and Emergency Response Standard (HAZWOPER) training (29 CFR 1910). The Contractor's personnel shall be issued Personnel Protective Equipment (PPE) and shall be trained in their proper use that includes what to use, and when, as well as putting on and taking the PPE off. Typical PPE includes steel toe boots, ear protection, protective chemical resistant gloves, eye protection and a hard hat. Often the PPE may include a respirator and tyvek suit, if required. The Contractor's personnel should be medically cleared, trained and fit tested for respirator use prior to being issued a person specific respirator. Because the systems are noisy, hearing protection shall also be issued and should be worn when working near the systems, especially the blowers.

Formal operator training is needed to adequately prepare site operators to safely and effectively operate and maintain the Bioventing and LNAP recovery system equipment. Refer to the attached Health and Safety Plan for more detailed information.

2.5.1 Emergency Safety Plan

A properly designed system will minimize fugitive vapor emissions in the form of explosive and non-explosive vapors. In the case of permitted and approved releases of VOCs directly to the atmosphere, release points should be located away from sensitive receptors and potential sources of ignition. Explosion hazards should be considered relative to other aspects of the Bioventing systems as well.

Some vacuum pumps generate high discharge temperatures. If these units push high-temperature gases into carbon beds, there is the possibility of spontaneous combustion that can produce even higher temperatures, thereby propagating the combustion. Starting an internal fire fanned by a vacuum pump or blower is possible. If the concentration of organic vapors falls between the upper and lower explosive limits, the possibility of explosion exists.

Vacuum pumps have internal clearances that affect efficiency. If a rotary lobe vacuum pump is poorly maintained and has a bearing or lobe failure, the unit may be damaged beyond repair. Also there is greater potential for a poorly maintained unit to create a fire hazard, especially if high concentrations of organics are being extracted.

Carbon canisters can sometimes contain high concentrations of VOCs that can leak into the surrounding atmosphere during the changing of these units. The equipment may include valves to isolate the liquids and fumes before piping, hoses, or ducts are disconnected, as well as provision for fire protection/suppression.

To avoid static electricity buildup, all equipment should be grounded as should the building and other items inside the building where the process equipment is installed.

The National Fire Protection Association (NFPA) prepared a guide on hazardous materials (1994) which includes data on flashpoint, specific gravity, water solubility, hazard identification, and boiling point for flammable liquids, gases, and solids. Material safety data sheets assembled for a site will contain information on the physical and chemical properties for contaminants of concern. Fire hazard data are also included that identify combustibility, flammability, and explosivity of the compounds.

An operating plan for emergencies and the procedures to be followed until normal operation can be resumed. Phone numbers to keep readily accessible should be police and fire departments, and for chemical spills or exposure the MTA LIRR response contractor. The emergency call up list should identify, in ranked order, waste water system personnel responsible for making decisions in specific situations.

2.5.1.1 Fire Procedures

EMERGENCY: A fire which could cause the release of toxic fumes from hazardous waste or a fire which could spread to off-site areas. If the fire spreads, it could ignite materials at other locations at the site or cause heat-induced explosions. Use of water or water and chemical fire suppressant could result in contaminated run-off.

NON-EMERGENCY: If you have been trained, if the fire is small (rule of thumb: less than a wastepaper basket) and you feel you can capably use the fire extinguisher, locate the nearest fire extinguisher for use.

The following procedures should be followed in the event of a fire:

1. Pull fire alarm.
2. If someone is on fire, locate a fire blanket, direct the person to ‘stop, drop, and roll’ and use the blanket to cover the person to snuff out the flames.
3. Call the Metropolitan Transportation Authority Police Department Emergency Phone Number, **911 or 1-888-NYC SAFE**. Be prepared to provide the following information:.
4. Proceed to the nearest available exit by following exit signs.
5. Close doors (unless there is a natural gas leak) as you leave.
6. Do not smoke or use elevators while exiting.
7. Do not return for any reason once you are clear of the building.
8. Assemble with other building occupants at the designated area.
9. Once the building or area is considered safe the MTA Fire Chief in charge will announce re-entry is permitted after concurrence with the Emergency Coordinator.

2.5.1.2 Explosion Procedures

EMERGENCY: An explosion has occurred. An imminent danger exists that an explosion involving hazardous waste could occur, resulting in a safety hazard due to flying fragments or shock waves. An imminent danger exists that an explosion could ignite other hazardous waste at the facility. An imminent danger exists that an explosion involving hazardous waste could result in the release of toxic material.

NON-EMERGENCY: A loud bang, pop or other noise resulting from an occurrence other than an explosion.

The following procedures should be followed in the event of an explosion:

1. Pull fire alarm.
2. If someone is on fire, locate a fire blanket, direct the person to 'stop, drop, and roll' and use the blanket to cover the person to snuff out the flames.
3. Call the Metropolitan Transportation Authority Police Department Emergency Phone Number, **911 or 1-888-NYC SAFE**. Be prepared to provide the following information:.
4. Proceed to the nearest available exit by following exit signs.
5. Close doors (unless there is a natural gas leak) as you leave.
6. Do not smoke or use elevators while exiting.
7. Do not return for any reason once you are clear of the building.
8. Assemble with other building occupants at the designated area.
9. Once the building or area is considered safe the MTA Fire Chief in charge will announce re-entry is permitted after concurrence with the Emergency Coordinator.

2.6 Equipment Maintenance

2.6.1 Requirements and Frequency

General maintenance and inspection activities are categorized as (1) routine, (2) special, (3) emergency, and (4) winter. Routine maintenance and inspection activities are those that are regularly performed and required to keep equipment and systems in satisfactory continuous operation. Special maintenance activities are those that are not regularly performed, but which can be scheduled on a non-emergency basis. Emergency maintenance activities are those required to be performed to correct a situation where damage has already occurred or to prevent a potential damaging situation. Winter maintenance activities are those required to protect the system from damage during periods of freezing temperatures.

The piping spill boxes, drain sumps, and any aboveground piping should be inspected at least twice during the winter or after each major snow or sleet event, whichever is more frequent. Snow or heavy ice accumulation should be removed, and valve operation should be checked. Ensure that the heater is working in building and that flow is entering the tanks.

Lubrication is probably the most important function of a routine maintenance program and if possible, only the best quality of oils and grease obtainable should be used. It is very important to follow the procedures and the manufacturer's recommendations. Any extruded grease should be collected and properly disposed. It is a good practice to eliminate as many different types of lubricants and consolidate as much as possible. Lubrication procedures for each piece of equipment associated with the Bioventing and LNAPL recovery systems are described below.

The following subsections summarize these maintenance activities and schedules for the items described in the specifications. Attachment D includes a Maintenance Schedule. Detailed maintenance information is included in the O&M Data.

Whenever operating personnel are conducting maintenance activities associated with an alarm condition, the following procedures should be followed:

Step 1: Notify management personnel so that they can independently interface with the control system remotely to determine the cause of the problem.
Step 2: At the yard implement appropriate lock-out/tag-out procedures for the equipment requiring maintenance and any associated equipment.
Step 3: Determine the type of repairs that are required before starting any activities.
Step 4: Complete the necessary repairs and verify that repairs are complete by inspecting the information displayed on the PLC screens.

Step 5: Visually inspect the rest of the system in order to identify any additional irregularities of equipment in need of repair.
Step 6: Re-energize the equipment in accordance with the appropriate lockout/tagout procedures ensuring all valves are moved to the correct positions.
Step 7: Start the system with the startup sequences and make sure everything is running correctly.
Step 8: Document all activities so that an accurate record of all repairs is in place.

2.6.2 Equipment Record System

An important factor in operating any efficient remediation system is the maintenance of accurate O&M logs, analytical data and reports. Without a record of past operational performance, it is impossible to identify trends in any process. Records will provide the Railroad, operators and federal and state regulatory agencies with valuable information upon which to base their decisions concerning the system operation. A formal data management system is vital to efficient operation of the system.

The operator should use the records as a guide in regulating, adjusting, and modifying system operation. They are also important in establishing a reliable continuing record of proof of performance and justifying decisions, expenditures, and recommendations. Maintenance records provide important information concerning the equipment history, parts requirements, and preventative maintenance supplies needed.

Data for this project will be obtained from a combination of sources, including field measurements and analytical laboratories. The process of data gathering is a coordination effort and will be conducted by project staff in conjunction with all potential data producers. The data will be obtained from the analytical service provider, when appropriate, in the form of an electronic data deliverable, in addition to the required hard-copy analytical data package. Vacuums/pressures, flow rates, temperatures, and other operating parameters need to be monitored and recorded. Information regarding sample location, date and time of collection, laboratory, test method, analytical results, detection limits, and associated quality control samples must be tracked. For large or long term systems operation, a computerized data management system is suggested.

The records maintained include: weekly and monthly O&M forms, analytical data, monitoring reports, maintenance records, shutdown records and emergency condition records. Examples of weekly and monthly O&M forms that are used for the system are presented in Attachments A, B and C.

2.6.3 Site and Equipment Maintenance

Detailed site and equipment maintenance, troubleshooting and system specifications are included in the product recovery system equipment operations manual and the bioventing O&M manual. These documents are included in the submission of O&M Data as per Section 1.3.2.1 of Specification 133999 The following subsections lists specific equipment maintenance activities.

2.6.3.1 Blowers (B-1 through B-2)

Routine maintenance for each unit should consist of weekly inspection and monthly lubrication of the bearings. Greasing the packing frequently with limited quantities of grease is the best practice. Inject grease through the fittings. Adjustment of the packing is accomplished by tightening the packing gland adjusting nuts. At any point of operation where leaking of the packing is suspected, even tightening of the nuts will keep the packing properly compressed and sealed. The blower requires oil lubrication on the gear end and grease lube on the drive end.

The inspection of the blowers should be conducted and recorded on the forms included in Attachment A at least weekly.

2.6.3.2 Pumps (P-1 through P-2)

Routine maintenance for each pump unit on the moisture separator and concentrate dilution transfer pump should consist of weekly inspection along with monthly lubrication of the bearings. Greasing the packing frequently with limited quantities of grease is the best practice. Inject grease through the fittings. Collect and dispose of all extruded grease. Adjustment of the packing is accomplished by tightening the packing gland adjusting nuts. At any point of operation where leaking of the packing is suspected, even tightening of the nuts will keep the packing properly compressed and sealed. Use only recommended lubricants.

The inspection of the pumps should be conducted and recorded on the forms included in Attachment A at least weekly.

2.6.3.3 Pumps (P-3 through P-7)

These skimming pumps are equipped with automatic water table tracking and are suspended in the product recovery wells pumps. The pumps require maintenance two to four times per month. The pump should is removed from the probe and its filter, screen and probe tube are wiped clean. Then the pump is re-seated in the probe and the auto seeker returns the pump to the product-water interface. At any point of operation if a failure is suspected, then the pumps will be removed and repaired or replaced according to manufacturer's recommendations.

2.6.3.4 Pumps (P-700, P-900)

Routine maintenance for each pump unit on the concentrate and dilution transfer pumps should consist of weekly inspection along with monthly lubrication of the bearings. Greasing the packing frequently with limited quantities of grease is the best practice. Inject grease through the fittings. Collect and dispose of all extruded grease. Adjustment of the packing is accomplished by tightening the packing gland adjusting nuts. At any point of operation where leaking of the packing is suspected, even tightening of the nuts will keep the packing properly compressed and sealed. Use only recommended lubricants.

2.6.3.5 Piping

System piping includes 4" to 12" PVC pipes, LNAPL tubing and galvanized steel pipe. No routine maintenance of the piping is required. An inspection of the piping, as well as the spill box and the drain sumps should be conducted and recorded on the forms included in Attachment B at least weekly. Document any significant variations in product delivery from the piping. Should a substantial drop in the production rate occur, clean-out may be warranted.

2.6.3.6 LNAPL Storage Tank (T-1)

Should sludge buildup in Tank T-1 become such that the normal operation of the tank is limited, cleanout of that tank is warranted. Proper procedures for cleanout of T-1 are described in the manufacturer's O&M manual in the O&M Data Submission. An inspection of T-1 should be conducted and recorded on the forms included in Attachment B according to the schedule detailed in Table 11. On an annual basis, this inspection should include testing for structural integrity.

Information regarding the field repair of T-1 is provided in the manufacturer's O&M manuals in O&M Data Submission.

2.6.3.7 Moisture Separator Tank (MS-1, MS-2)

Monitoring for excessive solids buildup should be performed in the moisture separator tanks (MS 1 and MS-2). Naturally occurring inorganic solutes such as iron, manganese, calcium and fouling by indigenous micro-organisms can occur. Visually inspect the moisture separator tank to ensure it discharges water. If fouling or clogging is suspected then shut system down and clean deposits from discharge areas to re-create flow.

2.6.3.8 Concentrate and Dilution Tanks (T-700, T-800)

Monitoring for excessive solids buildup should be performed in the concentrate and dilution tanks (T-700 and T-800). Naturally occurring inorganic solutes such as iron, manganese, calcium and fouling by indigenous micro-organisms can occur. Visually inspect the dilution water storage tank to ensure it discharges water and inspect the concentrate mix tank to ensure it is discharging the concentrate. If fouling or clogging is suspected then shut system down and clean deposits from discharge areas to re-create flow.

2.6.3.9 GAC Filters

Maintenance and inspection of the GAC units is related to the effluent air quality monitoring. If rising levels of VOCs are detected in the either of the two (2) outlet vents then the granular activated carbon may need to be replaced in one or more of the 4 units. As data is collected from the operation of the Bioventing system, more specific procedures for monitoring the effectiveness of the GAC units are included ion Attachment A.

Spent carbon may be removed by vacuum i.e. a vac-truck or drum vacuum may be used. The vessel must be drained, and the top manway may be removed for ease of access. The carbon can be removed with a nonmetallic pipe or hose though the top manway, or through the adsorbent drain lines at the bottom of each vessel.

Change-out of the GAC will be considered to be handling of hazardous materials and will be performed in a manner consistent with health and safety plan and training. Appropriate PPE will be used while performing the activated carbon change-out.

2.6.3.10 LNAPL Level Meters

No routine maintenance is required for the electronic level meters. However, the site tubes will require weekly cleaning. The site glass ports should be unscrewed and a brush used to remove buildup from the inside of the site glass. A cleaning solvent (such as WD-40) may be used to ensure that a thin film of buildup does not remain. An inspection of the level meters should be conducted and recorded on the forms included in Attachment B at least weekly. Maintenance activities should also be recorded on the forms included in Section 4.0. Information regarding the servicing of the level meters is provided from the manufacturer.

2.6.3.11 Bioamendment Level Meters

Routine maintenance is required for these level meters. The water level in the dilution tank is controlled by level sensors that open and close an automatic solenoid control valve. Testing of the sensors and solenoid is required periodically. Solenoid failure would require replacement of the solenoid. The level and dilution of the concentrate in the tank is manually controlled by the operator

by manual ball valves and manual transfer to the tank. The flow of water and concentrate from the tanks to the injection wells is controlled by way of core isolation valves and throttle valves immediately after the flow meters. An inspection of the level meters should be conducted and recorded on the forms included in Attachment C at least weekly. Maintenance activities should also be recorded on the forms included in Attachment C. Information regarding the servicing of the level meters is provided from the manufacturer.

2.6.3.12 Valves

Operating personnel should open and close each valve associated with the LNAPL recovery system, bioventing system and bioamendment infiltration system periodically to ensure a full range of motion. Any problems should be fixed immediately. An inspection of the valves should be conducted and recorded on the appropriate forms at least weekly. Information regarding obtaining service for the valves is provided from the manufacturer.

2.6.3.13 APD Mixer

The mixer shaft is liberally lubricated before assembly with anti-seize compound (Locktite, Kluber, etc.). The lubricant aids in installation of the reducer and will aid removal. After the first week of operation check all external fasteners and plugs for tightness. After the first month of operation, start unit and when the sump oil reaches normal operating temperature, shut down the drive and immediately drain oil. The magnetic probe should be cleaned at this time. Flush the unit with warm oil of the same type and collect. Pump or pour the clean oil into unit until clean oil appears at the drain. Close drain and refill with same oil type. An inspection for signs of a leak should be conducted and recorded on the form included in Attachment C at least weekly. At any point of operation if a failure is suspected, then the mixer will be removed and replaced.

2.6.3.14 Inline Mixer (IM-800)

The mixer does not have any moving parts and requires no maintenance. An inspection for signs of a leak should be conducted and recorded on the form included in Attachment C at least weekly. At any point of operation if a failure is suspected, then the inline mixer will be removed and replaced.

2.6.3.15 Programmable Logic Controller

No routine maintenance is required for the PLC. An inspection of PLC operation should be conducted and recorded at least weekly. Information regarding the servicing of the PLC is provided from the manufacturer.

2.6.3.16 LNAPL Float Sensors/Switches

There is an array of sensor bands, internal to the probe that use a low frequency, omni directional signal to sense the product and water interface. No routine maintenance is required for these sensors/switches. The sensors/switches on the skimming pumps are suspended in the product recovery wells pumps and are designed to operate in a well for years with no maintenance required. At any point of operation if a failure is suspected, then the pumps will be removed and cleaned, repaired or replaced according to manufacturer's recommendations.

2.6.3.17 Wiring

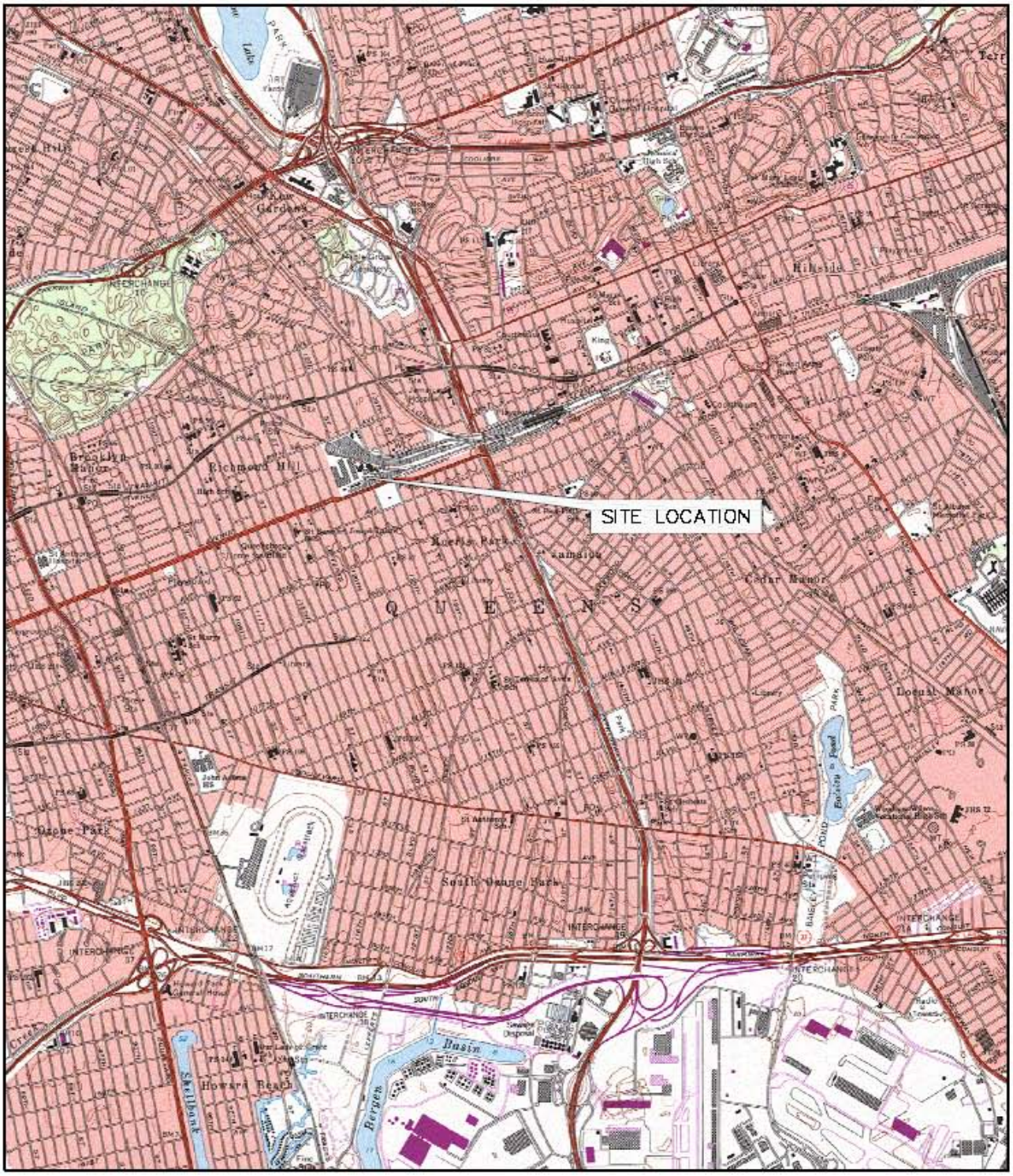
No routine maintenance is required for the wiring. An inspection of the wiring should be conducted and recorded on the forms weekly. Any frayed or stripped wiring encountered, however, should be addressed immediately by a qualified electrician to prevent any undue or unscheduled shutdown of the plant and to eliminate any potential fire hazards.

2.6.3.18 Building

No routine maintenance is associated with the building structure, however, following every major storm a visual inspection of the building shell is warranted to ensure that integrity of the building is maintained.

FIGURE and DRAWING

Figure 1 – Site Location Plan
Drawing C-1 – Existing Site Plan



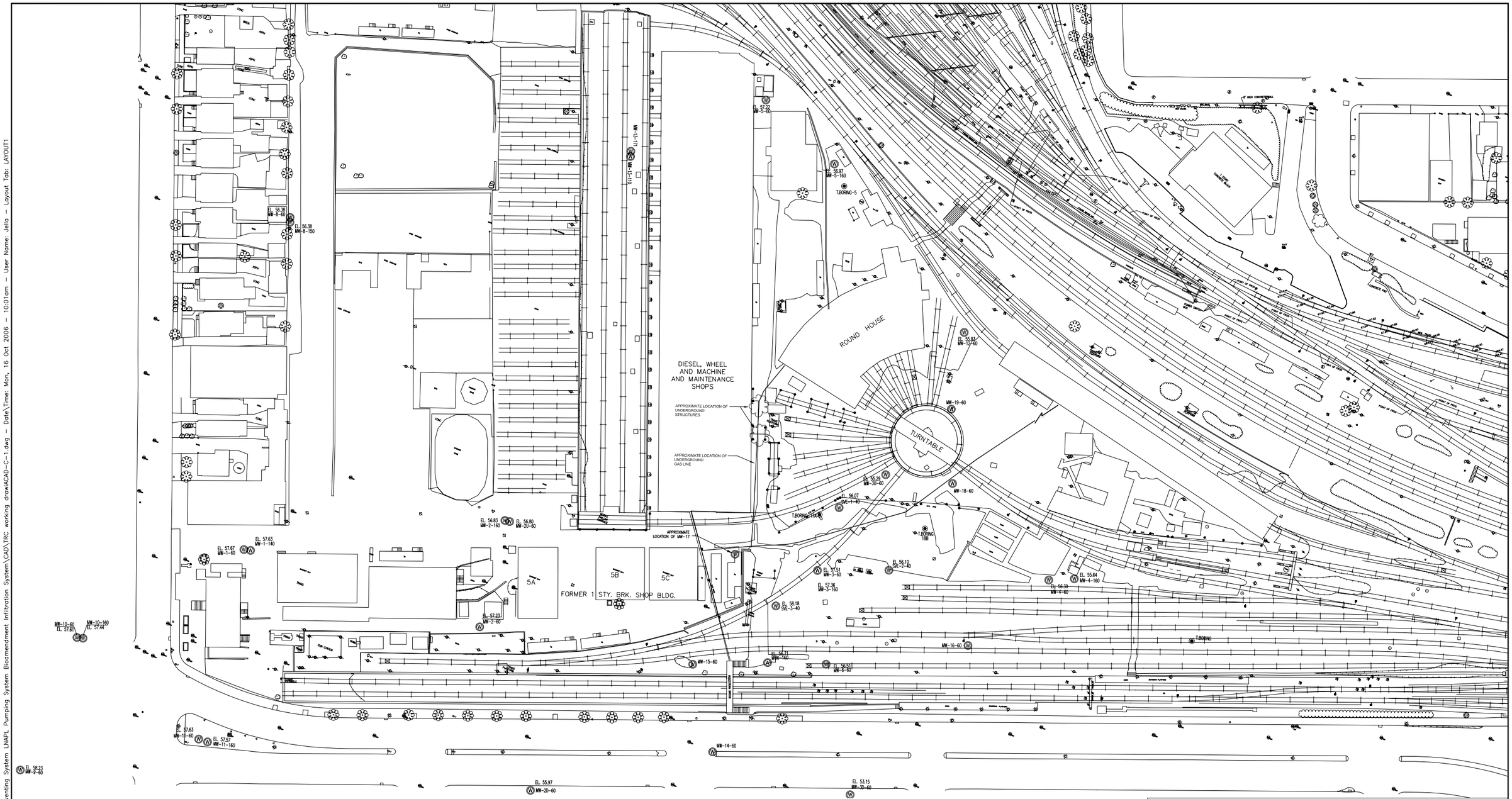
BASE CREATED WITH TOPO™ © 1996
WILDFLOWERS PRODUCTIONS, www.topo.com
QUEENS, NY – 7.5' TOPOGRAPHIC MAP

SITE LOCATION MAP

0 3,000' 6,000'

GRAPHIC SCALE

FIGURE 1



NOTES:
1) THE LOCATIONS OF UNDERGROUND STRUCTURES AND UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR.

LEGEND

- EXISTING MONITORING WELL
- SOIL BORING POINT

EXTERNAL DRAWING REFERENCE: BASEMAP SURVEY PROVIDED BY MTA LONG ISLAND RAIL ROAD

NUMBER	DATE	REVISIONS	APPROVED
FINAL ISSUE NO. 1	10-14-06	REMEDIATION DESIGN	

TRC
Customer-Focused Solutions
1430 BROADWAY
NEW YORK, NY 10018
(212) 221-7822

MTA LONG ISLAND RAIL ROAD
MORRIS PARK YARD
QUEENS, NEW YORK

EXISTING SITE PLAN

STEVEN D. MEERSMA, P.E.
NY PE # 076572
DATE

DESIGN:	SWL,BAK	11/09/00	SHEET 2 OF 19	C-1
DRAWN:	KDH	12/28/04	SCALE: AS SHOWN	
CHECKED:	SM,RR	10/16/06		

ATTACHMENTS

Attachment A – Bioventing System O&M Form
Attachment B – LNAPL Recovery O&M Form
Attachment C – Bioamendment Infiltration System O&M Form
Attachment D – Maintenance Schedule

Bioventing Remediation System Monitoring
Weekly / Monthly Report
System Operating and Monitoring Requirements

Client	
Site:	
Technician:	
Date:	
Time:	

Parameter	Item	Units	Value	Comments		
Temperature	Inlet Header	^{0}F				
	Outlet Header	^{0}F				
Vacuum	Inlet Header	in. H_2O				
	Outlet Header	in H_2O				
Water Level	Moisture Separator Tank (M-1)	in.				
	Moisture Separator Tank (M-2)	in.				
	Condensate Storage Tank (T-900)	in.				
	Condensate Storage Tank (T-1000)	in.				
	Condensate Storage Tank (T-900)	gal.				
	Condensate Storage Tank (T-1000)	gal.				
Concentration	**Carbon Unit**		**1**	**2**	**3**	**4**
	VOC - from carbon unit effluent	ppm				
	CO2 - from carbon unit influent	ppm				
	O2 - from carbon unit influent	ppm				
	CH4 - from carbon unit influent	ppm				
	LEL - from carbon unit influent	%				
Misc.	Air Velocity Biovent Well Flow Rates	scfm				
	Total Blower Assembly Flow Rate	scfm				
Inspection *	**Activity**	**Yes**	**No**	**Comments**		
	Gauge Air Flow	☐	☐			
	Grease Blower	☐	☐			
	Check Oil Level	☐	☐			
	Changed Oil in Blower	☐	☐			
	Check Transfer Pump	☐	☐			
	Check Valves	☐	☐			
	Check Wire	☐	☐			
	Check Drain Sump	☐	☐			
	Check Piping	☐	☐			
	Check GAC Filter	☐	☐			
	Check Well Covers	☐	☐			
	Check Electric Panel	☐	☐			
	Check Enclosures & Locks	☐	☐			
	Check Moisture Separator Tank	☐	☐			
	Check Moisture Separator Drain	☐	☐			
	Check Exhaust Fan Operation	☐	☐			
	Check Lights	☐	☐			
Vacuum Measurements	**Extraction Wells**	**ID**	**in. H_2O**	**ID**	**in. H_2O**	
	Biovent Wellhead	*BVW-1*		*BVW-9*		
	Differential Pressure -	*BVW-2*		*BVW-10*		
	Measure pressure at the pre and	*BVW-3*		*BVW-11*		
	post orifice plate stopcock valve on	*BVW-4*		*BVW-12*		
	the 1/4" copper tubing.	*BVW-5*		*BVW-13*		
		BVW-6		*BVW-14*		
		BVW-7		*BVW-15*		
		BVW-8				

Bioventing Remediation System Monitoring
Weekly / Monthly Report
System Operating and Monitoring Requirements

Comments	
Repairs	
*** Item**	**Action**
Gauge Air Flow	Measure the airflow to ensure appropriate levels are achieved. Check the wells for blockage, check pipes and connectors.
Grease Blower	Approximately every 500 hours re-grease the blower according to the manual.
Check Oil Level	Check that the oil level is within the appropriate range.
Changed Oil in Blower	Approximately every 1,500 hours (9 weeks), change oil in blower assembly, adding oil suitable to ambient conditions for the next period.
Check Transfer Pump	Verify that the transfer pump is working properly. Listen for abnormalities.
Check Valves	Check the valves to make sure they are in the appropriate position and no leaks have occurred.
Check Wire	Inspect connections to ensure they are snug or complete and look for signs of damaged to wire or wire insulation.
Check Drain Sump	Inspect for signs of leakage and integrity of the structure.
Check Piping	Check for leaks, especially at joints and connection points. Verify pipe positions have not changed.
Check GAC Filter	Check for fouling or clogging. Change out as needed. Periodically drain water. A tube will be placed on the valve equipped with a manual pump and the discharge tube will be placed in the closest condensate storage tank.
Check Well Covers	Check for signs of damage or water infiltration and remove any debris that may have accumulated in or around the cover, seal and mounting hardware.
Check Electric Panel	Ensure the cover closes properly and no liquids are coming into contact with the panel. Also check breakers are working.
Check Doors & Locks	Complete a walk around and inspect for signs of water or physical damage. Inspect locks and doors.
Check Moisture Separator Tank	Inspect for signs of warping or possible implosion, check for rust and corrosion. Inspect the site tube and assembly for signs of damage or failure. Inspect connections
Check Moisture Separator Drain	Check the valve to make sure it is in the appropriate position and no leaks have occurred.
Check Exhaust Fan Operation	Verify that the fan is working properly. Listen for abnormalities.
Check Lights	Make sure all lights are working.
Clean Building	Check floor for signs of leaks and broom clean the area. Put away any

LNAPL Recovery Remediation System Monitoring
Weekly / Monthly Report
System Operating and Monitoring Requirements

Client	
Site:	
Technician:	
Date:	
Time:	

Inspection *		**Front Panel LED**		**Control Panel**		**Seeker Reel**		**Flow Meter**	
	Location	**OK**	**Not OK**	**OK**	**Not OK**	**OK**	**Not OK**	**OK**	**Not OK**
	PRW-1	☐	☐	☐	☐	☐	☐	☐	☐
	PRW-2	☐	☐	☐	☐	☐	☐	☐	☐
	PRW-3	☐	☐	☐	☐	☐	☐	☐	☐
	PRW-4	☐	☐	☐	☐	☐	☐	☐	☐
	PRW-5	☐	☐	☐	☐	☐	☐	☐	☐
	PRW-6	☐	☐	☐	☐	☐	☐	☐	☐
		Yes	**No**	**Comment**					
	Check Piping Spill Box	☐	☐						
	Check Piping	☐	☐						
	Check Connections	☐	☐						
	Check Wiring	☐	☐						
	Check Enclosure/Locks	☐	☐						
	Check Shut Off Switch	☐	☐						
	Check Product Piping	☐	☐						
	Check Piping Drop Tube	☐	☐						
	Check Product Tank	☐	☐						
	Check Lights	☐	☐						
	Clean Building	☐	☐						
Comments									
Repairs									

*** Item**	**Action**
Front Panel LED	Check for yellow light indicating system is on. Also lights will indicate: tank is full, reel high or low limit, or pump circuit overload. Listen for audio enunciator tones look for light.
Control Panel	Ensure the cover closes properly and no liquids are coming into contact with the panel. Test panel using test switch.
Seeker Reel	Inspect for signs of damage or failure. Ensure line is free to move and not knotted or tangled. Check wire connections make sure complete.
Flow Meter	Inspect for signs of rust and corrosion. Inspect the meter and assembly for signs of damage or failure. Record value as needed.
Spill Box	Check spill box for signs of leaks and signs of imminent failure. Keep box clean so leaks are easily
Piping	Check for leaks, especially at joints and connection points. Verify pipe positions have not changed.
Connections	Inspect connections to ensure they are snug or complete and look for signs of damaged to insulation.
Wiring	Inspect connections to ensure they are snug or complete and look for signs of damaged to wire or wire
Doors/Locks	Complete a walk around and check for signs of water or physical damage. Inspect locks and door.
Shut Off Switch	Inspect switch and assembly for signs of damage or failure.
Product Piping	Check for leaks, especially at joints and connection points. Verify pipe positions have not changed and no impacts have occurred.
Piping Drop Tube	Inspect for signs of damage or failure. Ensure tube is measuring tank levels and clean as needed.
Product Tank	Check floor for signs of leaks. Inspect tank for signs of imminent failure. If the tank is at 75% capacity then contact the oil removal contractor to pick up the oil for off site treatment, disposal or destruction.
Lights	Make sure all lights are working.
Building	Check floor for signs of leaks and broom clean the area. Put away any items used and ensure a tidy work area is maintained.

Bioadmendment Infiltration System Monitoring
Weekly / Monthly Report
System Operating and Monitoring Requirements

Client				
Site:				
Technician:				
Date:				
Time:				
Parameter	**Item**	**Units**	**Value**	**Comments**
Water Meter	This reading	gal.		
	Last reading	gal.		
	Amount (this - last)	gal.		
Water/ Concentrate Level	Dilution Water Storage Tank (T-800)	in.	NA	Automatically controlled
	Concentrate Mix Tank (T-700) begin	gal.		
	Concentrate Mix Tank (T-700) end	gal.		
	T-700 (end-begin) =	gal.		
Inspection *	**Activity**	**Yes**	**No**	**Comments**
	Gauge Water Use	☐	☐	
	Check for Leaks at BackFlow Preventor	☐	☐	
	Check Valves	☐	☐	
	Check Tank T-700	☐	☐	
	Check Tank T-800	☐	☐	
	Check APD Mixer	☐	☐	
	Listen to APD Mixer	☐	☐	
	Check APD Mixer Oil	☐	☐	
	Change APD Oil (monthly)	☐	☐	
	Check Pump (P-700)	☐	☐	
	Listen to Pump (P-700)	☐	☐	
	Check Pump (P-900)	☐	☐	
	Listen to Pump (P-900)	☐	☐	
	Check Piping	☐	☐	
	Check IM Mixer	☐	☐	
	Check Injection Piping	☐	☐	
	Check Electric Panel	☐	☐	
	Check Doors & Locks	☐	☐	
	Check Wire	☐	☐	
	Check Lights	☐	☐	
	Check Building	☐	☐	
Additional Activities	**Describe**	**Yes**	**No**	**Comments**
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	

Bioadmendment Infiltration System Monitoring
Weekly / Monthly Report
System Operating and Monitoring Requirements

Comments	
Repairs	
*** Item**	**Action**
Gauge Water Use	Read the water meter at the beginning and end of use. Subtract the values in gallons and note amount on the form.
Check BackFlow	Inspect for signs of leakage and integrity BackFlow Preventor.
Check Valves	Check the valves to make sure they are in the appropriate position and no leaks have occurred.
Check Tank T-700	Inspect for signs of warping or possible leaks. Inspect the solenoid for signs of damage or failure. Inspect connections.
Check Tank T-800	Inspect for signs of warping or possible leaks. Inspect the solenoid for signs of damage or failure. Inspect connections.
Check APD Mixer	After the first week of operation check all external fasteners and plugs for tightness.
Check APD Mixer Oil Level	Check that the oil level is within the appropriate range.
Change Oil in APD Mixer	After the first month of operation, start unit and when the sump oil reaches normal operating temperature, shut down the drive and immediately drain oil. The magnetic probe should be cleaned at this time. Flush the unit with warm oil of the same type and collect. Pump or pour the clean oil into unit until clean oil appears at the drain. Close drain and refill with same oil type.
Check Pump (P-700)	Verify that the pump is working properly.
Listen to Pump (P-700)	Listen for abnormalities.
Check Pump (P-900)	Verify that the pump is working properly.
Listen to Pump (P-900)	Listen for abnormalities.
Check Piping	Check for leaks, especially at joints and connection points. Verify pipe positions have not changed.
Check IM Mixer	Check for leaks, especially at joints and connection points. Verify pipe positions have not changed.
Check Injection Piping	Check for leaks, especially at joints and connection points. Verify pipe positions have not changed at the area where pipe enters ground.
Check Electric Panel	Ensure the cover closes properly and no liquids are coming into contact with the panel. Also check breakers are working.
Check Doors & Locks	Complete a walk around and inspect for signs of water or physical damage. Inspect locks and doors.
Check Wire	Verify that the wire has not been damaged and is working properly.
Check Lights	Make sure all lights are working.
Clean Building	Check floor for signs of leaks and broom clean the area. Put away any items used and ensure a tidy work area is maintained.

Maintenance Schedule

Item	Action	Preventative	Scheduled	Frequency	Details
Blowers (B1 and B2)	Inspection	X		Weekly	An inspection for signs of a leak or other release should be conducted and recorded on the forms.
	Lubrication		X	Monthly	Greasing the packing frequently with limited quantities of grease is the best practice. Inject grease through the fittings. Adjustment of the packing is accomplished by tightening the packing gland adjusting nuts. At any point of operation where leaking of the packing is suspected, even tightening of the nuts will keep the packing properly compressed and sealed. The blower requires oil lubrication on the gear end and grease lube on the drive end.
Pumps (P1 and P2)	Inspection	X		Weekly	An inspection for signs of a leak or other release should be conducted and recorded on the forms.
	Lubrication		X	Monthly	Greasing the packing frequently with limited quantities of grease is the best practice. Inject grease through the fittings. Collect and dispose of all extruded grease. Adjustment of the packing is accomplished by tightening the packing gland adjusting nuts. At any point of operation where leaking of the packing is suspected, even tightening of the nuts will keep the packing properly compressed and sealed. Use only recommended lubricants.
Pumps (P3 to P7)	Inspection	X		Weekly	An inspection for signs of a leak or other release should be conducted and recorded on the forms.
	Lubrication		X	Bi-monthly	The pump should be removed from the probe and its filter, screen and probe tube are wiped clean. Then the pump is re-seated in the probe and the auto seeker returns the pump to the product-water interface

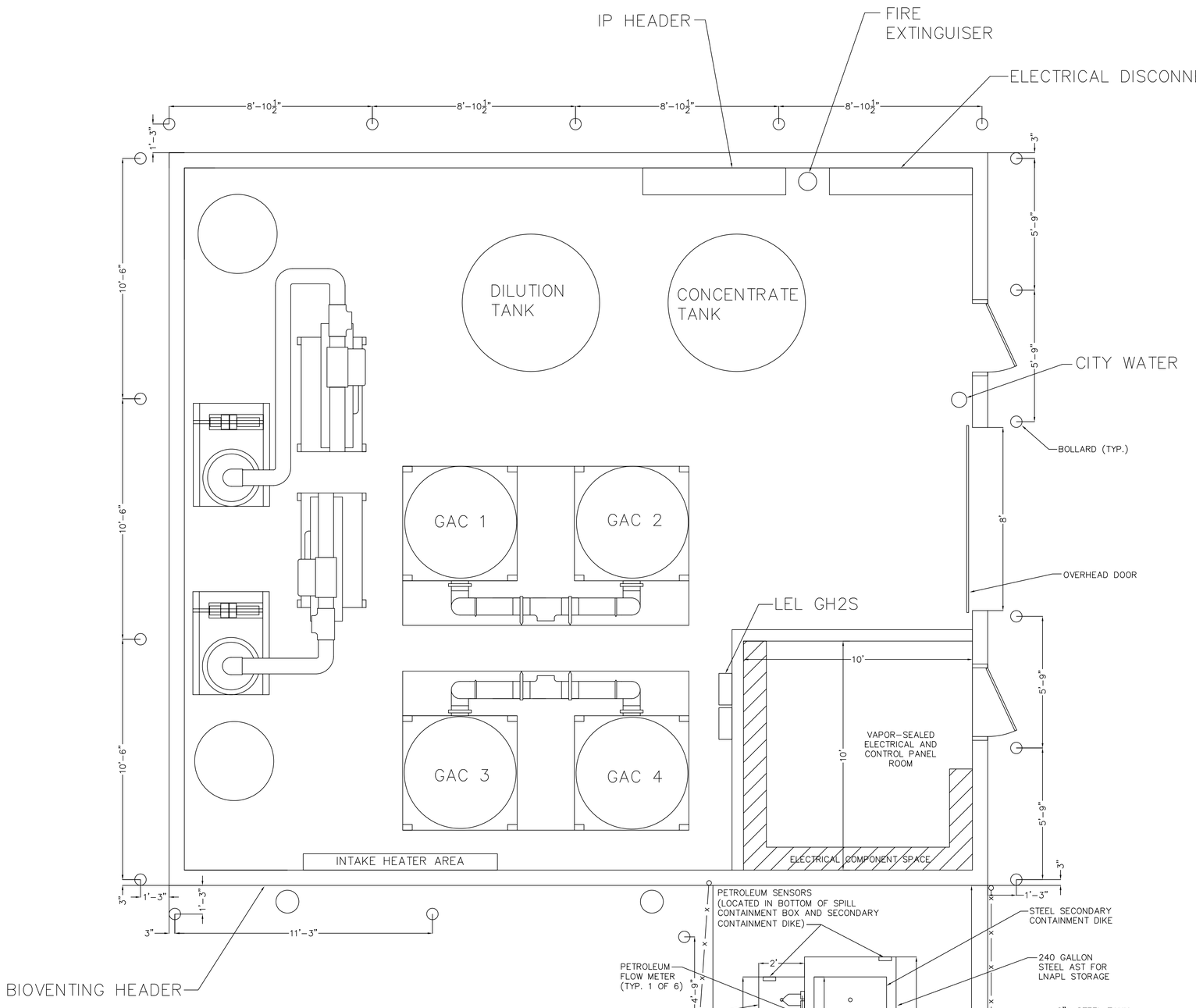
Item	Action	Preventative	Scheduled	Frequency	Details
Pumps (P700 and P900)	Inspection	X		Weekly	An inspection for signs of a leak or other release should be conducted and recorded on the forms. The meter will be checked for accuracy and operation.
	Lubrication		X	Bi-monthly	The pumps include ball bearings that are permanently lubricated with the appropriate lubrication. No lubrication is needed.
Piping	Inspection	X		Weekly	An inspection of the piping and the drain sumps should be conducted and recorded.
			X	Twice during winter	The aboveground piping should be inspected at least twice during the winter, or after each major snow or sleet event, whichever is more frequent.
Spill Boxes	Inspection	X		Weekly	An inspection of the spill box for signs of a leak or other release should be conducted and recorded on the forms.
	Inspection	X		Twice during winter	The spill boxes should be inspected at least twice during the winter, or after each major snow or sleet event, whichever is more frequent.
LNAPL Storage Tank (T-1)	Inspection	X		Weekly	Check for sludge buildup to make sure normal operation of the tank, otherwise cleanout of that tank is warranted.
	Inspection	X		Annually	Test for structural integrity based upon manufacturer's recommendations and specifications.
Moisture Separator Tank (MS-1, MS-2)	Inspection	X		Weekly	Monitor for excessive solids buildup and visually inspect the moisture separator tank to ensure it discharges water. If fouling or clogging is suspected then shut system down and clean deposits from discharge areas to re-create flow.

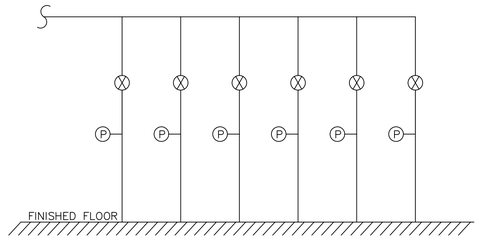
Item	Action	Preventative	Scheduled	Frequency	Details
Site Tubes	Inspection	X		Weekly	Site tubes require weekly cleaning. The site glass ports should be unscrewed and a brush used to remove buildup from the inside of the site glass. A cleaning solvent (such as WD-40) may be used to ensure that a thin film of buildup does not remain. An inspection of the level meters should be made to check that they are showing the proper tank level.
GAC Filters	Inspection	X		Weekly	Monitor the effluent air quality. If rising levels of VOCs are detected in the either of the two (2) outlet vents then the granular activated carbon may need to be replaced in one or more of the 4 units.
	Drain	X		Weekly	A tube will be placed on the valve equipped with a manual pump and the discharge tube will be placed in the closest condensate storage tank (T-900 or T-1000).
	Change out		X	As Needed	Spent carbon may be removed by vacuum i.e. a vac-truck or drum vacuum may be used. The vessel must be drained, and the top manway may be removed for ease of access. The carbon can be removed with a nonmetallic pipe or hose though the top manway, or through the adsorbent drain lines at the bottom of each vessel
Valves	Inspection	X		Weekly	An inspection for signs of a leak or other release should be conducted and recorded on the forms.
	Operation		X	Monthly	During shutdown or offline periods personnel should open and close each valve associated with the LNAPL recovery system, the Bioventing System and the Bioamendment Infiltration System to ensure a full range of motion.

Item	Action	Preventative	Scheduled	Frequency	Details
Programmable Logic Controller	Inspection	X		Weekly	No routine maintenance is required for the PLC. An inspection of PLC operation should be conducted and recorded at least weekly.
	Operation		X	Annually	Check power supply to make sure the proper voltage is being supplied.
LNAPL Float Sensors/Switches	Inspection	X		Weekly	There is an array of sensor bands, internal to the probe that uses a low frequency, omni directional signal to sense the product and water interface. No routine maintenance is required for these sensors/switches.
	Change out		X	As Needed	At any point of operation if a failure is suspected, then the pumps will be removed and cleaned, along with the probe inlet slots and holes in the sensor band area. Care must be taken when cleaning the slots and holes to avoid damaging the probe and sensor area. Avoid using sharp tools like screwdrivers, knives, etc. to clean the slots and holes.
Water Storage Tank (T-800) and Mix Tank (T-700)	Inspection	X		Weekly	Monitor for excessive solids buildup and visually inspect the tanks to ensure it discharges water. If fouling or clogging is suspected then shut system down and clean deposits from discharge areas to re-create flow.
	Inspection	X		Annually	Test for structural integrity based upon manufacturer's recommendations and specifications.
Tank Level Sensors	Inspection	X		Weekly	The level sensors in the tank open and close an automatic solenoid control valve. The level sensor and solenoid control valve each require weekly testing.
	Change out		X	As Needed	At any point of operation if a failure is suspected, then the solenoid or the sensor will be removed and replaced as needed.

Item	Action	Preventative	Scheduled	Frequency	Details
Solenoid Valves	Inspection	X		Weekly	The solenoid control valve requires weekly testing.
	Cleaning		X	Monthly	The valve should be disassembled and cleaned; strainer or filter should also be cleaned. The reassembly requires lubrication to the stem gasket.
	Change out		X	As Needed	At any point of operation if a failure is suspected, then the solenoid or the sensor will be removed and replaced as needed.
Inline Mixer (IM-800)	Inspection	X		Weekly	The mixer does not have any moving parts and requires no maintenance. An inspection for signs of a leak should be conducted and recorded on the form.
	Change out		X	As Needed	At any point of operation if a failure is suspected, then the inline mixer will be removed and replaced.
APD Mixer	Inspection	X		Weekly	After the first week of operation check all external fasteners and plugs for tightness.
	Change out		X	Monthly	Start unit and when the sump oil reaches normal operating temperature, shut down the drive and immediately drain oil. The magnetic probe should be cleaned at this time. Flush the unit with warm oil of the same type and collect. Pump or pour the clean oil into unit until clean oil appears at the drain. Close drain and refill with same oil type.
Water Meters	Inspection	X		Weekly	No routine maintenance is required for the meter. An inspection of the meter for leaks and recording the amount will be completed and recorded on the form.
	Replace		X	As Needed	In the event a water meter leaks or stops counting then it will be replaced.

Item	Action	Preventative	Scheduled	Frequency	Details
Wiring	Inspection	X		Weekly	No routine maintenance is required for the wiring. An inspection of the wiring should be conducted and recorded on the forms weekly.
	Replace		X	As Needed	Any frayed or stripped wiring encountered, however, should be addressed immediately by a qualified electrician to prevent any undue or unscheduled shutdown of the plant and to eliminate any potential fire hazards.
Building	Inspection	X		Weekly	No routine maintenance is associated with the building structure other than cleaning, including sweeping and dry mopping.
	Inspection		X	As Needed	Following every major storm a visual inspection of the building shell is warranted to ensure that integrity of the building is maintained.
	Inspection		X	Twice during winter	Ensure that the heater is working in building. The drain sumps should be inspected at least twice during the winter, or after each major snow or sleet event, whichever is more frequent.





1 / A-2 | A-2 INFILTRATION SYSTEM PIPING MANIFOLD
NTS

0 3' 6'
GRAPHIC SCALE

WARNING

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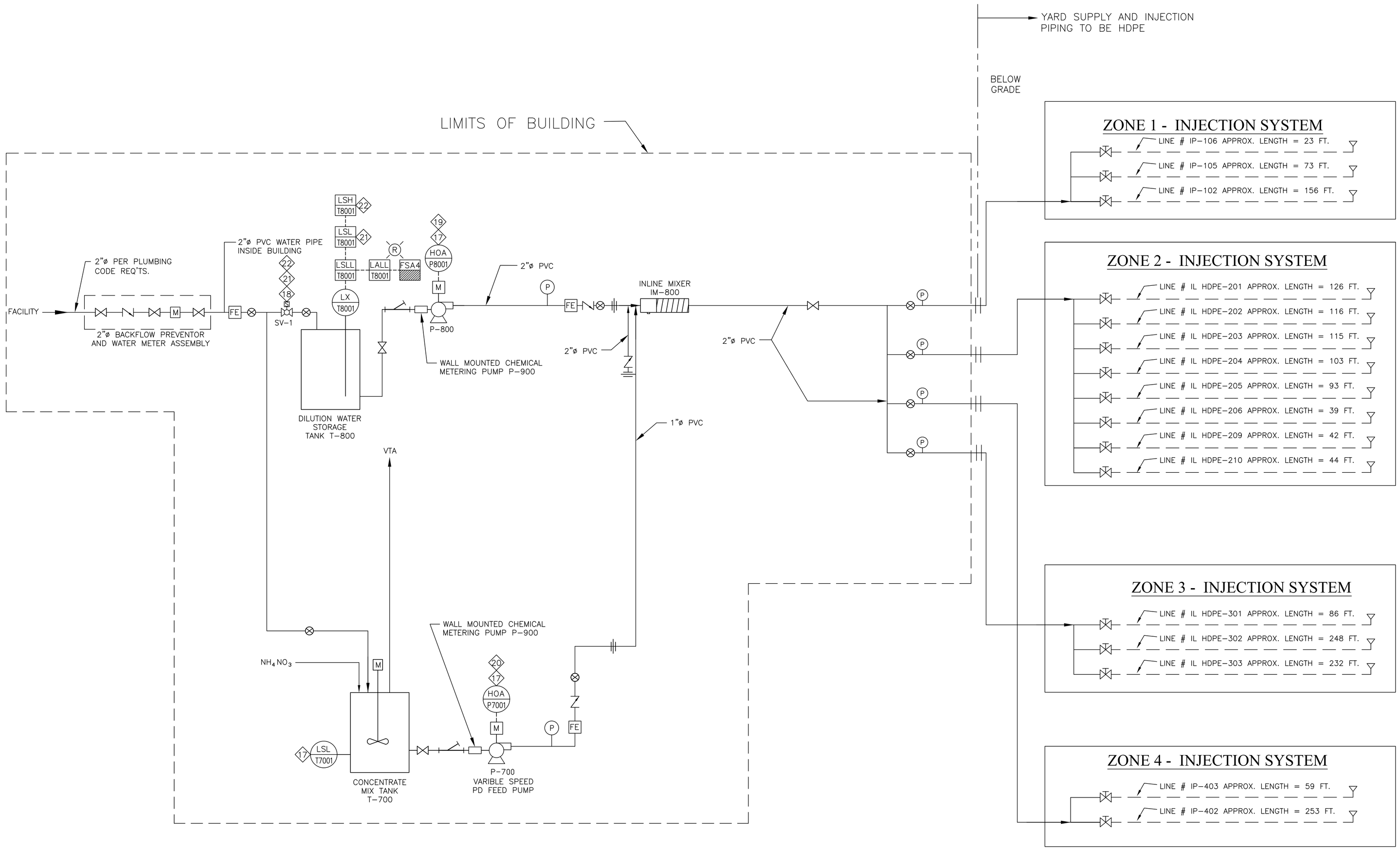
THE FRANKLIN COMPANY CONTRACTORS INC.

CORE ENVIRONMENTAL
Core Environmental
46-11 54th Avenue
Maspeth, NY 11378

JOB TITLE AND LOCATION:
MTA LONG ISLAND RAIL ROAD
MORRIS PARK YARD, QUEENS, NEW YORK

DRAWING TITLE:
REMEDIATION SYSTEM
BUILDING LAYOUT PLAN

DATE:		JOB NO.:	DRAWING NO.
DESIGNED BY:	CHECKED BY:	SCALE:	
DRAWN BY:	PROJ. ENG.:	SHEET OF	



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CORE ENVIRONMENTAL
Core Environmental
46-11 54th Avenue
Maspeth, NY 11378

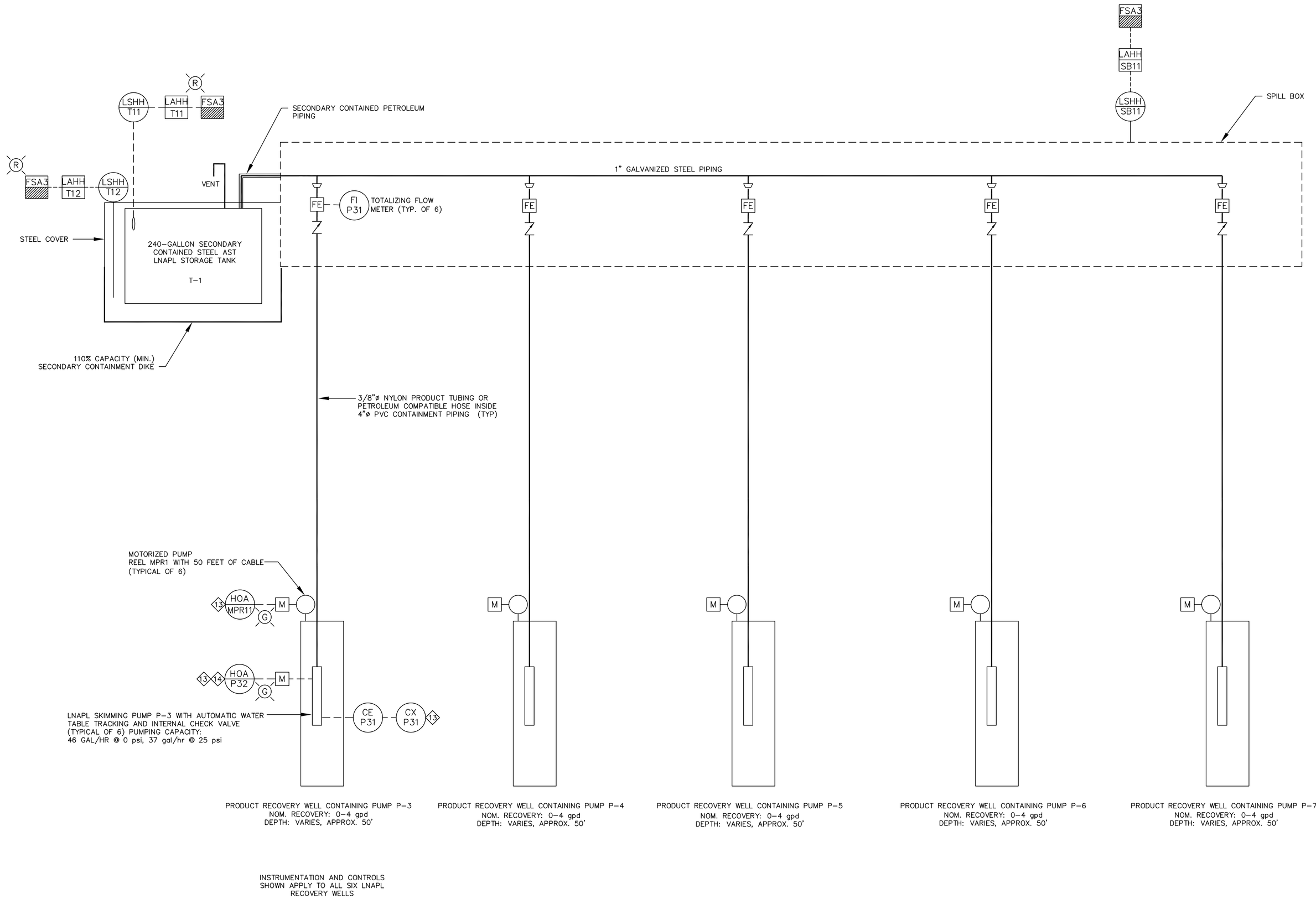
JOB TITLE AND LOCATION:

MTA LONG ISLAND RAIL ROAD
MORRIS PARK YARD, QUEENS, NEW YORK

DRAWING TITLE:

PROCESS AND INSTRUMENTATION DIAGRAM FOR BIOAMENDMENT SYSTEM

DATE:		JOB NO.:	DRAWING NO.
DESIGNED BY:	CHECKED BY:	SCALE:	
DRAWN BY:	PROJ. ENG.:	SHEET OF	



INSTRUMENTATION AND CONTROLS SHOWN APPLY TO ALL SIX LNAPL RECOVERY WELLS

THE FRANKLIN COMPANY CONTRACTORS INC.

CORE ENVIRONMENTAL
Core Environmental
46-11 54th Avenue
Maspeth, NY 11378

JOB TITLE AND LOCATION:

MTA LONG ISLAND RAIL ROAD
MORRIS PARK YARD, QUEENS, NEW YORK

DRAWING TITLE:

PROCESS AND INSTRUMENTATION DIAGRAM FOR LNAPL RECOVERY SYSTEM

DATE:		JOB NO.:	DRAWING NO.
DESIGNED BY:	CHECKED BY:	SCALE:	
DRAWN BY:	PROJ. ENG.:	SHEET OF	

Part IV: Groundwater Monitoring and Sampling Procedures

Long Island Rail Road Morris Park Yard
Groundwater Monitoring and Sampling Procedures

Groundwater Monitoring

On a monthly basis, the groundwater monitoring wells will be gauged. The depth to water and depth to product (if present) of each well will be measured via an interface probe and recorded. All measurements will be from top of casing (TOC).

On a weekly basis, free product-containing wells will be gauged. The wells will be bailed using a disposable bailer, and the product will be transferred to the above-ground product recovery tank located on the south side of the remediation building.

Quarterly Groundwater Sampling Procedure

Groundwater samples are collected from monitoring wells using either low-flow or purge and bail methods.

During each day of sampling, groundwater monitoring wells are generally sampled from least to greatest concentration of total contaminants detected in samples collected during the previous sampling event.

The head space of each monitoring well is screened with a photo-ionization detector (PID) and the depths to water and product (if present) are measured with an oil/water interface probe prior to purging and sampling. Total well depth is also measured for wells that are sampled utilizing the purge and bail method.

Prior to collecting a groundwater sample, groundwater is removed (purged) from each monitoring well to obtain a sample representative of the aquifer in the vicinity of the monitoring well instead of stagnant water in the monitoring well. One of the following three pieces of equipment is used to purge groundwater from each monitoring well: Grundfos Redi-Flo2 submersible stainless steel pump (Grundfos), dedicated QED bladder pump with Teflon-lined bladder (bladder pump) or disposable Teflon-lined bailer (bailer).

A Grundfos pump or bailer is used to purge three well volumes of groundwater from most monitoring wells prior to sampling. Groundwater quality indicator parameters [temperature, pH,

conductivity, dissolved oxygen (DO), turbidity and oxidation-reduction potential (ORP)] are monitored using a Horiba U-52™ water quality meter (Horiba) (or equivalent device) equipped with a flow-through cell during groundwater purging activities. When utilizing a Grundfos pump, the pump is lowered to approximately three (3) feet below the surface of the water table and purging is performed at extraction rates between approximately 1 to 4 gallons per minute. If the volume of groundwater present in the monitoring well is insufficient to utilize a Grundfos pump, a bailer is used to purge three well volumes of groundwater and parameters are not measured. Groundwater is purged from the remaining monitoring wells via low-flow methods using dedicated bladder pumps (installed for a separate investigation). Purge water extraction rates are approximately 100 to 300 mL per minute when using a bladder pump. Purging is considered complete for monitoring wells purged using a bladder pump when indicator parameters stabilize or after (30) minutes of purging, whichever occurs first. Stabilization is defined as a variation of +/- 10% (+/- 10 mV for ORP parameter) for three consecutive measurements taken at 3-5 minute intervals. Purged groundwater is stored in steel 55-gallon drums at the site and is disposed of either via drum removal or vacuum truck after the groundwater sampling event is concluded.

Groundwater samples are collected with bailers or bladder pumps immediately after purging. For monitoring wells purged with a Grundfos pump or bailer, groundwater samples are collected by lowering the midpoint of the bailer to the midpoint of the saturated well screen before extracting groundwater. For monitoring wells purged and sampled with dedicated bladder pumps, the pumps are installed with the pump inlet at a depth approximately two to three feet above the bottom of the well. Equipment used during purging and sampling is decontaminated using Alconox® and demineralized water after the sample is collected at each well.

Groundwater samples are placed directly into sample bottles provided by the analytical testing laboratory, Con-Test Analytical Laboratories, Inc. Following sample collection, sample bottles are placed in iced containers and transported to the laboratory by courier under chain-of-custody protocols. QA/QC samples consisting of one (1) equipment blank, one (1) duplicate sample, one (1) matrix spike (MS), one (1) matrix spike duplicate (MSD) per twenty (20) samples and one (1) trip blank per cooler containing volatile organic compound (VOC) samples are included in the sampling effort.

Groundwater samples are analyzed for volatile organic compounds (VOCs) by EPA Method 8260 and for semi-volatile organic compounds (SVOCs) by EPA Method 8270.

Bi-Weekly Groundwater Sampling Procedure

Groundwater samples are collected from monitoring wells using the same low-flow sampling methods used during the quarterly groundwater sampling events discussed above. However, only wells MW-2-50R, MW-2D-60, MW-3-60, MW-3D-60, MW-3-160, MW-4-60, MW-6-168, MW-15-60, MW-16-60, MW-20-50, MW-19-60, and MW-37S are sampled during the bi-weekly event.

Depths to water and product (if present) are measured with an oil/water interface probe prior to purging and sampling. Prior to collecting a groundwater sample, groundwater is removed (purged) from each monitoring well to obtain a sample representative of the aquifer in the vicinity of the monitoring well instead of stagnant water in the monitoring well. Dedicated QED bladder pumps with Teflon-lined bladders (bladder pump) are utilized for purging. Purge water extraction rates are approximately 100 to 300 mL per minute when using a bladder pump. Purging is considered complete for monitoring wells purged using a bladder pump when indicator parameters stabilize or after (30) minutes of purging, whichever occurs first. Stabilization is defined as a variation of +/- 10% (+/- 10 mV for ORP parameter) for three consecutive measurements taken at 3-5 minute intervals. Purged groundwater is stored in steel 55-gallon drums at the site and is disposed of either via drum removal or vacuum truck.

Groundwater samples are collected with bladder pumps immediately after purging. The pumps are installed with the pump inlet at a depth approximately two to three feet above the bottom of the well.

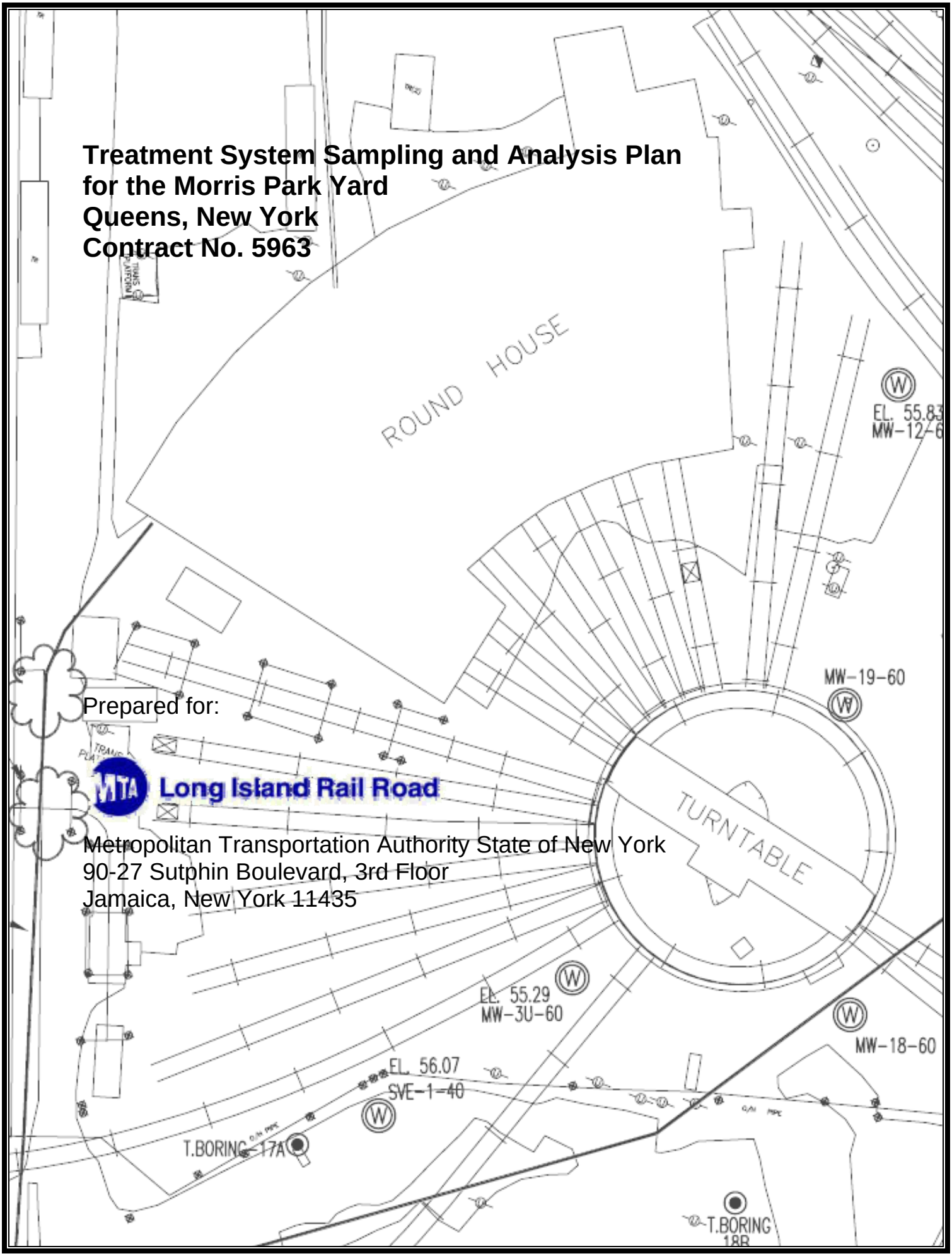
Non-dedicated equipment used during purging and sampling is decontaminated using Alconox® and demineralized water after the sample is collected at each well.

Groundwater samples are placed directly into sample bottles provided by the analytical testing laboratory, Con-Test Analytical Laboratories, Inc. Following sample collection, sample bottles are placed in iced containers and transported to the laboratory by overnight express mail under chain-of-custody protocols.

Groundwater samples are analyzed for nitrate by Method SM 18-20 4500 NO3 F.

Part V: SAP

Treatment System Sampling and Analysis Plan for the Morris Park Yard Queens, New York Contract No. 5963



Prepared for:

Long Island Rail Road

Metropolitan Transportation Authority State of New York
90-27 Sutphin Boulevard, 3rd Floor
Jamaica, New York 11435

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1.0 INTRODUCTION

This Treatment System Sampling and Analysis Plan (SAP) has been prepared to identify procedures and techniques for treatment system sampling at the site during the post-construction phase of the work at the Morris Park Yard located in Queens, New York City, New York. Several areas of environmental concern have been identified due to operations, specifically involving the storage and handling of petroleum products. The project site is part of an ongoing voluntary remediation being undertaken by the owner of the site, the Metropolitan Transit Authority (MTA) Long Island Rail Road (LIRR).

1.1 Site Location

The Morris Park Yard is located in the Richmond Hill Section of Queens, New York. Morris Park Yard is bounded by the Richmond Hill Yard to the north, the Van Wyck Expressway to the east, Atlantic Avenue to the south, and 121st Street to the west. The surrounding neighborhood is mixed use; industrial, commercial and residential. The site is approximately 23 acres in total area. A site location map is included as Figure 1 and an Existing Site Plan is included as Drawing C-1.

1.2 Background

For at least ninety years the Morris Park Yard site has operated as a rail yard; initially to support steam, coal-fired and electric locomotives followed by diesel locomotives. Currently the 23-acre Morris Park Yard is almost entirely utilized for LIRR operations. Operations conducted at the yard include the service and maintenance of diesel locomotives which includes mechanical servicing, lubrication and fueling.

Based on a previous site observations and a remedial investigation (RI), it was apparent that the site was impacted by the fueling and maintenance operations in the areas of petroleum storage and/or transfer. An initial RI and pilot tests were conducted at the site and additional investigation tasks were also completed subsequent to the initial RI. The RI sought to supplement the existing subsurface information data from the previous investigation, characterize soil quality, determine the horizontal extent of the light, non-aqueous phase liquid (LNAPL) floating on the water table, characterize shallow and deep groundwater quality both on and off-site, and confirm the presence/absence of any dense, nonaqueous phase liquid (DNAPL) within the aquifer, characterize

the aquifer's hydraulic conditions, conduct pilot tests for evaluating feasible remedial technologies and formulate a remedial action plan.

The RI recommended remediation of the site through a combination of remedial technologies including LNAPL pumping to remove the liquid phase petroleum product and bioventing with bioamendment addition to remediate the petroleum impacted, unsaturated soils.

Information on the remediation system from the Summary of Work is as follows:

The Bioventing System consists of fifteen (15) bioventing wells (BVW); well head controls; subsurface conveyance piping; a remediation equipment building and concrete foundation; bioventing blower(s); moisture separators; condensate storage tanks; transfer pumps and carbon adsorption treatment vessels; electrical components; interior piping; and system controls.

The bioamendment system includes water dilution and mixing tanks, injection and metering pumps, mixers, header piping, injection laterals, control valves, electrical components, and system controls.

The LNAPL Recovery System includes four (4) new product recovery wells (PRWs); one (1) retrofit existing monitoring well; wellhead vaults and controls; down-well product pumps and sensor array, an automatic water/product interface tracking reel, subsurface conveyance and electrical conduit; a secondarily contained product storage tank; a piping manifold spill box, electrical components, and system controls.

The remediation equipment is housed at the remediation system compound. The compound consists of a 32' x 36' building and an adjacent 12' x 12' concrete pad surrounded by an 8' high chain link fence. The building is divided into two parts. The main part of the building houses the process equipment. All components in this area are suitable for installation in a Class I Division II hazardous environment. The remainder of the building includes a 10' x 10' electrical and control room. The product recovery tank and dike are located on the adjacent 12' x 12' concrete pad.

The Contract includes providing Operation and Maintenance (O&M) services for the remediation system for a period of five (5) years after system acceptance. The O&M services will include system Start-up, Checkout and shakedown to demonstrate proper installation and operation of all system components. An O&M Manual for the system will be prepared.

1.3 Purpose

The purpose of the Treatment System SAP is to address the sampling to be conducted during the post-construction phase of the work. The sample media includes groundwater at the extraction wells, condensate water at the holding tank, and vapor from the pre-carbon train and the post-carbon train locations of each blower assembly. Furthermore, the SAP addresses the subsurface soil sampling through borings to be completed after one year of system operation.

2.0 SCOPE OF WORK

The scope of work has been outlined to address the collection of samples from the specified media for analytical characterization purposes.

Specifically the SAP includes the following items for each of the sample media:

a. sample locations and sample collection;
b. equipment decontamination procedures;
c. sample preservation and shipment;
d. sample chain of custody;
e. the name and certifications of the ELAP-certified laboratory;
f. sample analytical methods; and
g. analytical deliverable packages.

2.1 Sample Locations and Sample Collection

2.1.1 Vapor

Based on the specifications, the Contractor will measure total organic vapor (TOV) concentrations at the blower discharge, between carbon units, and following the final carbon unit in each train. Within seven (7) calendar days of the beginning of the performance test phase, the Contractor will complete these measurements and weekly thereafter. A Photovac Micro® flame ionization detector (FID) will be used to qualitatively screen the soil for volatile organic compounds (VOCs) that may be present.

The FID is classified as intrinsically safe for North America and will be used only by a qualified operator trained in its use. The FID will be calibrated daily to methane following manufacturer's instructions. Following screening with the FID, the Contractor will collect a sample from the pre-carbon train and the post-carbon train locations of each blower assembly to be submitted for laboratory analysis. Within seven (7) calendar days of the beginning of the performance test phase, The Contractor will complete the sampling and weekly thereafter. The gas samples will be collected in Tedlar® bags for laboratory analysis. Only Teflon® tubing and Teflon-lined septums are used for bag sampling. A Gillian® Air Sampling Pump with a low flow rate (50-200mL/min) is attached with the tubing to the bag and turned on. We will avoid filling the bag more than 80% of its maximum volume. At the end of the sampling period, the pump is turned off by closing the valve on the bag by tightening clockwise. The locations of the pre-carbon train and the post-carbon train sampling locations are depicted on Drawing M-2 – Process and Instrumentation Diagram for Bioventing System. Since the bags are transparent to ultraviolet light, the sample bags will be removed from any sunlight to limit photochemical reactions. The bags will be stored and shipped in a protective box at room temperature. An ice chest (cooler) may be used as long as it is not chilled with ice or dry ice. The samples will be sent to the lab via laboratory courier for analysis under chain of custody.

When sampling indicates that the total concentration of VOCs at the outlet of any primary carbon adsorption unit exceeds 1 ppm, the Contractor will shutdown the Bioventing System, and replace the carbon in all primary units. Prior to restarting the Bioventing System, the Contractor will divert the flow such that the primary units become the secondary units. The replacement, redirecting of flow and restarting of the Bioventing Systems will be completed within 72 hours of detecting a total VOC concentration of greater than 1 ppm. Change out will be performed by the Contractor in accordance with the approved Operation and Maintenance (O&M) Manual. The Contractor will be responsible for identifying and complying with all local, state and federal requirements pertaining to the storage, transfer, transportation, and disposal of the spent carbon. The Contractor will assume spent primary carbon units shall be changed out at an average frequency of two carbon unit every two weeks.

To minimize the potential for carbon breakthrough The Contractor will complete the following:

- The carbon adsorption design includes two (2) pairs of GAC canisters that are operated in series. The series arrangement is operated so that the secondary unit acts as a backup when breakthrough occurs on the primary canister. Furthermore, when the lead column is removed

from service, the lag column is moved up to the lead position and the new column (or regenerated column) is installed in the lag position.

- The time to reach "breakthrough" or exhaustion of the carbon is the single most critical operating parameter. Because of the high potential for some organic to desorbs and breakthrough, the Contractor will monitor influent and effluent conditions frequently and change-out GAC in a timely manner. The Contractor will closely review analytical data for increases in VOC, such as MTBE, that may breakthrough the carbon units on an accelerated basis.
- If hydrocarbons are detected in line between the two canisters, a third canister may be added to ensure that no breakthrough can occur.

To meet the requirements of New York State Air Guide 1 requirements the Contractor will:

- Ensure that the carbon units are monitored regularly as required. In the event the total concentration of VOCs at the outlet of any primary carbon adsorption unit exceeds 1 ppm, then the replacement, redirecting of flow and restarting of the Bioventing Systems will be completed within 72 hours. This will ensure the prolonged breakthrough of contaminants does not occur. Contaminant levels should not exceed the Annual or Short-term Guideline Concentrations (AGCs & SGCs). The change out of GAC will be completed as soon as possible.
- The system is designed to treat the effluent air to levels below the Annual and Short-term Guideline Concentrations (AGCs & SGCs). In the event contaminant levels exceed the AGCs & SGCs then changes to the operations, maintenance and/or design will be required. For instance a third canister may be added to ensure that no breakthrough can occur. These types of design changes will be made by the system designers with the assistance of the Contractor's system data and input as needed.

2.1.2 Condensate Water

Based on the specifications, a water sample will be collected from each of the two (2) 500-gallon capacity condensate storage tanks. The location of the aboveground storage tanks are depicted on Drawing M-2. Sample collection at these tanks will be completed through the sampling port located on the side of each tank. The aqueous samples will be collected into laboratory-provided sample containers, preserved (as appropriate for the analysis), and sent to the lab via laboratory courier for analysis under chain of custody.

2.1.3 Soil Borings

After one year of routine operations and each year thereafter, the Contractor will provide a hollow stem auger drill rig to perform up to ten (10) soil borings at on-site locations selected by the Railroad. The actual boring locations will be based upon field conditions and underground utilities and obstructions, if any. Cuttings brought up to the surface during drilling shall be screened continuously with a FID device. Two (2) representative soil samples from each soil boring shall be identified by the Railroad for analysis. The soil samples will be collected using a two (2) foot long split spoon samplers that will be advanced ahead of the hollow stem augers continuously. The spoons will be cleaned with an abrasive brush in a solution of water and Alconox®. The spoons will then be rinsed with potable water prior to reuse. All wash and rinse water will be collected. The selected samples will be submitted for laboratory analysis will be placed into laboratory-provided sample containers and sent to the lab via laboratory courier for analysis under chain of custody.

Drilling of the soil borings will be conducted using rotary drilling techniques with augers to the approved depth. During the drilling of the bore holes an accurate log will be maintained. The log will include depths, elevations, and descriptions of all formations encountered; and identification of each soil sample according to the Unified Soil Classification System; and depths at which ground water is encountered. A graphic boring log to scale will also be prepared representing the soil grain size, moisture content and other characteristics. FID screening of cuttings and split spoons will be completed and readings will be recorded on the Test Boring Log (Attachment 5).

Cuttings brought up to the surface during drilling will be screened continuously with a Photovac Micro® Flame Ionization Detector (FID) by a qualified operator trained in their use. The FID is classified as Intrinsically Safe for North America to qualitatively screen the soil for volatile organic compounds (VOCs) that may be present. Any drill cuttings that are visually contaminated (i.e., oily, discolored, etc.) and/or result in instrument readings above 50 part per million (ppm), will be segregated by placing in 55-gallon drums adjacent to the drilling location. The drill cuttings and drummed soils will be transported off-site for disposal according to Specification 02225.

2.2 Equipment Decontamination Procedures

Decontamination of light (e.g. submersible pumps, spoons, bowls, hand tools, etc.) equipment will be rinsed in tap water, then scrubbed with an Alconox® and tap water mixture and finally rinsed with tap water again. Wash water will be stored on-site in a 500 gallon tank constructed of polyethylene.

Decontamination of large drilling equipment (e.g. hollow stem augers, rods, etc.) will be completed with a high-pressure cleaner within a decontamination trough to contain wash water. After decontamination activities are completed the wash water will be stored in the 500 gallon polyethylene tank and managed according to provisions for dewatering fluids (Specification 02225). A water sample will be collected from the tank and analyzed according to Table 2. Based upon the estimated quantity of decontamination water expected to be generated; a vacuum truck will likely be used to remove the water from the tank and transport it for off-site treatment.

2.3 Sample Preservation and Shipment

Preservation refers to temperature control and/or pH adjustment procedures performed to prevent or slow the loss of target analytes through precipitation, volatilization, decomposition, or biodegradation. Samples to be analyzed will be placed into certified cleaned laboratory grade sampling jars or other appropriate container and properly labeled. Aqueous samples will be preserved with the appropriate laboratory provided chemical in already-preserved containers. Soil and solid samples require no chemical preservatives. However, analysis must be performed within the method-specific holding time requirements. Table 1 includes the sample containers and preservation requirements for the each of the sample media.

The samples are to be stored with ice in a cooler to preserve the samples at a temperature of less than 4º Celsius prior to and during shipment. The samples will be packed with ice in double zip type plastic bags and placed upright within the cooler along with air filled bubble wrap to protect the sample vessels during shipment. A trip blank sample will be included with each sample shipment. The trip blank will travel with the project cooler from the laboratory to the sampling site and back to the laboratory without being opened. The trip blank will be analyzed by the laboratory to verify that no sample contamination occurred during the transportation or sampling operations of the project. One temperature blank shall be placed in the center of each cooler for shipment to the laboratory to check the temperature upon arrival at the lab. A representative from the laboratory will pick up the

samples from the Morris Park Yard site following each day of sample collection or upon the completion of a sample delivery group (SDG). The samples will be shipped via a laboratory courier who will take custody of the sealed ice chest on site and deliver it to the sample receipt area at the laboratory. The receiving laboratory will measure the temperature within the ice chest immediately upon assuming custody of a shipment of samples. This temperature will be noted on the chain-of custody form.

2.4 Sample Chain of Custody

A chain-of-custody (COC) will be prepared by experienced personnel to accompany the samples during shipment to the laboratory. The COC will include detailed information including the site name, date, sample identification, sample matrix, sample preservation, sample time and requested analysis including method numbers. The COC will include the samplers signature as well as any others taking custody of the samples until they arrive at the laboratory, which will provide the final signature. The COC forms should be placed in the shipping container, protected from moisture using plastic bags (e.g., Ziploc®), and will accompany the container during delivery to the laboratory. COC forms included in any shipping container should only reflect those samples that are in that container. The field personnel collecting the samples will be responsible for arranging transport to the laboratory. Sample transfer requires the individuals relinquishing and receiving the samples to sign, date and note the time of transfer on the forms. The COC is considered to be complete after it has been received and signed in by the analytical laboratory. A copy of the COC record should be maintained by the field personnel along with the other field records.

2.5 Laboratory Certification

The samples will be sent to Chemtech, a New York State Department of Health (NYSDOH) certified laboratory for the analysis. The laboratory is part of the Environmental Laboratory Approval Program (ELAP) and has ELAP No. 11376 which expires April 1, 2009. The laboratory certificates are included as Attachment 1 and a sample Chain of Custody form is included as Attachment 2.

2.6 Sample Analytical Methods

The selected media sample analytical methods will be conducted in accordance with U. S. Environmental Protection Agency (EPA) Methods. The EPA publication SW-846, entitled *Test*

Methods for Evaluating Solid Waste, Physical/Chemical Methods, is the official compendium of analytical and sampling methods that have been evaluated and approved for use in complying with the RCRA regulations. The EPA publication SM-18th means *Standard Methods for the Examination of Water and Wastewater*. Table 2 includes the Treatment System SAP Analytical Requirements. The table includes the sample media, parameters, sample matrix, EPA methods and data use.

2.7 Analytical Deliverable Packages

The data reporting is initially made by fax with hard copy follow-up delivery as well as electronic deliverables via email or disk. The Standard Format reporting package includes results of the analysis (Form 1's) and the field chain of custody documentation. The completed chain of custody documentation will be the final version complete with all signatures, dates and times, the temperature at receipt at the lab as well and the laboratory batch numbers.

TABLES

TABLE 1

Sample Containers and Preservation

Parameter	Method(s)	Matrix	Container	Preservation
pH	EPA-150.1	Liquid	HDPE Plastic 250 mL	None, 4ºC
	SW846-9040B	Soil	Wide Mouthed Glass 250 mL	None, 4ºC
Reactivity	SW846-Ch 7.3.3.2, SW846-7.3.4.2	Liquid	Amber Glass 1 L	None, 4ºC
		Soil	Wide Mouthed Glass 250 mL	None, 4ºC
Ignitability	SW846-1030P	Liquid	Amber Glass 1 L	None, 4ºC
		Soil	Wide Mouthed Glass 250 mL	None, 4ºC
TAL Metals	SW846-6010B, SW846-7470A, SW846-7471A	Liquid	HDPE Plastic 500 mL	HNO_3 to pH<2, 4ºC
VOCs	SW846-8260B SW846-8021	Liquid	Glass, 2 x 40 mL	HCL to pH<2, 4ºC
		Soil	Wide Mouthed Glass 250 mL	None, 4ºC
SVOCs	SW846-8270C	Liquid	Amber Glass 1 L	None, 4ºC
		Soil	Wide Mouthed Glass 250 mL	None, 4ºC
TCLP Extraction	SW846-1311	Soil	Wide Mouthed Glass 500 mL	None, 4ºC
TCLP 8 RCRA Metals	SW846-6010B			
TCLP SVOCs	SW846-8270C			
TCLP VOCs	SW846-8021			
TCLP Pesticides	SW846-8081A			
TCLP Herbicides	SW846-8151A			

SW846 – 1986 EPA "Test Methods for Evaluating Solid Waste"
EPA – 2005 "Standard Methods for the Examination of Water and Wastewater"
HCl – hydrochloric acid
HNO_3 – nitric acid
RCRA - Resource Conservation and Recovery Act
TAL – Target Analyte List (23) - Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn)
TCLP-Toxicity Characteristic Leaching Procedure

TABLE 2

Treatment System SAP Analytical Requirements

Media	Parameter	Matrix	Method(s)	Data Use
Vapor	VOCs	Vapor	Air Matrix Method: TO-15 Volatile Organics including chlorofluorocarbons by GC/MS	Perform an impact evaluation as per NYS DAR-1
Condensate Water	Reactivity	Liquid	SW846-Ch 7.3.3.2, SW846-7.3.4.2	Waste Characterization
	Ignitability	Liquid	SW846-1030P	Waste Characterization
	Corrosivity	Liquid	EPA-150.1	Waste Characterization
	TAL Metals	Liquid	SW846-6010B, SW846-7470A, SW846-7471A	Waste Characterization
	VOCs	Liquid	SW846-8260B	Waste Characterization
	SVOCs	Liquid	SW846-8270C	Waste Characterization
Soil	VOCs	Soil	SW846-8021	Comparison to CP-51
	SVOCs	Soil	SW846-8270C	Comparison to CP-51
	TCLP Leaching Procedure [1]	Soil	SW846-1311	Waste Characterization
	TCLP 8 RCRA Metals	Soil	SW846-6010B	Waste Characterization
	TCLP VOCs	Soil	SW846-8021	Waste Characterization
	TCLP SVOCs	Soil	SW846-8270C	Waste Characterization
	TCLP Pesticides	Soil	SW846-8081A	Waste Characterization
	TCLP Herbicides	Soil	SW846-8151A	Waste Characterization

TABLE 2 continued

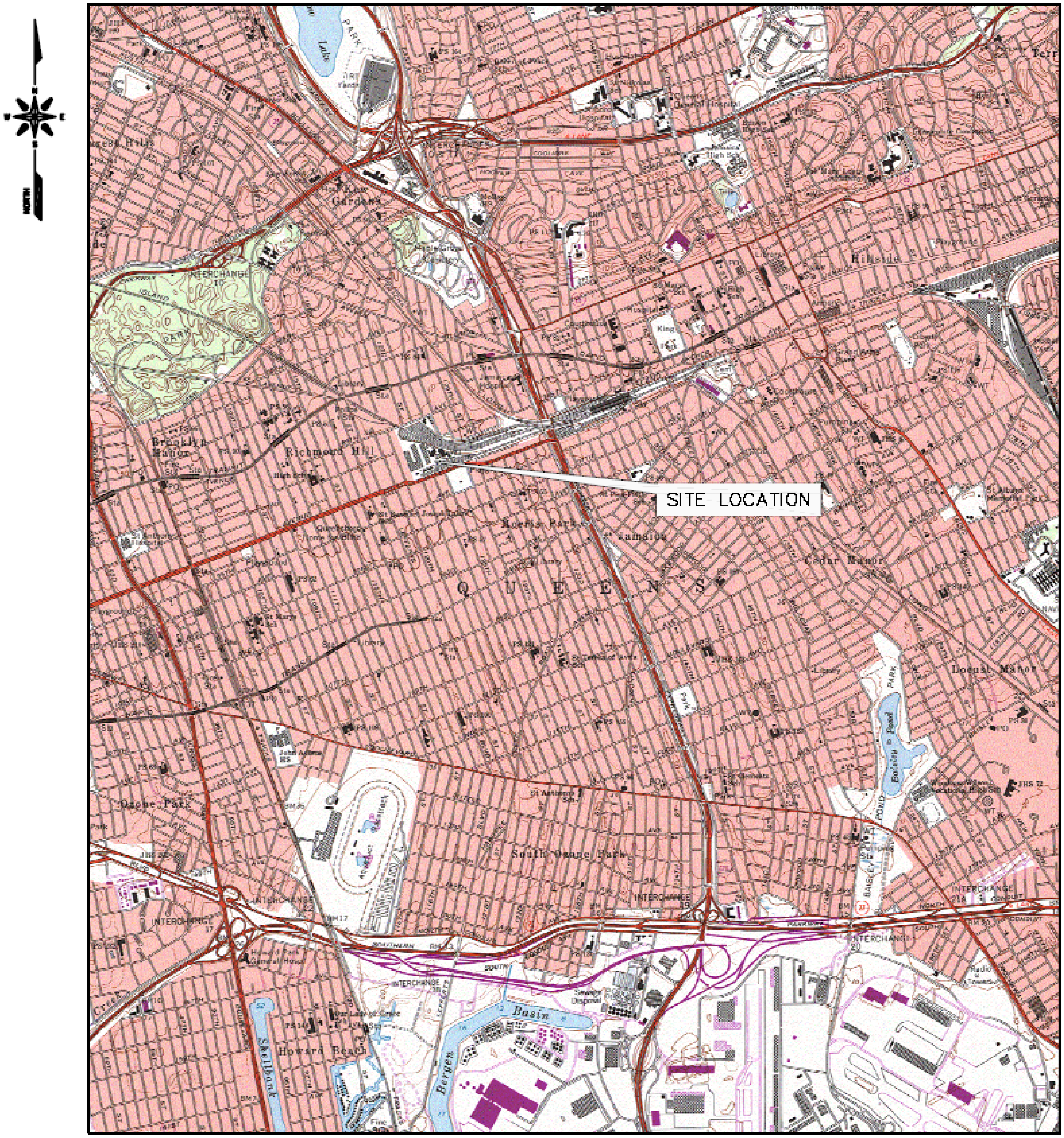
Treatment System SAP Analytical Requirements

Media	Parameter	Matrix	Method(s)	Data Use
Purge/Decon Water -for off site disposal	Reactivity	Liquid	SW846-Ch 7.3.3.2, SW846-7.3.4.2	Waste Characterization
	Ignitability	Liquid	SW846-1030P	Waste Characterization
	Corrosivity	Liquid	EPA-150.1	Waste Characterization
	TAL Metals	Liquid	SW846-6010B, SW846-7470A, SW846-7471A	Waste Characterization
	VOCs	Liquid	SW846-8260B	Waste Characterization
	SVOCs	Liquid	SW846-8270B	Waste Characterization

1 – TCLP and other analysis may be required according to facility specific acceptance criteria.
SW846 – 1986 EPA "Test Methods for Evaluating Solid Waste"
EPA – 2005 "Standard Methods for the Examination of Water and Wastewater"
GC/MS - Gas chromatography/mass spectrometry
TAL – Target Analyte List (23) - Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn)
TCLP-Toxicity Characteristic Leaching Procedure
VOCs – Volatile Organic Compounds
SVOCs – Semi Volatile Organic Compounds
CP-51 – Soil Cleanup Guidance
RCRA - Resource Conservation and Recovery Act

FIGURE and DRAWINGS

Figure 1	–	Site Location Plan
Drawing C-1	–	Existing Site Plan
Drawing C-2	–	Existing and Proposed Product Recovery Wells and Proposed Bioventing Points
Drawing C-6	–	Well Details
Drawing M-2	–	Process and Instrumentation Diagram for Bioventing System
Drawing M-3	–	Process and Instrumentation Diagram for LNAPL Recovery System



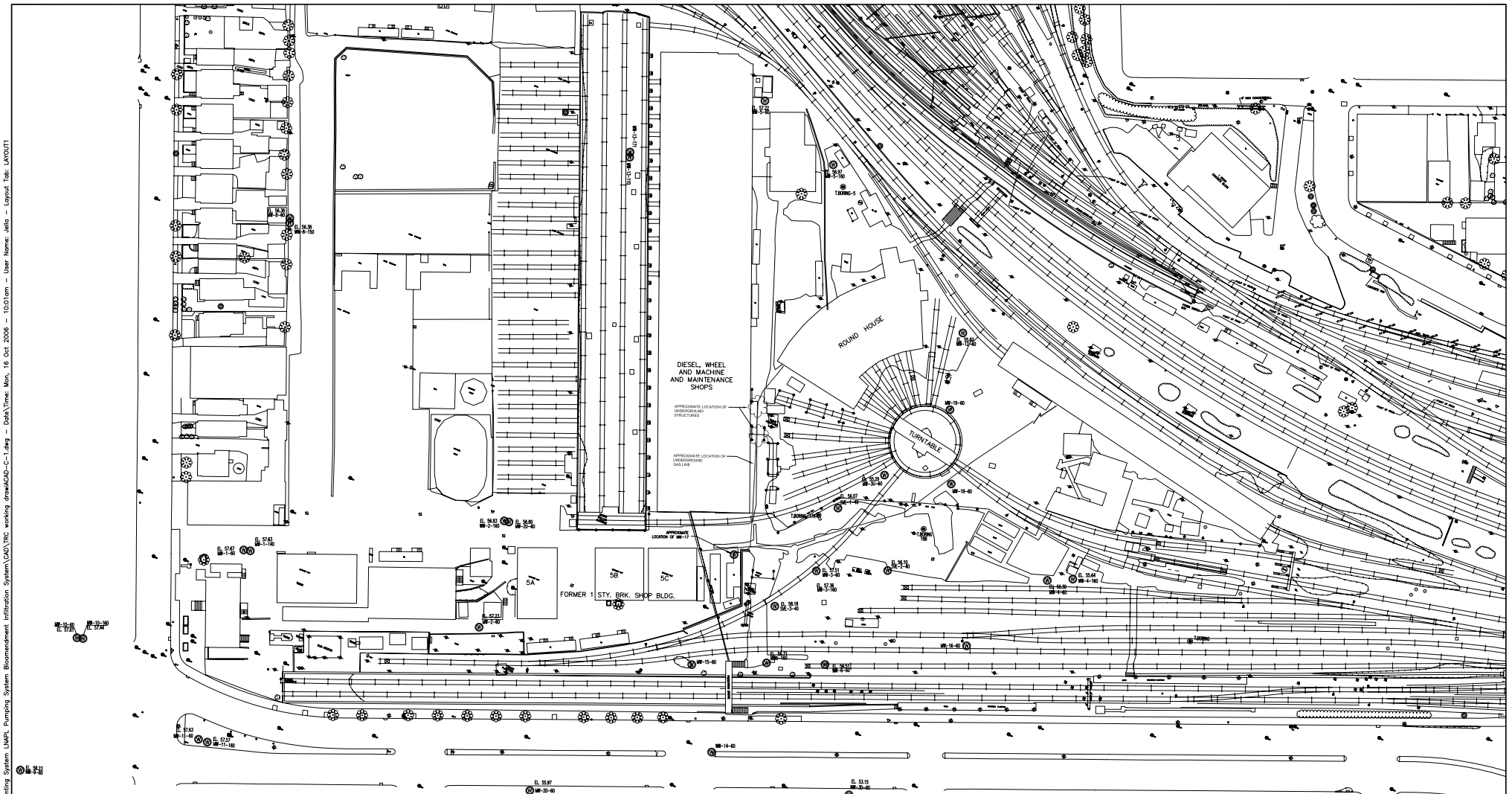
BASE CREATED WITH TOPO™ © 1996
WILDFLOWERS PRODUCTIONS, www.topo.com
QUEENS, NY – 7.5' TOPOGRAPHIC MAP

SITE LOCATION MAP

0 3,000' 6,000'
GRAPHIC SCALE

FIGURE 1

The Franklin Company



NOTES:
1) THE LOCATIONS OF UNDERGROUND STRUCTURES AND UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR.

LEGEND

- EXISTING MONITORING WELL
- SOIL BORING POINT

NORTH

0 50' 100'
GRAPHIC SCALE

EXTERNAL DRAWING REFERENCE: BASEMAP SURVEY PROVIDED BY MTA LONG ISLAND RAIL ROAD

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(212) 221-7822

MTA LONG ISLAND RAIL ROAD
MORRIS PARK YARD
QUEENS, NEW YORK

EXISTING SITE PLAN

STEVEN D. MEERSMA, P.E.
NY PE # 076572
DATE

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DRAWN:	KDH	12/28/04	
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C-1

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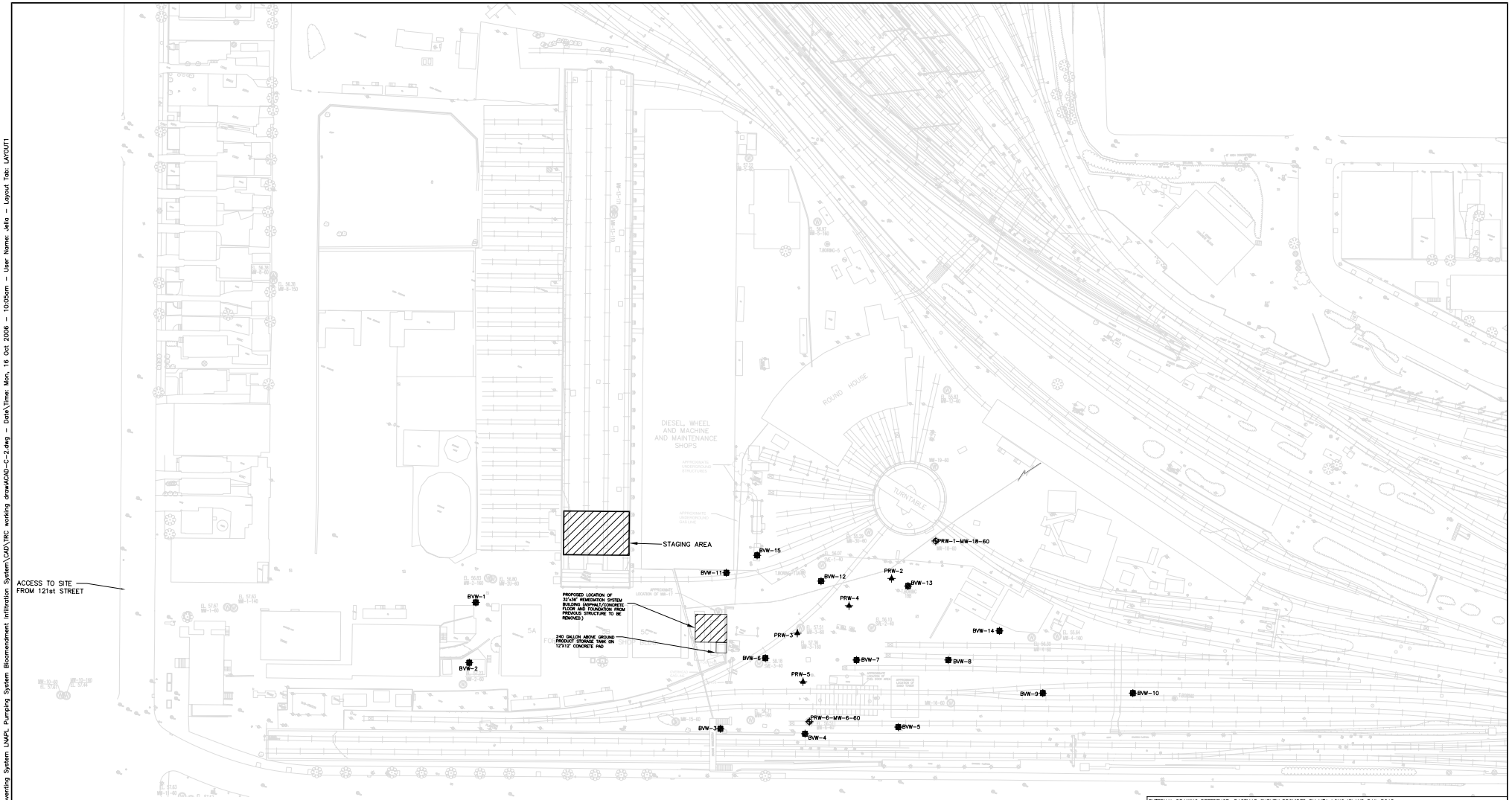

NOTES:

1) A 50 FOOT BY 75 FOOT AREA WITHIN THE FOOTPRINT OF THE FORMER ONE STORY BRICK SHOP BUILDING AREA WILL BE PROVIDED TO THE CONTRACTOR FOR OFFICE TRAILER LOCATION AND TEMPORARY MATERIALS STORAGE. AREA SHALL BE KNOWN AS THE STAGING AREA LOCATED IN THE EAST TRANSFER PIT.

2) CONTRACTOR SHALL REMOVE RAIL, RELOCATE TRAIN TRANSFER PLATFORM, CONSTRUCT RAMP AND MAKE OTHER IMPROVEMENTS TO PROVIDE A SAFE STAGING AREA.

3)THE CONTRACTOR MUST PROCEED CAUTIOUSLY WITH ALL EXCAVATING WORK IN ALL AREAS THROUGHOUT THE YARD.

4) PROTECT EXISTING MONITORING WELLS AND UTILITIES FROM DAMAGE DURING CONSTRUCTION ACTIVITIES.

5) UNDERGROUND CONCRETE STRUCTURES, TRACK AND MISCELLANEOUS DEBRIS ARE LOCATED THROUGHOUT THE YARD. CONTRACTOR IS RESPONSIBLE FOR DEMOLITION, REMOVAL, AND DISPOSAL OF SUCH MATERIAL. THE CONTRACTOR SHALL NOTIFY THE RAILROAD OF ALL DEBRIS ENCOUNTERED.

6) PIPE LOCATIONS MAY BE ADJUSTED TO AVOID EXISTING UTILITIES WITH PRIOR RAILROAD APPROVAL.

7) THE LOCATIONS OF THE UNDERGROUND STRUCTURES AND UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR.

LEGEND

- EXISTING MONITORING WELL TO BE USED FOR PRODUCT RECOVERY
- NEW PRODUCT RECOVERY WELL
- NEW BIOVENTING WELL

NORTH

0 50' 100'
GRAPHIC SCALE

EXTERNAL DRAWING REFERENCE: BASEMAP SURVEY PROVIDED BY MTA LONG ISLAND RAIL ROAD

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QUEENS, NEW YORK

EXISTING AND PROPOSED PRODUCT RECOVERY WELLS AND PROPOSED BIOVENTING POINTS

STEVEN D. MEERSMA, P.E.
NY PE # 076572
DATE

DESIGN:	SWL,BAK	11/09/00	SHEET 3 OF 19	C-2
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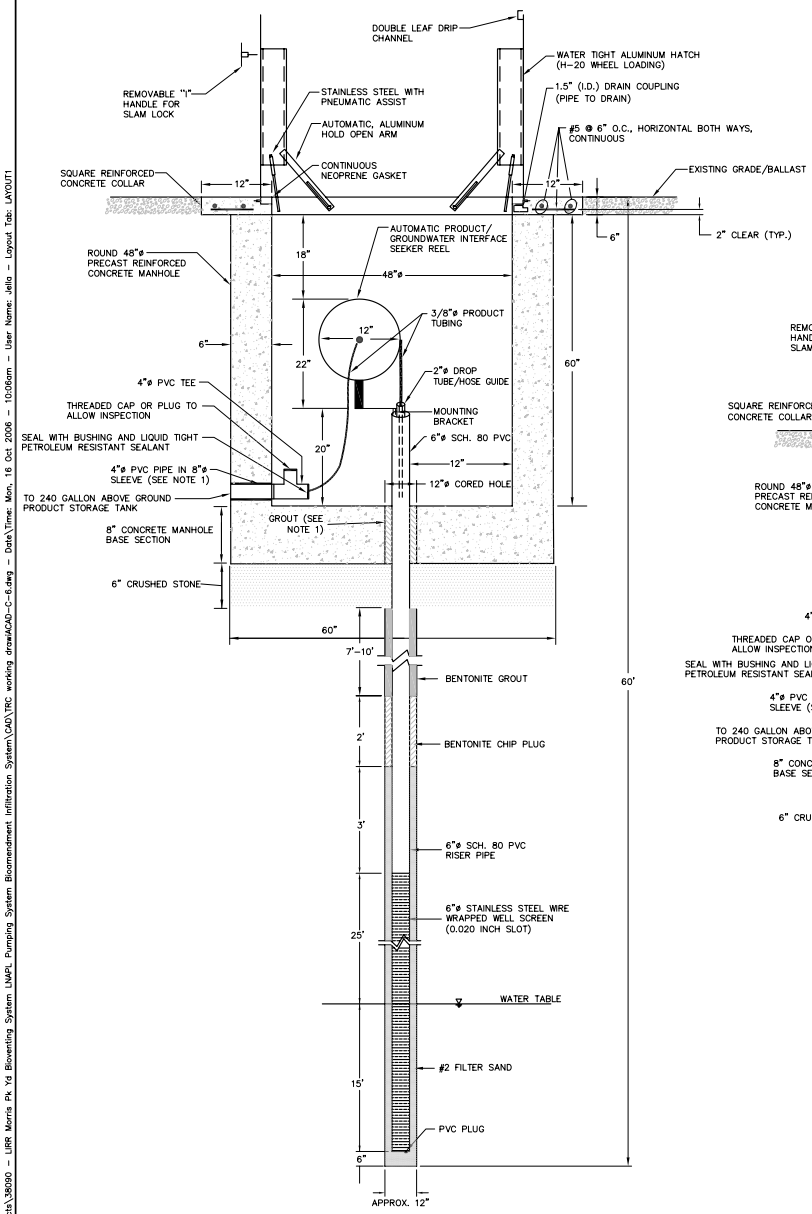
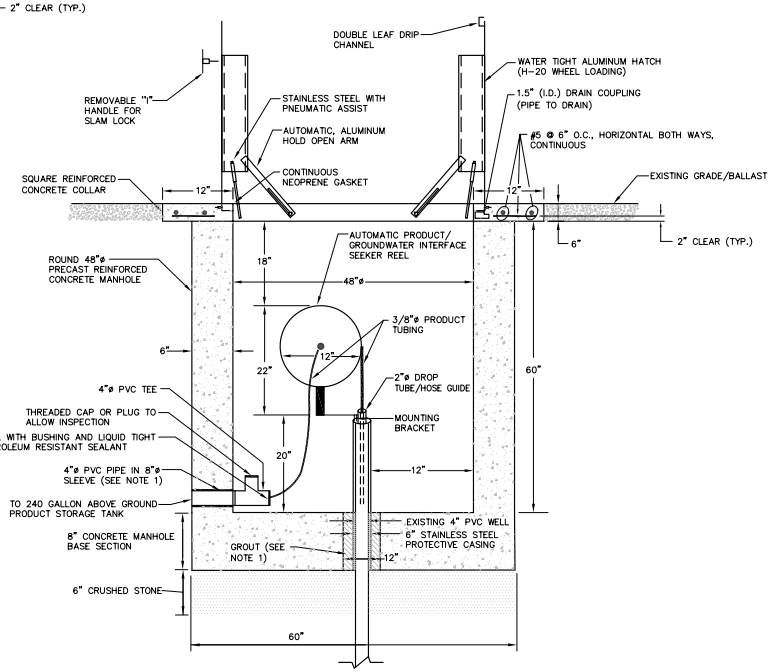


PRODUCT RECOVERY WELL AT NEW PRODUCT RECOVERY WELLS PRW-2, PRW-3, AND PRW-4

SCALE: NOT TO SCALE



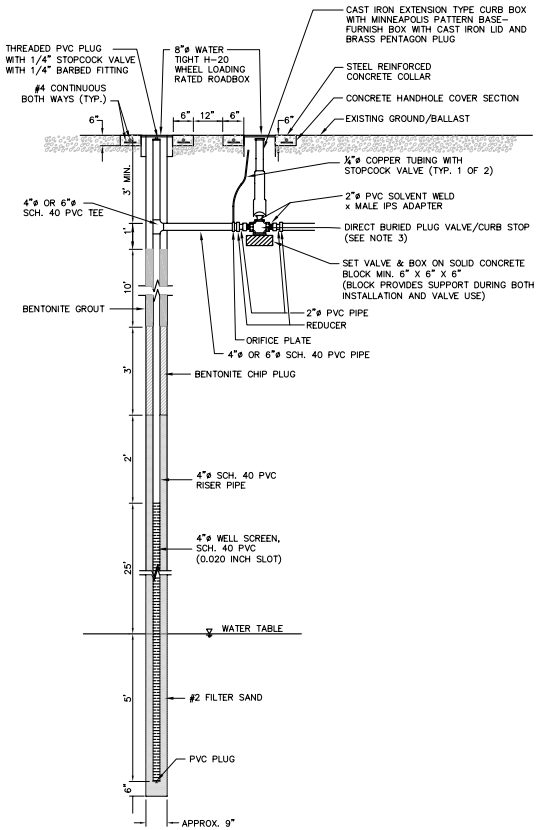
PRODUCT RECOVERY WELL HEAD AT EXISTING WELLS PRW-1-MW-18-60 AND PRW-6-MW-6-60

SCALE: NOT TO SCALE

NOTES:
1) SEAL ALL PENETRATIONS THROUGH THE CONCRETE MANHOLE WITH CEMENT GROUT. ELECTRICAL CONDUIT WILL BE CHANNELED THROUGH THE 8" SLEEVE. THIS SLEEVE HAS NOT BEEN SHOWN FOR CLARITY.

2) INSTALL CEMENT GROUT BETWEEN CONCRETE CORE/PUNCHOUT WALL AND PROTECTIVE 6" STAINLESS STEEL CASING AND BETWEEN PROTECTIVE 6" STAINLESS STEEL CASING AND PVC WELL CASING.

3) FURNISH A SHUT-OFF KEY/ROD COMPATIBLE WITH THE CURB VALVE TO OPERATE THE CURB VALVE. THE BOX BASE SHALL BE TAPPED FOR ATTACHMENT TO THE CURB VALVE WHICH WILL BE THREADED WITH A MINNEAPOLIS THREADED TOP.



BIOVENTING WELL

SCALE: NOT TO SCALE

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MTA LONG ISLAND RAIL ROAD
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QUEENS, NEW YORK

WELL DETAILS

STEVEN D. MEERSMA, P.E.
NY PE # 076572
DATE

DESIGN:	SWL,BAK	11/09/00
DRAWN:	KDH	12/28/04
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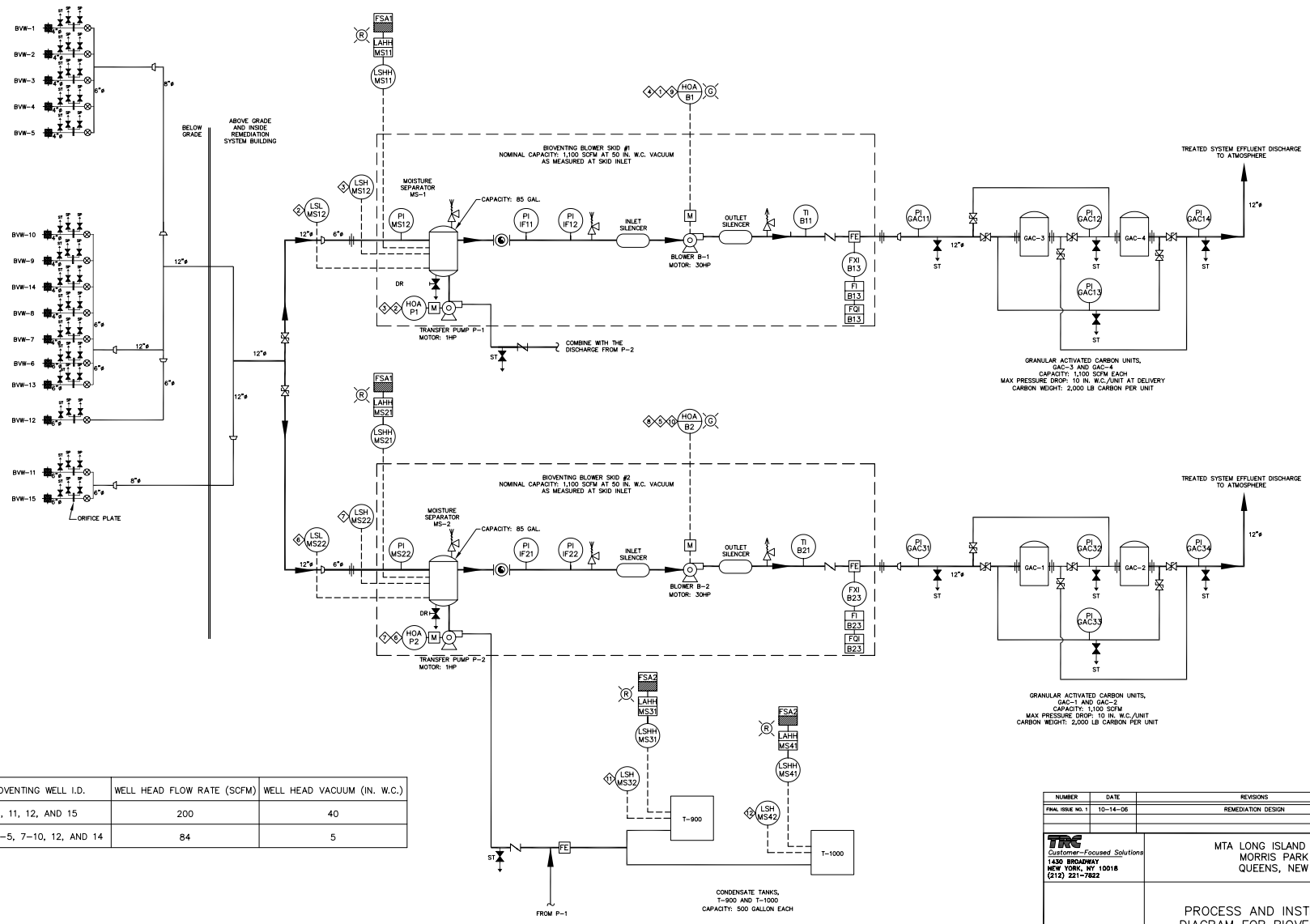
SHEET 7 OF 19
SCALE: NONE

C-6



BIOVENTING WELL I.D.	WELL HEAD FLOW RATE (SCFM)	WELL HEAD VACUUM (IN. W.C.)
BVW-6, 11, 12, AND 15	200	40
BVW-1-5, 7-10, 12, AND 14	84	5

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MTA LONG ISLAND RAIL ROAD
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QUEENS, NEW YORK

PROCESS AND INSTRUMENTATION DIAGRAM FOR BIOVENTING SYSTEM

STEVEN D. MEERSMA, P.E.
NY PE # 076572
DATE

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SHEET 14 OF 19
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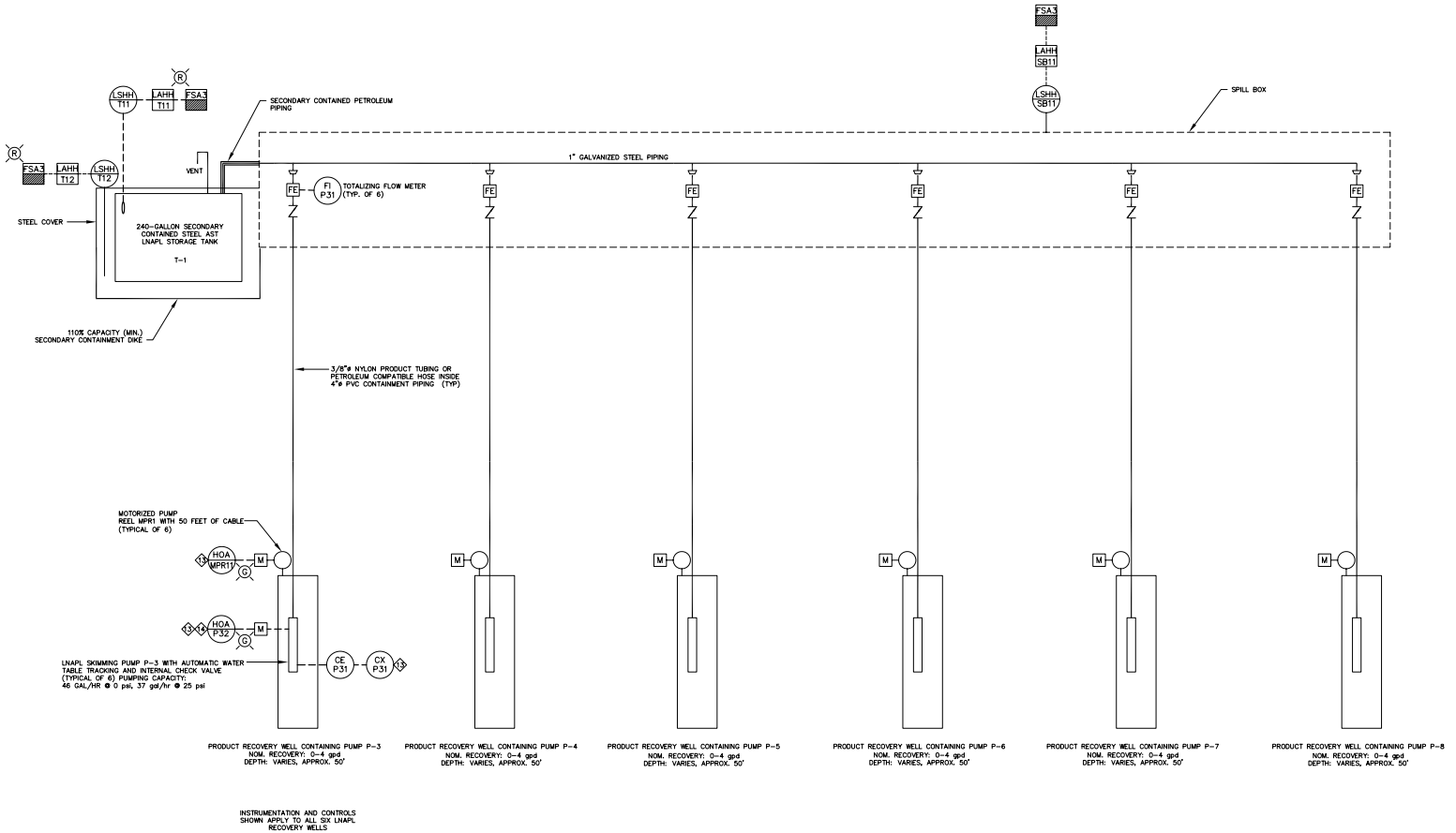
M-2



NOTE: SEE DRAWING M-5 FOR CONTROL INTERLOCK LOGIC

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PROCESS AND INSTRUMENTATION DIAGRAM FOR LNAPL RECOVERY SYSTEM

STEVEN D. MEERSMA, P.E.
NY PE # 076572
DATE

DESIGN:	SWL,BAK	11/09/00	SHEET 15 OF 19
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CHECKED:	SM,RR	10/16/06	SCALE: NONE

M-3

ATTACHMENTS

Attachment 1 – Laboratory Certifications
Attachment 2 – Laboratory Chain of Custody
Attachment 3 – Test Boring Log

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER
RICHARD F. DAINES, M.D.

Expires 12:01 AM April 01, 2009
Issued April 03, 2008

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DIVYAJIT MEHTA
CHEMTECH
284 SHEFFIELD STREET
MOUNTAINSIDE, NJ 07092

NY Lab Id No: 11376
EPA Lab Code:

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards for the category ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:

Drinking Water Metals I

Arsenic, Total	EPA 200.7 Rev. 4.4
Barium, Total	EPA 200.7 Rev. 4.4
Cadmium, Total	EPA 200.7 Rev. 4.4
Chromium, Total	EPA 200.7 Rev. 4.4
Copper, Total	EPA 200.7 Rev. 4.4
Iron, Total	EPA 200.7 Rev. 4.4
Lead, Total	EPA 200.8 Rev. 5.4
Manganese, Total	EPA 200.7 Rev. 4.4
Mercury, Total	EPA 245.1 Rev. 3.0
Selenium, Total	EPA 200.8 Rev. 5.4
Silver, Total	EPA 200.7 Rev. 4.4
Zinc, Total	EPA 200.7 Rev. 4.4

Drinking Water Metals II

Antimony, Total	EPA 200.9 Rev. 2.2
Beryllium, Total	EPA 200.7 Rev. 4.4
Nickel, Total	EPA 200.7 Rev. 4.4

Drinking Water Non-Metals

Alkalinity	SM 18-20 2320B (97)
Calcium Hardness	EPA 200.7 Rev. 4.4
Chloride	EPA 300.0 Rev. 2.1
Color	SM 18-20 2120B (01)
Hydrogen Ion (pH)	SM 18-20 4500-H B (00)
Solids, Total Dissolved	SM 18-20 2540C (97)
Sulfate (as SO4)	EPA 300.0 Rev. 2.1

Volatile Aromatics

1,2,3-Trichlorobenzene	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2

Volatile Aromatics

1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2
1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2
2-Chlorotoluene	EPA 524.2
4-Chlorotoluene	EPA 524.2
Benzene	EPA 524.2
Bromobenzene	EPA 524.2
Chlorobenzene	EPA 524.2
Ethyl benzene	EPA 524.2
Hexachlorobutadiene	EPA 524.2
Isopropylbenzene	EPA 524.2
n-Butylbenzene	EPA 524.2
n-Propylbenzene	EPA 524.2
p-Isopropyltoluene (P-Cymene)	EPA 524.2
sec-Butylbenzene	EPA 524.2
Styrene	EPA 524.2
tert-Butylbenzene	EPA 524.2
Toluene	EPA 524.2
Total Xylenes	EPA 524.2

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 524.2
1,1,1-Trichloroethane	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2

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Volatile Halocarbons

1,1-Dichloropropene	EPA 524.2
1,2,3-Trichloropropane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3-Dichloropropane	EPA 524.2
2,2-Dichloropropane	EPA 524.2
Bromochloromethane	EPA 524.2
Bromomethane	EPA 524.2
Carbon tetrachloride	EPA 524.2
Chloroethane	EPA 524.2
Chloromethane	EPA 524.2
cis-1,2-Dichloroethene	EPA 524.2
cis-1,3-Dichloropropene	EPA 524.2
Dibromomethane	EPA 524.2
Dichlorodifluoromethane	EPA 524.2
Methylene chloride	EPA 524.2
Tetrachloroethene	EPA 524.2
trans-1,2-Dichloroethene	EPA 524.2
trans-1,3-Dichloropropene	EPA 524.2
Trichloroethene	EPA 524.2
Trichlorofluoromethane	EPA 524.2
Vinyl chloride	EPA 524.2

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260B
Acrylonitrile	EPA 8260B
Amines	
2-Nitroaniline	EPA 8270C
3-Nitroaniline	EPA 8270C
4-Chloroaniline	EPA 8270C
4-Nitroaniline	EPA 8270C
Aniline	EPA 8270C
Carbazole	Method Not Specified
Pyridine	EPA 8270C
Bacteriology	
Standard Plate Count	SM 18 9215B
Benzidines	
3,3' -Dichlorobenzidine	EPA 625
	EPA 8270C
Benzidine	EPA 625
	EPA 8270C
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 608
	EPA 8081A
4,4'-DDE	EPA 608
	EPA 8081A
4,4'-DDT	EPA 608
	EPA 8081A
Aldrin	EPA 608
	EPA 8081A

Chlorinated Hydrocarbon Pesticides	
alpha-BHC	EPA 608
	EPA 8081A
alpha-Chlordane	Method Not Specified
beta-BHC	EPA 608
	EPA 8081A
Chlordane Total	EPA 608
	EPA 8081A
delta-BHC	EPA 608
	EPA 8081A
Dieldrin	EPA 608
	EPA 8081A
Endosulfan I	EPA 608
	EPA 8081A
Endosulfan II	EPA 608
	EPA 8081A
Endosulfan sulfate	EPA 608
	EPA 8081A
Endrin	EPA 608
	EPA 8081A
Endrin aldehyde	EPA 608
	EPA 8081A
Endrin Ketone	EPA 8081A
gamma-Chlordane	Method Not Specified
Heptachlor	EPA 608
	EPA 8081A
Heptachlor epoxide	EPA 608
	EPA 8081A
Lindane	EPA 608

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Chlorinated Hydrocarbon Pesticides	
Lindane	EPA 8081A
Methoxychlor	EPA 608
	EPA 8081A
Toxaphene	EPA 608
	EPA 8081A
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	EPA 625
	EPA 8270C
2-Chloronaphthalene	EPA 625
	EPA 8270C
Hexachlorobenzene	EPA 625
	EPA 8270C
Hexachlorobutadiene	EPA 625
	EPA 8270C
Hexachlorocyclopentadiene	EPA 625
	EPA 8270C
Hexachloroethane	EPA 625
	EPA 8270C
Chlorophenoxy Acid Pesticides	
2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
Dicamba	EPA 8151A
Demand	
Biochemical Oxygen Demand	EPA 405.1
	SM 18-20 5210B (01)
Chemical Oxygen Demand	EPA 410.1
Demand	
Chemical Oxygen Demand	EPA 410.4 Rev. 2.0
	SM 18-20 5220D (97)
Haloethers	
4-Bromophenylphenyl ether	EPA 625
	EPA 8270C
4-Chlorophenylphenyl ether	EPA 625
	EPA 8270C
Bis (2-chloroisopropyl) ether	EPA 625
	EPA 8270C
Bis(2-chloroethoxy)methane	EPA 625
	EPA 8270C
Bis(2-chloroethyl)ether	EPA 625
	EPA 8270C
Low Level Polynuclear Aromatics	
Acenaphthene	EPA 8310
Acenaphthylene	EPA 8310
Anthracene	EPA 8310
Benzo(a)anthracene	EPA 8310
Benzo(a)pyrene	EPA 8310
Benzo(b)fluoranthene	EPA 8310
Benzo(g,h,i)perylene	EPA 8310
Benzo(k)fluoroanthene	EPA 8310
Chrysene	EPA 8310
Dibenzo(a,h)anthracene	EPA 8310
Fluoranthene	EPA 8310
Fluorene	EPA 8310
Indeno(1,2,3-cd)pyrene	EPA 8310

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Low Level Polynuclear Aromatics	
Naphthalene	EPA 8310
Phenanthrene	EPA 8310
Pyrene	EPA 8310
Mineral	
Alkalinity	SM 18-20 2320B (97)
Chloride	EPA 300.0 Rev. 2.1
	EPA 325.3
	SM 18-20 4500-Cl- C
Fluoride, Total	EPA 300.0 Rev. 2.1
	EPA 340.2
	SM 18-20 4500-F C (97)
Hardness, Total	EPA 200.7 Rev. 4.4
Sulfate (as SO4)	EPA 300.0 Rev. 2.1
	EPA 375.4
Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 625
	EPA 8270C
	EPA 8330
2,6-Dinitrotoluene	EPA 625
	EPA 8270C
	EPA 8330
Isophorone	EPA 625
	EPA 8270C
Nitrobenzene	EPA 625
	EPA 8270C
	EPA 8330
Nitrosoamines	
N-Nitrosodimethylamine	EPA 625
	EPA 8270C
N-Nitrosodi-n-propylamine	EPA 625
	EPA 8270C
N-Nitrosodiphenylamine	EPA 625
	EPA 8270C
Nutrient	
Ammonia (as N)	EPA 350.1 Rev. 2.0
	EPA 350.2
Kjeldahl Nitrogen, Total	EPA 351.1 Rev. 1978
	EPA 351.3
	SM 18 4500-NH3 C
Nitrate (as N)	EPA 300.0 Rev. 2.1
	EPA 353.1
	EPA 353.2 Rev. 2.0
	SM 18-20 4500-NO3 E (00)
	SM 18-20 4500-NO3 F (00)
Nitrite (as N)	EPA 300.0 Rev. 2.1
	EPA 354.1
	SM 18-20 4500-NO2 B (00)
Orthophosphate (as P)	EPA 300.0 Rev. 2.1
	EPA 365.2
Phosphorus, Total	EPA 365.2
Phthalate Esters	
Benzyl butyl phthalate	EPA 625
	EPA 8270C
Bis(2-ethylhexyl) phthalate	EPA 625

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All approved analytes are listed below:

Phthalate Esters	
Bis(2-ethylhexyl) phthalate	EPA 8270C
Diethyl phthalate	EPA 625
	EPA 8270C
Dimethyl phthalate	EPA 625
	EPA 8270C
Di-n-butyl phthalate	EPA 625
	EPA 8270C
Di-n-octyl phthalate	EPA 625
	EPA 8270C
Polychlorinated Biphenyls	
PCB-1016	EPA 608
	EPA 8082
PCB-1221	EPA 608
	EPA 8082
PCB-1232	EPA 608
	EPA 8082
PCB-1242	EPA 608
	EPA 8082
PCB-1248	EPA 608
	EPA 8082
PCB-1254	EPA 608
	EPA 8082
PCB-1260	EPA 608
	EPA 8082
Polynuclear Aromatics	
Acenaphthene	EPA 625
	EPA 8270C

Polynuclear Aromatics	
Acenaphthylene	EPA 625
	EPA 8270C
Anthracene	EPA 625
	EPA 8270C
Benzo(a)anthracene	EPA 625
	EPA 8270C
Benzo(a)pyrene	EPA 625
	EPA 8270C
Benzo(b)fluoranthene	EPA 625
	EPA 8270C
Benzo(ghi)perylene	EPA 625
	EPA 8270C
Benzo(k)fluoranthene	EPA 625
	EPA 8270C
Chrysene	EPA 625
	EPA 8270C
Dibenzo(a,h)anthracene	EPA 625
	EPA 8270C
Fluoranthene	EPA 625
	EPA 8270C
Fluorene	EPA 625
	EPA 8270C
Indeno(1,2,3-cd)pyrene	EPA 625
	EPA 8270C
Naphthalene	EPA 625
	EPA 8270C
Phenanthrene	EPA 625
	EPA 8270C

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Polynuclear Aromatics		**Priority Pollutant Phenols**	
Pyrene	EPA 625	Phenol	EPA 625
	EPA 8270C		EPA 8270C
Priority Pollutant Phenols		**Purgeable Aromatics**	
2,4,5-Trichlorophenol	EPA 625	1,2-Dichlorobenzene	EPA 601
	EPA 8270C		EPA 602
2,4,6-Trichlorophenol	EPA 625		EPA 624
	EPA 8270C		EPA 625
2,4-Dichlorophenol	EPA 625		EPA 8021B
	EPA 8270C		EPA 8260B
2,4-Dimethylphenol	EPA 625		EPA 8270C
	EPA 8270C	1,3-Dichlorobenzene	EPA 601
2,4-Dinitrophenol	EPA 625		EPA 602
	EPA 8270C		EPA 624
2-Chlorophenol	EPA 625		EPA 625
	EPA 8270C		EPA 8021B
2-Methyl-4,6-dinitrophenol	EPA 625		EPA 8260B
	EPA 8270C	1,4-Dichlorobenzene	EPA 601
2-Methylphenol	EPA 8270C		EPA 602
2-Nitrophenol	EPA 625		EPA 624
	EPA 8270C		EPA 625
4-Chloro-3-methylphenol	EPA 625		EPA 8021B
	EPA 8270C		EPA 8260B
4-Methylphenol	EPA 8270C	Benzene	EPA 602
4-Nitrophenol	EPA 625		EPA 624
	EPA 8270C		EPA 8021B
Cresols, Total	EPA 8270C		EPA 8260B
Pentachlorophenol	EPA 625	Chlorobenzene	EPA 624
	EPA 8270C		EPA 8021B

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Purgeable Aromatics	
Chlorobenzene	EPA 8260B
Ethyl benzene	EPA 602
	EPA 624
	EPA 8021B
	EPA 8260B
Styrene	Method Not Specified
Toluene	EPA 624
	EPA 8021B
	EPA 8260B
Total Xylenes	EPA 624
	EPA 8021B
	EPA 8260B
Purgeable Halocarbons	
1,1,1-Trichloroethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
1,1,2,2-Tetrachloroethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
1,1,2-Trichloroethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
1,1-Dichloroethane	EPA 601
	EPA 624
	EPA 8021B
Purgeable Halocarbons	
1,1-Dichloroethane	EPA 8260B
1,1-Dichloroethene	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
1,2-Dichloroethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
1,2-Dichloropropane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
2-Chloroethylvinyl ether	EPA 601
	EPA 624
	EPA 8260B
	SM 18-19 6230B
Bromodichloromethane	EPA 624
	EPA 8021B
	EPA 8260B
Bromoform	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Bromomethane	EPA 601
	EPA 8021B
	EPA 8260B
Carbon tetrachloride	EPA 601

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Purgeable Halocarbons	
Carbon tetrachloride	EPA 624
	EPA 8021B
	EPA 8260B
Chloroethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Chloroform	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Chloromethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
cis-1,3-Dichloropropene	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Dibromochloromethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Dichlorodifluoromethane	EPA 601
	EPA 624
	EPA 8260B
Methylene chloride	EPA 601
	EPA 624
Purgeable Halocarbons	
Methylene chloride	EPA 8021B
	EPA 8260B
Tetrachloroethene	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
trans-1,2-Dichloroethene	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
trans-1,3-Dichloropropene	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Trichloroethene	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Trichlorofluoromethane	EPA 601
	EPA 624
	EPA 8021B
	EPA 8260B
Vinyl chloride	EPA 601
	EPA 8021B
Purgeable Organics	
2-Butanone (Methylethyl ketone)	EPA 8015 B
	EPA 8260B
2-Hexanone	EPA 8260B

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Purgeable Organics	
4-Methyl-2-Pentanone	EPA 8260B
Acetone	EPA 8260B
Carbon Disulfide	EPA 8260B
Vinyl acetate	EPA 8260B
Residue	
Solids, Total	EPA 160.3
	SM 18-20 2540B (97)
Solids, Total Dissolved	EPA 160.1
	SM 18-20 2540C (97)
Solids, Total Suspended	EPA 160.2
	SM 18-20 2540D (97)
Semi-Volatile Organics	
2-Methylnaphthalene	EPA 8270C
Benzoic Acid	EPA 8270C
Benzyl alcohol	EPA 8270C
Dibenzofuran	EPA 8270C
Wastewater Metals I	
Barium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	SM 18-20 3120B (99)
Cadmium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	SM 18-19 3113B (99)
	SM 18-20 3120B (99)
Calcium, Total	EPA 200.7 Rev. 4.4

Wastewater Metals I	
Calcium, Total	EPA 6010B
Chromium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	SM 18-20 3120B (99)
Copper, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	SM 18-20 3120B (99)
Iron, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
	SM 18-20 3120B (99)
Lead, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	SM 18-20 3120B (99)
Magnesium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B
Manganese, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	SM 18-20 3120B (99)
Nickel, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
	EPA 6010B
	SM 18-20 3120B (99)
Potassium, Total	EPA 200.7 Rev. 4.4
	EPA 6010B

Serial No.: 36731

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER
RICHARD F. DAINES, M.D.

Expires 12:01 AM April 01, 2009
Issued April 03, 2008

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DIVYAJIT MEHTA
CHEMTECH
284 SHEFFIELD STREET
MOUNTAINSIDE, NJ 07092

NY Lab Id No: 11376
EPA Lab Code:

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Purgeable Aromatics

1,2-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
Benzene	EPA TO-15
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
Toluene	EPA TO-15
Total Xylenes	EPA TO-15

Purgeable Halocarbons

1,1,2,2-Tetrachloroethane	EPA TO-15
1,1-Dichloroethane	EPA TO-15
1,1-Dichloroethene	EPA TO-15
1,2-Dichloroethane	EPA TO-15
Carbon tetrachloride	EPA TO-15
Chloroform	EPA TO-15
Methylene chloride	EPA TO-15
Tetrachloroethene	EPA TO-15
Vinyl chloride	EPA TO-15

Volatile Chlorinated Organics

Benzyl chloride	EPA TO-15
Epichlorohydrin	EPA TO-15

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All approved analytes are listed below:

Wastewater Miscellaneous		**Sample Preparation Methods**
Boron, Total	EPA 200.7 Rev. 4.4	EPA 5030B
	EPA 6010B	EPA 9010B
Bromide	EPA 300.0 Rev. 2.1	EPA 9030B
Color	EPA 110.2	
Cyanide, Total	EPA 335.1	
	EPA 335.2	
	EPA 9012A	
	SM 18-20 4500-CN D (99)	
	SM 18-20 4500-CN E (99)	
Hydrogen Ion (pH)	EPA 150.1	
	EPA 9040B	
	SM 18-20 4500-H B (00)	
Oil & Grease Total Recoverable (HEM)	EPA 1664A	
Organic Carbon, Total	EPA 415.1	
Phenols	EPA 420.1 Rev. 1978	
Silica, Dissolved	EPA 200.7 Rev. 4.4	
Specific Conductance	EPA 120.1 Rev. 1982	
	SM 18-20 2510B (97)	
Sulfide (as S)	EPA 376.1	
	EPA 9034	
Surfactant (MBAS)	EPA 425.1	
	SM 18-20 5540C (00)	
Temperature	SM 18-20 2550B (00)	

Sample Preparation Methods

EPA 3005A
EPA 3010A
EPA 3510C
EPA 3520C

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260B
Acrylonitrile	EPA 8260B
Amines	
2-Nitroaniline	EPA 8270C
3-Nitroaniline	EPA 8270C
4-Chloroaniline	EPA 8270C
4-Nitroaniline	Method Not Specified
Carbazole	EPA 8270C
Benzidines	
3,3' -Dichlorobenzidine	EPA 8270C
Benzidine	EPA 8270C
Characteristic Testing	
Corrosivity	EPA 1110
	EPA 9040B
Ignitability	EPA 1010
	EPA 1030
Reactivity	SW-846 Ch7, Sec. 7.3
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081A
4,4'-DDE	EPA 8081A
4,4'-DDT	EPA 8081A
Aldrin	EPA 8081A
alpha-BHC	EPA 8081A
alpha-Chlordane	Method Not Specified
beta-BHC	EPA 8081A
Chlordane Total	EPA 8081A

Chlorinated Hydrocarbon Pesticides	
delta-BHC	EPA 8081A
Dieldrin	EPA 8081A
Endosulfan I	EPA 8081A
Endosulfan II	EPA 8081A
Endosulfan sulfate	EPA 8081A
Endrin	EPA 8081A
Endrin aldehyde	EPA 8081A
Endrin Ketone	EPA 8081A
gamma-Chlordane	Method Not Specified
Heptachlor	EPA 8081A
Heptachlor epoxide	EPA 8081A
Lindane	EPA 8081A
Methoxychlor	EPA 8081A
Toxaphene	EPA 8081A
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	EPA 8270C
2-Chloronaphthalene	EPA 8270C
Hexachlorobenzene	EPA 8270C
Hexachlorobutadiene	EPA 8270C
Hexachlorocyclopentadiene	EPA 8270C
Hexachloroethane	EPA 8270C
Chlorophenoxy Acid Pesticides	
2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
Dicamba	EPA 8151A

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Haloethers	
4-Bromophenylphenyl ether	EPA 8270C
4-Chlorophenylphenyl ether	EPA 8270C
Bis (2-chloroisopropyl) ether	EPA 8270C
Bis(2-chloroethoxy)methane	EPA 8270C
Bis(2-chloroethyl)ether	EPA 8270C
Metals I	
Barium, Total	EPA 6010B
	EPA 6020
Cadmium, Total	EPA 6010B
	EPA 6020
Calcium, Total	EPA 6010B
Chromium, Total	EPA 6010B
	EPA 6020
Copper, Total	EPA 6010B
	EPA 6020
Iron, Total	EPA 6010B
Lead, Total	EPA 6010B
	EPA 6020
Magnesium, Total	EPA 6010B
Manganese, Total	EPA 6010B
Nickel, Total	EPA 6010B
	EPA 6020
Potassium, Total	EPA 6010B
Silver, Total	EPA 6010B
	EPA 6020
Sodium, Total	EPA 6010B
Metals II	
Aluminum, Total	EPA 6010B
	EPA 6020
Antimony, Total	EPA 6010B
	EPA 6020
Arsenic, Total	EPA 6010B
	EPA 6020
Beryllium, Total	EPA 6010B
Chromium VI	EPA 7196A
Mercury, Total	EPA 7471A
Selenium, Total	EPA 6010B
	EPA 6020
Vanadium, Total	EPA 6010B
Zinc, Total	EPA 6010B
Metals III	
Cobalt, Total	EPA 6010B
Molybdenum, Total	EPA 6010B
Thallium, Total	EPA 6010B
	EPA 6020
Miscellaneous	
Cyanide, Total	EPA 9012A
	EPA 9014
Hydrogen Ion (pH)	EPA 9040B
	EPA 9045C
Sulfide (as S)	EPA 9034
Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 8270C
2,6-Dinitrotoluene	EPA 8270C

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Nitroaromatics and Isophorone	
Isophorone	EPA 8270C
	OLM 4.2 BNA
Nitrobenzene	EPA 8270C
Nitrosoamines	
N-Nitrosodi-n-propylamine	EPA 8070A
N-Nitrosodiphenylamine	EPA 8270C
Phthalate Esters	
Benzyl butyl phthalate	EPA 8270C
Bis(2-ethylhexyl) phthalate	EPA 8270C
Diethyl phthalate	EPA 8270C
Dimethyl phthalate	EPA 8270C
Di-n-butyl phthalate	EPA 8270C
Di-n-octyl phthalate	EPA 8270C
Polychlorinated Biphenyls	
PCB-1016	EPA 8082
PCB-1221	EPA 8082
PCB-1232	EPA 8082
PCB-1242	EPA 8082
PCB-1248	EPA 8082
PCB-1254	EPA 8082
PCB-1260	EPA 8082
Polynuclear Aromatic Hydrocarbons	
Acenaphthene	EPA 8270C
Acenaphthylene	EPA 8270C
Anthracene	EPA 8270C
Benzo(a)anthracene	EPA 8270C

Polynuclear Aromatic Hydrocarbons	
Benzo(a)pyrene	EPA 8270C
Benzo(b)fluoranthene	EPA 8270C
Benzo(ghi)perylene	EPA 8270C
Benzo(k)fluoranthene	Method Not Specified
Chrysene	EPA 8270C
Dibenzo(a,h)anthracene	EPA 8270C
Fluoranthene	EPA 8270C
Fluorene	EPA 8270C
Indeno(1,2,3-cd)pyrene	EPA 8270C
Naphthalene	EPA 8270C
Phenanthrene	EPA 8270C
Pyrene	EPA 8270C
Priority Pollutant Phenols	
2,4,5-Trichlorophenol	EPA 8270C
2,4,6-Trichlorophenol	EPA 8270C
2,4-Dichlorophenol	EPA 8270C
2,4-Dimethylphenol	EPA 8270C
2,4-Dinitrophenol	EPA 8270C
2-Chlorophenol	EPA 8270C
2-Methyl-4,6-dinitrophenol	EPA 8270C
2-Methylphenol	EPA 8270C
2-Nitrophenol	EPA 8270C
4-Chloro-3-methylphenol	EPA 8270C
4-Methylphenol	EPA 8270C
4-Nitrophenol	EPA 8270C
Pentachlorophenol	EPA 8270C
Phenol	EPA 8270C

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All approved analytes are listed below:

Purgeable Aromatics	
1,2-Dichlorobenzene	EPA 8021B
	EPA 8260B
1,3-Dichlorobenzene	EPA 8021B
	EPA 8260B
1,4-Dichlorobenzene	EPA 8021B
	EPA 8260B
Benzene	EPA 8021B
	EPA 8260B
Chlorobenzene	EPA 8021B
	EPA 8260B
Ethyl benzene	EPA 8021B
	EPA 8260B
Styrene	EPA 8260B
Toluene	EPA 8021B
	EPA 8260B
Total Xylenes	EPA 8021B
	EPA 8260B

Purgeable Halocarbons	
1,1,1-Trichloroethane	EPA 8021B
	EPA 8260B
1,1,2,2-Tetrachloroethane	EPA 8021B
	EPA 8260B
1,1,2-Trichloroethane	EPA 8021B
	EPA 8260B
1,1-Dichloroethane	EPA 8021B
	EPA 8260B
1,1-Dichloroethene	EPA 8021B
	EPA 8260B

Purgeable Halocarbons	
1,2-Dichloroethane	EPA 8021B
	EPA 8260B
1,2-Dichloropropane	EPA 8021B
	EPA 8260B
2-Chloroethylvinyl ether	EPA 8021B
	EPA 8260B
Bromodichloromethane	EPA 8021B
	EPA 8260B
Bromoform	EPA 8021B
	EPA 8260B
Bromomethane	EPA 8021B
	EPA 8260B
Carbon tetrachloride	EPA 8021B
	EPA 8260B
Chloroethane	EPA 8021B
	EPA 8260B
Chloroform	EPA 8021B
	EPA 8260B
Chloromethane	EPA 8021B
	EPA 8260B
cis-1,3-Dichloropropene	EPA 8021B
	EPA 8260B
Dibromochloromethane	EPA 8021B
	EPA 8260B
Dichlorodifluoromethane	EPA 8021B
	EPA 8260B
Methylene chloride	EPA 8021B
	EPA 8260B

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Purgeable Halocarbons	
Tetrachloroethene	EPA 8021B
	EPA 8260B
trans-1,3-Dichloropropene	EPA 8021B
	EPA 8260B
Trichloroethene	EPA 8021B
	EPA 8260B
Trichlorofluoromethane	EPA 8021B
	EPA 8260B
Vinyl chloride	EPA 8021B
	EPA 8260B
Purgeable Organics	
2-Butanone (Methylethyl ketone)	EPA 8260B
2-Hexanone	EPA 8260B
4-Methyl-2-Pentanone	EPA 8260B
Acetone	EPA 8260B
Carbon Disulfide	EPA 8260B
Vinyl acetate	EPA 8260B
Semi-Volatile Organics	
2-Methylnaphthalene	EPA 8270C
Benzoic Acid	EPA 8270C
Benzyl alcohol	EPA 8270C
Dibenzofuran	EPA 8270C
Sample Preparation Methods	
	EPA 1311
	EPA 3005A
	EPA 3010A
	EPA 3050B

Sample Preparation Methods
EPA 3060A
EPA 3541
EPA 3550B
EPA 5030B
EPA 5035
EPA 9010B
EPA 9030B

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1,4-Dichlorobenzene	EPA TO-15
Benzene	EPA TO-15
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
Toluene	EPA TO-15
Total Xylenes	EPA TO-15

Purgeable Halocarbons

1,1,2,2-Tetrachloroethane	EPA TO-15
1,1-Dichloroethane	EPA TO-15
1,1-Dichloroethene	EPA TO-15
1,2-Dichloroethane	EPA TO-15
Carbon tetrachloride	EPA TO-15
Chloroform	EPA TO-15
Methylene chloride	EPA TO-15
Tetrachloroethene	EPA TO-15
Vinyl chloride	EPA TO-15

Volatile Chlorinated Organics

Benzyl chloride	EPA TO-15
Epichlorohydrin	EPA TO-15

Serial No.: 36733

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EPA Lab Code:

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES ANALYTICAL SERVICES PROTOCOL
All approved subcategories and/or analytes are listed below:

CLP Inorganics

Serial No.: 36734

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CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 Fax (908) 789-8922
www.chemtech.net

Chemtech Project Number

COC Number

Report to be sent to

COMPANY:
ADDRESS:
CITY: STATE: ZIP:
ATTENTION:
PHONE: FAX:

PROJECT NAME:
PROJECT #: LOCATION:
PROJECT MANAGER:
E-MAIL:
PHONE: FAX:

BILL TO: PO#
ADDRESS:
CITY: STATE: ZIP:
ATTENTION:
PHONE:

FAX:_____ DAYS*
HARD COPY:_____DAYS*
EDD_____DAYS*
* TO BE APPROVED BY CHEMTECH
STANDARD TURNAROUND TIME IS 10 BUSINESS DAYS

- ❑ RESULTS ONLY
- ❑ RESULTS * QC
- ❑ New Jersey REDUCED
- __ New Jersey CLP
- ❑ EDD FORMAT_____
- ❑ USEPA CLP
- ❑ New York State ASP "B"
- ❑ New York State ASP "A"
- ❑ Other_____

1 2 3 4 5 6 7 8 9

<-- Specify Preservatives
A-HCl B-HNO4
C-H2SO13 D-NaOH
E-ICE F-OTHER

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# of Bottles	1	2	3	4	5	6	7	8	9
1.																
2.																
3.																
4.																
5.																
6.																
7.																
8.																
9.																
10.																

RELINQUISHED BY SAMPLER	DATE/TIME	RECEIVED BY
1.		1.
RELINQUISHED BY	DATE/TIME	RECEIVED BY
2.		2.
RELINQUISHED BY	DATE/TIME	RECEIVED FOR LAB BY
3.		3.

10/18/2004

Conditions of bottles or coolers at receipt: ___ COMPLIANT ___ NON COMPLIANT COOLER TEMP_____

MeOH extraction requires an additional 4oz. Jar for percent solid

Comments:

S

CLIENT: ___ Hand Delivered
Overnight
CHEMTECH: ___ Picked Up

Page_____of_____

Shipment Complete
YES NO

#

WHITE - CHEMTECH COPYFOR RETURN TO CLIENT **YELLOW** - CHEMTECH COPY **PINK** - SAMPLER COPY

The Franklin Company

TEST BORING LOG

HOLE No.
WELL No.

22-04 119th Street, College Point, NY 11356

Project:
Client:
Contractor:

Project No.
GS Elev
WS Ref Elev
N-S Coord
E-W Coord
Start Date
Finish Date
Driller
Geologist

Groundwater Data (feet)

Date	Time	Depth	Elev

Equipment Data

	Casing	Sampler	Core
Type			
Diameter			
Weight			
Fall			

Well Construction	Depth (feet)	Sample No.	Blows per 6"	Recovery (%)	Graphic Log	Unified	Field Description	PID / FID Reading (ppm) Direct Screen	PID / FID Reading (ppm) Head Space

Part VI: HASP

HEALTH AND SAFETY PLAN

FEBRUARY 2007

FRANKLIN COMPANY CONTRACTORS CO., INC.
22-04 119TH STREET
COLLEGE POINT, NEW YORK 11356

718-762-5200

PREPARED FOR:

LIRR, MORRIS PARK YARD
QUEENS, NEW YORK

PROJECT:

CONTRACT NO. 5963
Construction, Installation, Operation and Maintenance of the Morris Park Remediation systems

TABLE OF CONTENTS:

LIST OF TABLES

1.0 HEALTH AND SAFETY PROGRAM

1.1 HEALTH AND SAFETY INTRODUCTION

This Health and Safety Plan (HASP) has been developed for the Franklin Company Contractors Co., Inc. (Franklin) and its subcontractors for use during the installation of, monitoring wells, remediation systems, underground storage tanks and Operation and Maintenance of Remediation systems. This plan designates health and safety procedures for personnel who may be exposed to any hazardous materials and conditions that may be present during the work. These activities may involve several subcontractors on a site any one time.

The procedures set forth in this plan are designed to reduce the risk of exposure to chemical substances, which may be present in soil, water, and air, and to physical hazards for work on underground storage tank and remediation sites. The procedures described herein conform to Occupational Safety and Health Administration (OSHA) standards for protecting workers during construction and underground storage tank remediation activities promulgated by Title 29 Code of Federal Regulations, Part 1910.120(29CFR 1910.120). Additionally, this plan presents specific construction safety and health standards pertinent to the project activities, as required by OSHA 29 CFR 1926. These OSHA requirements include, but are not limited to, heavy machinery operation; general health and safety concerns; environmental controls; personal protection equipment; materials handling, storage, use and disposal, motor vehicles and mechanical equipment operations; excavations and overhead protection. Lastly, this plan is consistent with Fire Prevention Codes promulgated by the New York City fire Department.

1.2 PROJECT ACTIVITIES

The project activities under this work order include the construction, installation, operation and maintenance of a remediation system located at the Morris Park Yard.

- The facility is located in the Richmond Hill section of Queens, N.Y. a detailed map of the location is attached in Appendix A.

All work performed at this site is covered by this Health and Safety Plan. In the event of an accident, EMS will be called using 911. If it is not a life threatening situation, site personnel will take the injured worker to the nearest hospital. Prior to the start of work, all employees will be briefed on what to do in the event of an emergency. This includes calling EMS and taking injured personnel to the hospital.

Hospital Directions and a hospital route map are located in Appendix A.

2.0 HAZARDS

2.1 POTENTIAL SITE HAZARDS

Potential chemical hazards at the property have been identified through information concerning the historic usage of the site. The primary chemical contaminants of concern at the property are petroleum hydrocarbons such as diesel fuel (semi volatile organics) and gasoline (volatile organic compounds).

In addition to health and safety concerns related to petroleum contamination at the site, there are potential physical hazards associated with excavating. Physical hazards may be encountered during activities involving heavy equipment and excavating. These physical hazards and related hazards are summarized in Table A-1.

ROUTES OF EXPOSURE

The primary routes of exposure to soil contaminated with petroleum products are through inhalation of airborne vapors, ingestion of particulates or dust, and absorption of these compounds through the skin. Respiratory protection may be required for field personnel working with dry soil, which has been contaminated with petroleum if intrusive activities cause a release of dust and soil particles into the air. Engineering controls and/or safe work procedures will be implemented to minimize the release of contaminants into the air and to prevent potential skin contact.

The primary route of exposure to petroleum products is by inhalation of hydrocarbon vapors and direct contact with the product. When ground water intersects the excavation, inhalation of light petroleum hydrocarbons or volatile organic compounds (VOCs) may occur. This risk of inhalation is present in excavations that intersect groundwater and will present a risk via skin absorption as well. Direct contact with untreated groundwater is to be avoided to prevent absorption through the skin.

TABLE A-1
PHYSICAL SAFETY CONCERNS

List of Potential Hazards:

Hazard	Description	Location	Procedure Used to Monitor/Reduce Hazard
Heavy Equipment	Back Hoe	All Sites	Personnel maintain eye contact with operators; hard hats and safety glasses worn during equipment operation
Utilities	Electrical, water, sewer, gas	All	Locate prior to and during site operations
Power Line and Electrical Equip.	Building Utility	To be determined	Locate and follow lockout/tagout procedures
Noise	During certain work activities	To be determined	Hearing Protectors with proper noise reduction rating
Temperature Extremes	Cold/Heat Stress	All tasks	Protection as designated by Safety Officer

3.0 PERSONNEL RESPONSIBILITIES

The Franklin Company Contractors Co., Inc. has assigned an individual who will perform the duties of both a Project Manager and Site Safety Officer to ensure adequate health and safety for this project. As the Site Safety Officer (SSO) the individual will ensure that the provisions of the HASP are being implemented or responsibilities have been passed to a Sub-Contractor's SSO.

3.1 PROJECT MANAGER/ SITE SAFETY OFFICER

The Project Manager will distribute the Health and Safety Plan to all the Franklin Company Contractors Co., Inc. personnel and subcontractor employees and discuss the plan prior to the start of field activities. All project personnel will sign documentation attesting that they have read and are familiar with the contents of this Health and Safety Plan.

The Site Safety Officer, has the following responsibilities:

- Ensure that all field personnel and subcontractors have reviewed the HASP Plan.
- Responsible for the field implementation, evaluation and any necessary field modifications of this Health and Safety Plan.
- Responsible for maintaining adequate supplies of all personal protective (PPE) equipment for the Franklin Company Contractors Co., Inc. personnel as well as calibration and maintenance of all monitoring instruments (subcontractors will provide the appropriate PPE to their own personnel).
- Authority to suspend subcontractor operations at the site due to any ineffectiveness of this Health and Safety Plan.

When the primary Site Safety Officer is unable to supervise and maintain health and safety responsibilities on site, an alternate SSO may be designated to act accordingly. All site safety personnel will have received the appropriate level of training necessary to perform applicable duties.

All subcontractors will ensure that its employees working at the site have met the training, respirator requirements and medical surveillance requirements of the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Standards promulgated by 29 CFR 1910.120 and other OSHA required training of 29 CFR 1926. Certain sections of 29 CFR 1910 (General Industry) are applicable to 29 CFR 1926, (Construction). The subcontractor shall be aware of those General Industry standards applicable to construction. This HASP references some construction standards; implementation of construction standards beyond what is discussed in this document will be the responsibility of the subcontractor through its established "health and safety program. The Franklin Company SSO will inform any subcontractor if non-compliance to OSHA 1926 is observed.

4.0 PERSONNEL TRAINING

According to OSHA regulations published in 29 CFR 1910.120(e)(3); "site workers engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor." Subcontractors who can document "equivalent training" as defined by 29 CFR 1910.120(e)(9) are not required to provide 40 hour training to their employees. The subcontractor must compare current training to the training requirements outlined in 29 CFR 1910.120. Where deficiencies are noted, the subcontractor shall conduct sufficient training to meet observed deficiencies. All training must be documented and available for review. The subcontractor shall certify in writing that its employees working on the site possess equivalent training in accordance with 29 CFR 1910.120. A copy of this certification shall be placed in the employee's personnel file.

The training must provide information regarding "safety, health, site hazards, use of personal protective equipment, work practices by which the employee can minimize risks from hazards, safe use of engineering controls and equipment on site, and medical surveillance requirements". This program must instruct employees on general health and safety principles and procedures, proper operation of monitoring instruments, and use of personal protective equipment.

As dictated by the nature of site activities, additional specialized training must also be provided. Specialized training must be provided for project activities such as excavations or drilling activities. Employees involved in these types of activities shall be given on-site instruction regarding the potential hazards involved with site activities and the appropriate health and safety procedures to be followed.

All personnel involved in project activities are required to have received the basic training discussed above, where applicable. Additionally, 8-hour refresher training or equivalent refresher training shall be performed annually.

5.0 SITE MONITORING AND PERSONAL PROTECTIVE EQUIPMENT

Field tasks associated with tank cleaning, purging, and tank removal, may create potentially hazardous conditions, such as the release of hazardous substances and flammable or combustible vapors into the breathing space. These substances may be in the form of mists, vapors, dusts, or fumes that can enter the body through ingestion, inhalation, and/or absorption. Monitoring for these substances must be performed and protective measures must be taken to ensure appropriate personal protection during site activities. In conjunction with monitoring, engineering controls and safe work practices can greatly reduce the risk of exposures to hazardous substances. Safe work practices are discussed in detail later in this manual and engineering controls are discussed below.

5.1 ENGINEERING CONTROLS

A primary concern for the planned project activities is the potential exposure to contamination that may be associated with excavated soil, free product and dissolved product in groundwater. Direct contact will be minimized by the use of appropriate personal protective equipment (PPE). The route of exposure concern is through the air via dust generation and vapors. To reduce this risk, excavation activities will be conducted in a manner to minimize dust generation and groundwater volatilization.

Excavation and drilling activities will be conducted carefully to avoid the generation of dust. If dust is generated, dust suppression controls, such as a water spray, will be used to moisten soils prior to, and during excavation activities. To reduce the effect of wind on the excavation area, mobile fences may be set up around each area. Physical barriers are also required to guard against someone falling into the excavation.

5.2 *SITE MONITORING*

The following describes the monitoring criteria to be implemented during excavation or drilling activities. Recommended monitoring instruments to be used are also discussed. All instruments to be used during site activities will be classified as Class I, Division I Groups A, B, C and D for intrinsic safety and be certified by Underwriters Laboratories, or another nationally recognized testing laboratory as being intrinsically safe. Action levels based on exposure limits are discussed in the following section.

The primary exposure concern during excavation/drilling activities is the inhalation of volatile organics. The development of fugitive dust will trigger the cessation of work, increased engineering controls or an increase from Level D to Level C protection. Air purifying respirators will be fitted with combination high efficiency particulate air (HEPA) filters and organic vapor cartridges.

In general, volatile organic compounds (VOCs) are of greatest concern during investigations and remediation activities. Organic vapor monitoring will be documented during excavation and drilling activities, which may result in contact with petroleum hydrocarbons, contaminated groundwater and/or soil, situated within the water table. During the field activities, total volatile organic compound (TVOC) concentrations will be monitored continuously in the breathing space with an organic vapor analyzer (OVA) or photo-ionization detector (PID), monitoring for explosive atmosphere conditions in the excavation (10% of the Lower Explosive Limit (LEL) will be conducted simultaneously with a combination combustible gas/oxygen meter. If an LEL of 10% is found in the excavation, employee shall be evacuated, and the excavation shall be purged for 10 minutes with a power ventilator and re-tested. Some combustible gas meters will not function in the absence of oxygen. If low oxygen levels are noted and 0% LEL is observed, refer back to the meters operating manual for guidance. Oxygen concentrations within the breathing zone of employees working in an excavation shall be monitored continuously (GasTech or equivalent).

If real time oxygen concentrations fall below 19.5%, workers will be evacuated. If workers are to re-enter an oxygen deficient atmosphere, they shall only do so wearing a full face supplied air respirator (Self Contained Breathing Apparatus or Airline Respirator with five minute escape bottle operated in a pressure demand mode). TVOC concentrations and percent LEL will be used as action level criteria for evacuating the work area, upgrading or downgrading the level of personnel protection, or implementing additional precautions, procedures, or engineering controls.

All site monitoring will be conducted by or under the supervision of the Franklin Company. All readings obtained will be recorded in a dedicated site notebook. The Site Safety Officer will maintain all monitoring instruments throughout the site investigation to ensure their reliability and proper operation. All meters, PIDs and other monitoring devices shall be calibrated in accordance with manufacturer recommendations.

Equipment	Use	Use Frequency	Calibration	Device
Photoionization Detector (PID)	Measuring volatile organic compounds in ambient air, soil, influent and efleunt.	Daily, hourly	Daily or if temperature varies by 10 ° F	100 ppm isobutlylene standard in a tedlar bag.
Multimeter	Measure: volts/amps/ohms	On startup	NIST	A-A-50734B
Meghometer	Measure wiring insulation and resistance to ground	As required	NIST	A-A-59322A

6.0 *ACTION LEVELS*

Action levels have been established for activity cessation, site evacuation, emergency response, implementation of special procedures and the upgrade or downgrade in the level or personal protective equipment. The action levels are based upon OSHA Permissible Exposure Limits (PELs) promulgated by 29 CFR 1910.1000, Air Contaminants, and chemical physical characteristics of the contaminants. The PEL is defined as the airborne concentration of a substance a worker can be exposed to for 8 hours per day for five days, over a forty-hour workweek without respiratory protection. Action levels are generally one half of the PEL. Table A-2 describes the chemical hazards in further detail. Descriptions of the various levels of personal protection are presented in the next section. Level C and B personal protective equipment, as described later in the plan, will be available if needed during work activities. Level D personal protective equipment, as described later in this plan, will be permitted for all initial excavation activities.

6.1 *ACTION LEVELS FOR VOLATILE ORGANIC COMPOUNDS*

Volatile Organic Compounds (VOCs) such as pentane, hexane, heptane, octane, toluene, xylene, ethylbenzene,and benzene may be found in and around tanks. Other light hydrocarbons found in gasoline and diesel fuel may also be found in and around underground tanks. Respiratory protection will be utilized and personal monitoring for these compounds will be performed whenever direct reading air monitoring indicates a total volatile organic compounds (TVOC) concentration above 25 ppm within the breathing zone of workers. A Photo-ionization Detector or Organic Vapor Analyzer will be utilized to detect the presence of these substances. When a TVOC concentration of 25 ppm or greater is detected in the breathing zone, the action levels presented below will apply.

TABLE A-2

ACTION LEVELS FOR VOLATILE ORGANIC COMPOUNDS

Total VOC Concentration (ppm)	Required Action and/or Level or Personal Protection
Detectable limit to 25 ppm	Level D personal protection
25 ppm to 500 ppm	Evacuate all personnel who are unable to wear air purifying respirators from area, implement engineering controls, or upgrade to Level C personal protection with full face air purifying respirators with combination organic vapor/HEPA cartridges.
Over 500 ppm	Evacuate all personnel who are unable to wear air supplied respirators form area, implement engineering controls, or upgrade to Level B personal protection using full face supplied air respirators operated in pressure demand mode.

As established by 29 CFR 1910.1000, (Air Contaminants), hexane has the lowest OSHA permissible exposure limit for the above referenced compounds; 50 ppm, averaged over an 8-hour workday. If the TVOC concentration detected is above 25 ppm, these requirements will remain in effect until subsequent personal air monitoring results indicates airborne concentrations of n-hexane below 25 ppm. Direct reading instrumentation such as an organic vapor analyzer or photo-ionization detector tubes shall be used. If colormetric detector tubes are used, care must be exercised to ensure other compounds do not interfere with the test results.

6.2 BENZENE

If Benzene is detected, additional precautions must be taken. Since benzene is considered a known human carcinogen, direct reading air Monitoring shall be performed if benzene is suspected. Whenever, the airborne concentration of benzene exceeds .5ppm within the breathing zone of the workers, respiratory protection shall be utilized in the immediate work area and personal air monitoring shall be performed. Direct reading instrumentation such as an organic vapor analyzer or photo-ionization detector tubes shall be used. If colormetric detector tubes are used, care must be exercised to ensure other compounds do not interfere with the test results.

TABLE A-3

ACTION LEVELS FOR BENZENE

Total VOC Concentration (ppm)	Required Action and/or Level or Personal Protection
Detectable limit to .5 ppm	Level D personal protection
.5 ppm to 5 ppm	Evacuate all personnel who are unable to wear air purifying respirators from area, implement engineering controls, or upgrade to Level C personal protection with full face air purifying respirators with combination organic vapor/HEPA cartridges.
Over 5 ppm	Evacuate all personnel who are unable to wear air supplied respirators from area, implement engineering controls, or upgrade to Level B personal protection using full face supplied air respirators operated in pressure demand mode.

As established by 29 CFR 1910.1028, Benzene, the OSHA permissible exposure limit for benzene is 1.0 ppm averaged over an 8-hour workday. If the benzene contamination detected is above .5 ppm, these requirements will remain in effect until subsequent personal air monitoring results indicates airborne benzene concentrations below .5 ppm.

6.3 *SEMI VOLATIE ORGANIC COMPOUNDS*

Semi volatile compounds (semi VOCs) may be found. Semi VOCs include heavy petroleum hydrocarbons such as those contained in all diesel fuel as well as anthracene, acridine, chrysene and pyrene. Although semi VOCs does not represent an inhalation hazard because of the high molecular weight, they may be absorbed through the skin. Dermal contact with semi VOCs can be avoided through the use of disposable coveralls, gloves and boots.

A semi VOC Action Level of .10 mg/m^3 has been established. If the airborne concentration of semi VOCs is above .10 mg/m^3 , respiratory protection will be provided. The following action limits apply.

TABLE A-4

ACTION LEVELS FOR SEMI-VOLATILE ORGANIC COMPOUNDS

Coal Tar Pitch Volatiles Concentration mg/m^3	**Required Action and/or Level or Personal Protection**
Detectable limit to .1 mg/m^3	Level D personal protection
.1 mg/m^3 to 1.0 mg/m^3	Evacuate all personnel who are unable to wear air purifying respirators from area, implement engineering controls, or upgrade to Level C personal protection with full face air purifying respirators with combination organic vapor/HEPA cartridges.
Over 1.0 mg/m^3	Evacuate all personnel who are unable to wear air supplied respirators from area, implement engineering controls, or upgrade to Level B personal protection using full face supplied air respirators operated in pressure demand mode.

As established by 29 CFR 1910.1000, Air Contaminants, the OSHA permissible exposure limit for coal tar pitch volatiles is .2 mg/m^3 averaged over an 8 hours work day. If the airborne concentration of coal tar pitch volatiles is above .10 mg/m^3, these requirements will remain in effect until subsequent air monitoring results indicates airborne concentrations below .10 mg/m^3. Air Monitoring will be performed utilizing an Hnu PID during drilling and trenching operations where contaminated soil is present.

7.0 PERSONAL PROTECTIVE EQUIPMENT

Types of protective clothing and equipment to be used during the site activities are discussed in this section. The levels of personal protection specified in this section are based upon OSHA guidelines presented in 29 CFR 1910.120, Appendix B. All personal protective equipment (PPE) used must be ANSI-approved. The subcontractor('s) will supply all of its/their own PPE. The Franklin Company will supply its own personal protective equipment for its employees.

Level C protection, as described in this plan, will be available at a minimum, for those activities that involve the disturbance of soil, i.e., excavating.

The SSO will determine when it is necessary to upgrade, downgrade or modify levels or protection. The SSO will make entries in the dedicated site logbook when changes in the level of PPE are made; the reason for the change shall be noted. Level D protection will be used for those activities that do not pose a potential threat of exposure to flammable or combustible vapors or hazardous substances. The requirement for optional protective equipment will be determined by the SSO. Descriptions of levels D, C, and B personal protection follow.

7.1 LEVEL D PROTECTION

1. Disposable outer coveralls such as Saranex coated tyvek or equivalent.
2. Nitrile outer gloves at a minimum. Inner latex original surgical gloves are recommended where practical.
3. Boots/shoes, chemical-resistant steel toe and shank.
4. Boots, outer, chemical-resistant (disposable). (as needed)
5. Safety glasses or chemical splash goggles. (as needed)
6. Hard hat. (as needed)
7. Escape mask. (as needed)
8. Face shield. (as needed)

7.2 LEVEL C PROTECTION

All mandatory level D protective equipment and:

1. Full-face air purifying respirator (APR) equipped with appropriate combination organic vapor/HEPA cartridges. All personnel requiring respiratory protection must be "fit-tested" with the make and model of the respirator to be used in the field. Combination Organic Vapor/HEPA filter cartridges will be available and utilized as warranted by site conditions. Powered Air Purifying respirators (PAEEs) may also be sued, provided they can be fitted with combination Organic Vapor/HEPA filter cartridges.

2. Chemical-resistant disposable coveralls such as Saranex coat tyvek or equivalent. Suits will be hooded and one piece with booties and elastic wristbands.

3. Outer nitrile gloves and inner latex surgical gloves. (chemical resistant)

7.3 LEVEL B PROTECTON

All mandatory level C protective equipment and:

1. Self Contained Breathing Apparatus (SCBAs) operated in the pressure demand mode or a full-face supplied air respirator with a five-minute escape bottle operated in the pressure demand mode.

2. Chemical resistant disposable clothing such as Saranex coated tyvek or equivalent affording protection from skin contamination. Disposable coveralls or suits will be hooded and one piece with booties and elastic wristbands.

3. Option equipment as required:

    1. Radio communication system
    2. Temperature control systems

8.0 DECONTAMINATION

8.1 GENERAL PERSONNEL DECONTAMINATION

Personnel involved with field activities may be exposed to contaminants in a number of ways, despite the most stringent protective procedures. While performing site duties, site personnel may come in contact with vapors, gases, mists, particulate in the air, or liquids. Use of monitoring instruments and site equipment can also result in exposure to hazardous substances.

In general, decontamination involves scrubbing with a detergent/water solution followed by clean water rinses. All disposable items shall be disposed of in a dry container. Certain parts of contaminated respirators and SCBAs, such as harness assemblies and cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in detergent water and scrubbed with a brush. In addition to being decontaminated, if rubber components become soiled from exhalation or perspiration, all respirators, non-disposable protective clothing, and other personal articles must be sanitized before they can be used again. The manufacturers instructions shall be followed when sanitizing respirator facepieces. The Site Safety Officer will be responsible for the proper maintenance, decontamination, and sanitizing of all respiratory equipment.

8.2 DECONTAMINATION PROCEDURE

The following procedures have been established to provide site personnel with minimum guidelines for proper decontamination. Personnel leaving the designated point of operations must follow these minimum procedures. The decontamination process shall take place in the Contamination Reduction Zone away from any area of potential contamination. (see Appendix B)

Personnel leaving the point of operations and entering the Contamination Reduction Zone will be required to follow these decontamination procedures. At a minimum, contaminated outer boots shall be removed first and stored in an appropriate area for reuse or disposed of properly. Outer boots to be reused must be washed when gross contamination is evident. Personnel shall then remove and dispose of the Saranex coated tyvek or equivalent disposable coveralls. Personnel should remove the disposable coveralls so that inner clothing does not come in contact with any contaminated surfaces. After disposable coverall removal, personnel shall remove and discard outer gloves.

If portable wash stations are utilized, their access shall be unobstructed. The wash station shall consist of a potable water supply, hand soap and clean towels. Two portable sprayer units filled with detergent/water solution and clean potable water should also be available to wash and rinse off grossly contaminated boots, gloves and equipment. The SSO will monitor decontamination procedures to ensure their effectiveness. Modifications of the decontamination procedure may be necessary as determined by the SSO's observations.

8.3 PRESCRIBED LEVELS OF DECONTAMINATION PROCEDURE

The following decontamination procedures should be implemented during site operations for the appropriate level of protection.

Level D – Personal Protection Decontamination Procedure

Step 1 – Segregated Equipment Drop: Deposit contaminated equipment (tools, sampling devices, notes, monitoring instruments, etc.) used on the site onto plastic drop cloths.

Step 2 – Boot Clean: Brush boots free of residual soils. If necessary, wash with Alconox solution and rinse with potable water.

Step 3 – Disposable Equipment Removal: Remove disposable boot covers, disposable coveralls, and outer gloves in that order. Place contaminated covers,

coveralls, and gloves into container with plastic line. Remove inner gloves (if used) and place in container.

Step 4 – Field Wash: Was hands and face thoroughly.

Level C – Personal Protection Decontamination Procedure

Step 1 – Segregated Equipment Drop: Previously described.

Step 2 – Overboot and Glove Wash: Overboots and out gloves should be scrubbed with a decontamination solution of detergent and water.

Step 3 – Rinse Off Overboot and Outer Gloves: Decontamination solution should be rinsed off boots and gloves using generous amounts of water. Wastewater is to be collected and disposed of as contaminated waste.

Step 4 – Removal of Overboots and Outer Gloves: Remove overboots and place them in a container with a plastic liner. Next, remove outer gloves and place in container.

Step 5 – Remove Chemical-Resistant Clothing: With care, remove chemical resistant suit. The exterior of the suit should not come into contact with any inner layers of clothing.

Step 6 – Inner Glove Wash and Rinse: Inner gloves should be washed with a mild decontamination solution (detergent/water) and then rinsed with water.

Step 7 – Remove Respirator: Remove respirator. Attempt to keep face/glove contact to a minimum.

Step 8 – Inner Glove Removal: Remove inner glove and deposit in plastic-lined container.

Step 9 – Field Wash: Wash hands and face thoroughly. A shower should be take as soon as possible.

Level B – Personal Protection Decontamination Procedure

Step 1 – Segregated Equipment Drop: Previously described.

Step 2 – Overboot and Outer Glove Wash: Previously described.

Step 3 – Overboot and Outer Glove Rinse: Previously described.

Step 4 – Removal of Overboots and Outer Gloves: Previously described.

Step 5 – Chemical Clothing Rinse: Completely wash splash suit, SCBA and inner gloves. Disposable coveralls do not have to be washed.

Step 6 – SCBA Backpack Removal: The SCBA backpack shall be removed and placed on a plastic trap or covered table. The facepiece shall be disconnected from the remaining SCBA unit and the worker will proceed to the next station.

Step 7 – Chemical Resistant Clothing Removal: Previously described.

Step 8 – Inner Glove Wash and Rinse: Previously described.

Step 9 – SCBA (Respirator) Face Piece Removal: Previously described.

Step 10 – Inner Glove Removal: Previously described.

Step 11 – Field Wash: Previously described.

8.4 EQUIPMENT DECONTAMINATION

A Primary Decontamination Station for equipment will be set up for the site. The actual location will be determined by the SSO. The station will be used to completely

decontaminate all machinery and equipment used on-site for project activities. This station may include shovels, brushes, a power washer or steam jenny and provisions to collect decontamination rinse water. All equipment exiting the site will be completely decontaminated at the station. All visible materials will be removed from the backhoes and loaders; using shovels and brooms. A high-pressure spray will then be used to remove any residue on the machinery. All contaminated water and detergent used for decontamination will be collected for disposal.

At the completion of excavation or drilling activities, personnel, wearing appropriate PPE, will remove gross soil contamination from the equipment that was used to excavate. The equipment will then be moved to the Contamination Reduction Zone for extensive decontamination.

Alternatively, equipment may be decontaminated off site. Gross contamination must be removed and the equipment wrapped in plastic sheeting prior to transport.

9.0 SITE SECURITY

Access into the established points of operations will be limited to those authorized personnel wearing appropriate personal protective equipment. The active operating areas will also be monitored by the Site Safety Officer to ensure personnel do not enter without proper personal protection.

Sign-in procedures may be implemented to ensure that only authorized personnel only will participate in the remedial action activities. The SSO will coordinate this effort and maintain the generated documentation accordingly.

10.0 EMERGENCY RESPONSE

10.1 NOTIFICATION OF SITE EMERGENCIES

In the event of an emergency, site personnel shall signal distress with three (5 second) blasts from an air horn. All appropriate authorities will then be immediately notified of the nature and extent of the emergency. Medical personnel will be informed of site hazards and activities prior to project initiation so that emergency situations can be handled most efficiently.

10.2 RESPONSIBILITIES

The SSO will be responsible for administratively responding to all emergencies. The SSO will:

1. Notify appropriate individuals, authorities, and/or health care facilities as needed. Emergency telephone numbers will be posted in the support zone. (see pg. 30)

2. Ensure that a working portable eyewash station, a stocked first aid kit approved by a licensed physician and BC rated carbon dioxide extinguishers are on site. The portable eyewash station shall provide at least fifteen minutes of potable water. At least three 20 pound BC rated carbon dioxide or equivalent fire extinguishers shall be on site, within thirty feet of the exclusion zone.

3. Have working knowledge of all safety equipment available at the site.

4. Establish a safe distance of refuge (an assembly area) from the work area and inform all employees and contractors of approved excavation routes, if necessary.
5. Ensure that a map, which details the most direct route to the nearest hospital and the list of emergency telephone numbers, are posted on site. (see Appendix A)

6. Prior to initiating work activities, the subcontractor will supply the SSO with the names of employees working that shift. In the event of a catastrophe, the SSO or designee will account for the Franklin Company Contractors Co., Inc. employees, subcontractor employees and other personnel on site at the designated assembly area.

10.3 ACCIDENTS AND INJURIES

Prevention of injuries is paramount to the Franklin Company Contractors Co., Inc. Any worker recognizing a potential safety hazard shall immediately correct the hazard if possible or bring the hazard to the attention of the SSO or Supervisor. If the safety hazard is not corrected following discussions with the SSO, the Project Manager shall be contacted to resolve the issue.

In the event of a safety or health emergency at the site, appropriate emergency measures must immediately be taken to assist those who have been injured or exposed and to protect others from hazards. The SSO will be immediately notified and will respond according to the seriousness of the injury.

If the emergency involves personnel injuries, NYC Emergency Medial Service (EMS) is to be contacted immediately by dialing 911. If designated, individuals trained in first aid or CPR and who are currently Certified may perform first aid treatment until EMS arrives. Individuals performing or expected to perform first aid will receive bloodborne pathogens training, 29 CFR 1910.1030. Areas contaminated with blood will be appropriately disinfected with approved agents. The person assigned to contact EMS should be prepared to provide the following information.

1. Exact location of the emergency
2. Phone number he/she is calling from
3. Type of injury(ies)
4. How many persons have been injured
5. What assistance or first aid is being given to the injured person(s)

DO NOT hang up unless told to do so. In most cases, the EMS dispatcher will require the caller to **stay on the phone**

When emergency response authorities (NYPD, NYFD or EMS) arrive, site personnel should immediately inform them of the details of the situation and what type of chemicals or hazards may be encountered within the exclusion zone, near the injured person.

If the injury is not serious, the person is conscious, can walk, is willing to travel and an ambulance is not immediately available; the person may be taken to the local hospital. Background medical information that may be important for the injured persons treatment should accompany him/her to the hospital. Incidents or accidents must be reported to the SSO using the Franklin Company Contractors Co., Inc. or subcontractor accident reporting forms an OSHA 101 Form may be used as well.

Early and proper recognition of the symptoms of various injuries and exposures in important. Table A-3 lists the signs and symptoms of various injuries, chemical exposure and shock.

Emergency Response Plan

TO BE POSTED AT THE SITE

In Case of Emergency Contact The Following:

Office Phone Number: (718) 762-5200

Project Manager:	Brad Ruder	Cell (201) 240-2378
Site Manager:	Bob Laga	Cell (917) 577-7297
	Rich Kavanagh	Cell (718) 309-6543
Field Supervision:	Rich Kavanagh	Cell (718) 309-6543
Site Geologist/Technician – Gujin Tao		Cell (917) 578-1863
New York State DEC (region 2 spills)		(800) 457-7362
National Response Center		(800) 424-8802
LIRR CPM	Andrew Wilson	(718) 558-3620
LIRR Management Bureau		(718) 558-8204

In the event of Emergency Call 911 FOR EMS, FIRE, POLICE

If injury is not life threatening, the nearest hospital is Jamaica Hospital, located at 8900 Van Wyck Expy. Jamaica, N.Y.

To get to the hospital by car, go east on Atlantic Ave. toward 123rd ST., turn left onto Van Wyck Expy. Turn left onto Jamaica Ave., Turn left onto Van Wyck Expy., arrive at hospital.

BASIC FIRST AID PROCEDURES

1. *Be calm and quickly evaluate the emergency.*
2. *Contact EMS.*
3. *Do not move the injured person unless necessary or instructed to do so.*
4. *If possible, move any physical and chemical hazards away from the area of the injured person.*
5. *Cover injured person to keep warm.*

TABLE A-5
SYMPTOMS OF VARIOUS TYPES OF INJURIES, EXPOSURES, AND SHOCK

Type of Injury or Exposure	*Symptom*
Bone Fracture	*Signs and symptoms of fractures include the sound of bone "snapping", a grating sensation of bones burring together, obvious deformities, pain, tenderness, swelling, bruising, and an inability to move the injured part. Victims with fractured ribs may feel pain as they breathe.*
Dislocation	*Signs and symptoms of a dislocation are similar to those of a fracture. They include swelling, deformity, pain in a joint, loss of movement, and tenderness.*
Internal Bleeding	*Signs and symptoms of internal bleeding are:* • *Bruised, swollen, tender, or rigid abdomen* • *Bruises on chest or signs of fractured ribs* • *Blood in vomit* • *Wounds that have penetrated the chest or abdomen* • *Bleeding from the rectum or vagina* • *Fractures of the pelvis* • *Abnormal pulse and difficult breathing* • *Cool, moist skin*

Type of Injury or Exposure	*Symptom*
Shock	*Shock has many signs and symptoms. These include confused behavior, very fast or very slow pulse rate; very fast or very slow breathing; trembling and weakness in arms and legs; cool and most skin; pale or bluish skin, lips, and fingernails; and enlarged pupils*
Chemical Exposure, Ingestion or Inhalation	*Symptoms of chemical exposure, ingestion or inhalation may include one or more of the following:* • *Abnormal Pulse* • *Behavioral changes* • *Breathing difficulties or abnormal breathing* • *Changes in complexion of skin color* • *Convulsions* • *Coordination difficulties* • *Coughing* • *Dizziness or drowsiness* • *Drooling* • *Diarrhea* • *Fatigue and/or weakness* • *Irritation of eyes, nose, respiratory tract, skin, throat, mouth, or lips* • *Headache* • *Itching* • *Light-headedness* • *Nausea/vomiting* • *Skin irritation or rash* • *Sneezing* • *Sweating* • *Tearing* • *Tightness in the chest* • *Unconsciousness*

Type of Injury or Exposure	*Symptom*
Heat Stroke	*Signs and symptoms of heat stroke are hot, red skin; very small pupils; and very high body temperature – sometimes as high as 105 degrees. If the victim was sweating from heavy work or exercise, his/her skin may be wet; otherwise, it will feel dry.*
Heat Exhaustion	*The usual signs and symptoms of heat exhaustion are cool, pale, and moist skin; heavy sweating; dilated pupils, headache, nausea; dizziness; and vomiting. Body temperature will be nearly normal.*
Frostbite	*The first sign of frostbite may be that the skin is slightly flushed. The skin color of the frostbitten area then changes to white or grayish yellow and finally grayish blue, as the frostbite develops. Pain is sometimes felt early on but later goes away. The frostbitten part feels very cold and numb. The victim may not be aware of the injury.*
Hypothermia	*The signs and symptoms of hypothermia include shivering, dizziness, numbness, confusion, weakness, impaired judgment, impaired vision, and drowsiness. The stages are:* *1. Shivering* *2. Apathy* *3. Loss of consciousness* *4. Decreasing pulse rate and breathing rate* *5. Death* *As hypothermia progresses, the victim may move clumsily or have trouble holding things. In the later stages, he/she may stop shivering.*

10.4 FIRST AID

First aid is to be administered only by currently certified persons trained in First Aid procedures or by an individual who is directed by the EMS dispatcher.

11.0 SPECIAL PRECAUTIONS AND PROCEDURES

11.1 POTENTIAL RISKS

The excavation, drilling and remediation activities at the property pose potential exposure risks from both chemical and physical hazards. The potential for chemical exposure to hazardous substances is significantly reduced through the use of personal protective equipment, engineering controls and implementation of safe work practices.

Physical hazards associated with the remedial activities can be encountered during excavation, tank cleaning, tank removal, tank abandonment and construction activities. Physical hazards may be encountered during activities involving heavy equipment, trenching, confined space entry, heat stress/cold exposure, site refuse, traffic and overhead or underground utilities. This plan established precautionary measures to reduce the risks of these hazards. These hazards are addressed in the following sections.

12.0 SITE CONTROL

In areas where excavation or drilling activities are implemented, the establishment and maintenance of work zones can minimize both physical and chemical hazards. The Site Safety Officer will be responsible for establishing and maintaining the following work zones:

12.1 EXCLUSION ZONE

An exclusion zone (EZ) may be established at each excavation location. Barricades may delineate the EZ or barricade tape installed by the contractor to take into account the limits of the operating area, and the spatial requirements of equipment and personnel. All persons within the EZ shall wear the required level of personal protection. The operating area shall remain an exclusion zone until operations are completed and the area is restored.

12.2 CONTAMINANT REDUCTION ZONE

The contamination reduction zone (CRZ) is the transition area between the exclusion zone area and the support zone (clean area). Preliminary equipment and personal decontamination will take place in the CRZ. Two types of CRZs may be used during excavation and drilling activities. An interim CRZ may be established at the excavation for removal of gross contamination and a permanent station (decontamination pad) established at the barricades (barricade type) for the decontamination of equipment and personnel leaving the site.

The decontamination pad shall be large enough to accommodate the equipment used during the remediation process and be constructed by placing a plastic liner on a smooth surface, which is sloped to one corner.
The perimeter shall consist of a berm that is approximately one foot high. After the area has been prepared a liner will be installed. At the low corner of the pad a 9 to 12 inch perforated sump or other catch basin shall be installed. Three quarter inch (3/4") or larger stone will be placed on the liner and around the sump can. A high-pressure washer will be used to decontaminate all equipment and materials before leaving the site. All liquids generated during this procedure will be collected at the sump can and disposed of in labeled 55-gallon drums or other suitable containing devices.

Alternatively, equipment may be decontaminated off-site. Gross contamination must be removed and the equipment wrapped in plastic prior to transport. Those decontamination activities discussed above must be performed at the off-site location.

12.3 SUPPORT ZONE

The support zone (SZ) is considered to be uncontaminated. Protective clothing and equipment is not required in this area but should be available for use in emergencies. Clean equipment and materials are stored and maintained within SZ. Protective closing is donned in the SZ prior to entering the CRZs. The support zone will be confirmed by SSO before fieldwork. Put simply, the support zone covers all areas which are not designated as EZs or CRZs. (see Appendix B)

13.0 HEAT/COLD STRESS

Work/rest regimens will be employed as necessary so that personnel do not suffer adverse effects from heat stress or cold exposure. Special clothing and an appropriate diet and fluid intake will be recommended to all site personnel to further reduce these temperature-related hazards.

13.1 COLD STRESS

Persons working outdoors in temperatures at or below freezing may be subject to frostbite. Table A-5 presents exposure limits at low temperatures. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling, possibly causing death or serious injury. Areas of the body that have high surface-area-to-volume ratio such as fingers, toes, and ears are the most susceptible.

Local injury resulting from cold temperatures is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost nip or initial frostbite: characterized by suddenly blanching or whitening of skin.
- Superficial frostbite: skin has waxy or white appearance and is firm to touch, but tissue beneath is resilient.
- Deep frostbite: tissues are cold, pale, and solid; extremely serious injury.

TABLE A-6

MAXIMUM DAILY TIME LIMITS FOR EXPOSURE AT LOW TEMPERATURES

Temperature Range		Maximum Daily Exposure
Celsius (degrees)	Fahrenheit (degrees)	
0 to –18	30 to -	No limit, providing that the person is properly clothed.
-18 to –34	0 to –30	Total work time; 4 hours. Alternate one hour in and one hour out of the low temperature area.
-34 to –57	-30 to –70	Two periods of 30 minutes each, at least 4 hours apart. Total low temperature work time allowed: one hour. (Note that some difference exists among individuals: one report recommends 15-minute periods – not over hour periods per work 8-hour shift; another limits periods to one hour out of every four; with a low chill factor, i.e., no wind; a third says that continuous operation for 3 hours at –53 has been experienced without ill effect).
-57 to –73	-70 to –100	Maximum permissible work time: 5 minutes during an 8-hour working day. At these extreme temperatures, completely enclosed headgear, equipped with a breathing tube running under the clothing and down the leg to preheat the air is recommended.

Another form of cold stress that can be quite serious is hypothermia. Hypothermia results when the body loses heat faster than it can produce it. When this situation first occurs, blood vessels in the skin construct in an attempt to conserve vital internal body heat. Hands and feet are first affected. If the body continues to lose heat, involuntary shivers begin. This is the body's way of attempting to produce more heat, and it is usually the first real warning sign of hypothermia. Further heat loss produces speech difficulty, forgetfulness, loss of manual dexterity, collapse, and finally death.

Systemic hypothermia is cause by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

1. shivering;
2. apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95oF;
3. unconsciousness, glassy stare, slow pulse, and slow respiratory rate;
4. freezing of the extremities; and finally
5. Death.

Two factors influence the development of a cold injury; ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature.
For instance, 10oF with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at –18oF.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed, if the clothing underneath is perspiration-soaked.

13.2 HEAT STRESS

Heat stress is an aggregate of environmental and physical work factors that constitute the total heat load imposed on the body. Heat strain is the series of physiological responses to heat stress. When the strain is excessive, a feeling of discomfort or distress may result; heat disorder may ensue. The severity of the strain will not only depend on the magnitude of the prevailing heat stress, but also on the age, physical fitness, degree of acclimatization and dehydration of the worker.

Prevention of dehydration can be accomplished by frequent small intakes of water prior to entering the exclusion zone. Once workers leave the zone and are full decontaminated, they shall be encouraged to drink more water.

Heat disorder is a term used to describe one of the following heat related illnesses or conditions:

- Heat Cramps – Painful intermittent spasms of the muscles following hard physical work in a hot environment. Cramps usually occur after heavy sweating and often towards the end of the work shift.
- Heat Exhaustion – Profuse sweating, weakness, rapid pulse, dizziness, nausea and headache. The skin is usually cool, sometimes pale and clammy with sweat. Body temperature is usually normal.

- Heat Stroke – Sweat is diminished or absent. The skin is dry to the touch and is usually flushed. Increased body temperature is found and if uncontrolled, can lead to delirium, coma, convulsions and death. Medical care is urgently needed.

The following control measures will aid in controlling heat disorders.

- Provide adequate liquids (cool water) and encourage workers to drink more than the amount to satisfy thirst.

- Establish work/rest periods to allow for the body to cool down. Inform workers of the importance of rest acclimatization and proper diet.

- Wear cooling devices such as ice vests.

- Do not assign tasks to workers who are on rest breaks.

Appropriate clothing and work/rest regimes shall be used during this project. These items shall be discussed with field team members by the SSO.

14.0 ADDITIONAL SAFETY PRACTICES

The following are important safety precautions, which will be enforced during this investigation:

1. Eating, drinking, chewing gum or tobacco, smoking or any practice that increases that probability of hand-to-mouth transfer and ingestion of hazardous material is prohibited within any action portion of tank cleaning, removal, abandonment operations.

2. Hands and face must be thorough washed upon leaving the work area and before eating, drinking, or any other activity associated with potential of hand-to-mouth transfer.

3. Whenever decontamination procedures for out garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.

4. All personnel utilizing respiratory protection must be clean-shaven. No facial hair, which interferes with the effectiveness of a respirator, will be permitted on personnel required to wear respiratory protection. Mustaches are permitted provided they are above the lip line. The respirator must seal against the face so that the wearer receives air only through air purifying cartridges attached to the

respirator. Fit testing shall be performed prior to respirator use, and annually there after, to ensure a proper seal is obtained by the wearer.

Respirators will be issued for the exclusive use of each worker and will be cleaned and disinfected after every use. Respirators will not be hung from straps and will be stored in clear plastic bags.
Cartridges for air purifying respirators will be changed daily at a minimum. Used cartridges will be disposed of as contaminated waste.

5. Contact with potentially contaminated surfaces should be avoided whenever possible. Individuals are not to walk through puddles, mud, or other discolored surfaces; kneel on ground; lean, sit or place equipment on drums, containers, vehicles or the ground.

6. Medicine and alcohol can increase the effect of exposure to certain compounds. Illegal drugs an alcoholic beverages are not to be consumed on-site by personnel involved in the project. Prescribed medication may be administered by an employee providing the SSO has been made aware of the prescription requirements and has verified that exposure to on-site contaminants will not influence the medication's effect.

7. Personnel and equipment in the work areas should be minimized, consistent with effective site operations.

8. Work areas for various operation activities should be established.

9. Procedures for leaving the work area must be planned and implemented prior to going to the site. Work areas and decontamination procedures must be established on the basis of prevailing site conditions.

10. Safety gloves and boots shall be taped to the disposable, chemical-protective suits as necessary.
11. All unsafe equipment shall be removed from service and identified by a "DANGER, DO NOT OPERATE" tag.

12. Noise muffs may be required for all site personnel working around heavy equipment. This requirement will be at the discretion of the Site Safety Officer.

15.0 EXCAVATIONS

The main concerns of trenching and excavation are ground control and fall prevention. Before an excavation is made, a thorough effort shall be made to determine whether underground obstructions (such as sewer, telephone, gas, fuel, water or electrical conductors) or aboveground hazards may be encountered. Underground utility lines shall be properly supported during excavation. Where appropriate, the respective utility companies shall be informed of the proposed site work and consulted to receive any additional advice based on their experience. Natural hazards, such as boulders and trees, shall be removed or controlled before excavation begins if there is a potential hazard to workers.

Very specific guidelines exist to protect employees from moving ground during excavation. They are based on ground type and excavation depth. All excavations performed during this project are not intended to exceed 15 feet. For excavations greater than 20 feet, sloping, a registered professional engineer shall approve shoring systems and timber shoring. The walls and faces of all excavations to which employees are exposed to shall be guarded by a shoring system or sloping of the ground. All slopes shall be excavated to a degree required in Table P-1 which is based on solid type and grounds unique ability to slide (see Table P-1). Soil types are based on cohesiveness (exhibiting cohesion). A cohesive soil is one, which is hard to break up when dry and exhibits significant cohesion when submerged. Soil types may be defined as:

1. Stable Rock – natural solid mineral manner that can be excavated with vertical slides and remain intact while exposed.

Table P-1

Maximum Allowable Sloping Requirements*

Type	Maximum Allowable Slope
Stable Rock	Vertical 90o
Type A	3/4:1 53o
Type B	1:1 45o
Type C	1-1/2:1 34o

* A registered professional engineer shall designate sloping for excavations greater than twenty feet.

2. Type A soil – soil which has an unconfined compressive strength of 1.5 5tons per square foot (sf). This includes cohesive soils such as clay, silty clay, sandy clay and clay loam. No cohesive soil is Type A if:

   - Soil is fissured
   - Subject to vibration
   - Has been previously disturbed
   - Part of a sloped, layered system, which dips into the excavation on a slope of 4 horizontal to one vertical.
   - Other factors require it to be reclassified.

3. Type B Soil – soil which has a cohesive soil with an unconfined compressive strength greater than .5 tsf but less than 1.5 tsf. This includes all soils classified as silt, angular gravel, silt loam, sand loam and all Type A soils previously disturbed. Dry rock that is not stable will be considered Type B soil. Type B solid also includes material that is part of a layered system where the layers dip into the excavation on a slope less

than 4 horizontal to one vertical, but only if material is classified as Type B.

4. Type C Soil – soil which has an unconfined compression strength of .5 tsf or less. Type C soil includes:

   - Granular soils including gravel, sand or loamy sand
   - Submerged soil or soil from which water is freely seeping
   - Submerged rock which is not stable
   - Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical or steeper.

A competent person as stable rock or one of the soil types described above shall classify each soil and rock deposit.

A competent person shall be assigned to the site during all excavation activities, i.e., sloping, shoring or working within excavations. A competent person is defined as one who is capable of identifying existing and predictable hazards or working conditions, which are unsanitary, hazardous or dangerous to employees, and has authorization to take prompt corrective measures to eliminate them. The subcontractor shall identify the competent person and submit the competent person's qualifications to the Franklin Company Contractors Co., Inc. Project Manager. A competent person shall perform daily inspection of excavation and adjacent areas. Inspections shall be concerned with possible cave-in, failure of protection systems, hazardous atmospheres or other hazardous conditions. Where a competent person finds evidence of such hazards, employees shall be removed from the excavation until the unsafe condition is corrected.

Vibrations from nearby railroad, highway traffic or heavy equipment near an excavation, may require the side of the excavation to be braced to resist the additional force from such loads. A warning system shall be in place when moveable equipment is operated next to an edge of an excavation and the operator does not have clear or direct view of the edge. Warning systems may be barricades, hand or mechanical signals or stop logs.

No work shall be performed within an excavation in which there is accumulated water unless adequate precautions are taken. Precautions include the removal of water by pumps and the diversion of any surface water by dikes, ditches or plastic sheeting.

If excavations are to be performed near a wall or building and may compromise its stability, registered professional engineer shall evaluate the wall or building and ensure its stability accordingly.

Stability may be achieved by designing a bracing system, if necessary. If bracing is not necessary, the registered professional engineer will indicate that fact in writing.

Excavated material (spoil) shall be kept at least two feet from the edges of all excavations.

Excavations less than twenty feet in depth occurring in Type C solid may be sloped at an angle no greater than 34 degrees measured from the horizontal plane. Excavations less than twenty feet in depth occurring in Type B solid may be sloped 45 degrees measure from the horizontal.

The Contractor may use tabulated data for slope design. The tabulated data must be in written form and is to include identification of the parameters, limits of use an identify the registered professional engineer (PE) who approved the data. A copy of the tabulated data identifying the registered PE will remain on-site during tank removal and installation activities. A sloping system designed and approved by a registered PE may be utilized. The written design must illustrate the magnitude of the slope considered safe based on the project. A copy of the approved written design must remain on the job site during work activities.

Shoring systems, support systems, shield systems and other pro-active systems may be used providing such systems are approved by the manufacturer or registered PE using the manufacturer's tabulated data. Deviations from those specifications outlined by the manufacturer or registered PE shall only be made following specific written approval.

If initiated, shoring systems shall be utilized for Type B soils at a depth of 5 feet or greater and immediately for Type C soils. Shoring systems shall be designed by a manufacturer, registered PE or be consistent with Attachment 1 of this Appendix (OSHA Minimum Timber Shoring Requirements).

For excavations greater than 4 feet, ladders must be located every 25 feet and extend three feet over the surface.

Any excavation activities below the ground water table shall be examined and approved in writing by a registered PE.

Prior to workers entering an excavation, the atmosphere must be tested for the presence of flammable or hazardous vapors. Any level equal to or greater than 10 percent of the LEL will lead to immediate evacuation of the excavation. See Section "Site Monitoring" for specific hazards involved at the site.

16.0 MATERIAL HANDLING EQUIPMENT

Attachments (scraper blades, buckets, clam shells) to heavy equipment such as cranes, front end loaders and backhoes shall be fully lowered or substantially blocked when not in use. All controls shall be set in neutral; motors stopped and brakes set. Whenever the equipment is parked, the parking brake shall be set. If parked on an incline, the wheels shall be chocked.

Employees are not to be placed in positions where they are directly under suspended loads or attachments to heavy equipment.

All vehicles shall possess operable braking and emergency braking systems. All brake lights shall be operating properly.

No vehicle with an obstructive view to the rear shall be used unless it possesses an audible backup alarm or an observer to signal to the operator to backup.

All vehicles equipped with cabs shall have windshields and powered wipers. All cracked or broken glass of the vehicle cab shall be replaced. Where necessary, operable defogging or defrosting equipment shall be maintained on the vehicle.

Vehicles used to transport employees shall possess seats firmly secured and adequate for the number of employee carried. Employees will not be allowed to ride outside of the seated cab or in the shovel or bucket of any vehicle during operation.

All vehicles shall be checked at the beginning of each shift to ensure its equipment, parts and accessories are in a safe operating condition and free of apparent damage.

All types of earth moving equipment, i.e., scrapers, loaders, crawler or wheel tractors, bulldozers and graders shall possess safety belts in accordance with ANSI/SAE J 386-1969. Please note that these vehicles are required to possess ROPs. Seat belts need not be provided for equipment, which is not required to possess ROPs or adequate canopy protection.

Access roadways and grades are to be constructed and maintained to safely accommodate the movement of vehicles involved.

Dump bodies shall possess guards over the cab to prevent falling material from falling on the driver's cab. Dump bodies transporting contaminated soil shall possess a canvass canopy to prevent migrating dust migration during transport.

17.0 CRANES AND DERRICKS

The Contractor shall comply with the manufacturer's specifications and limitations applicable to the operation of the crane or derrick. Where the manufacturer's specifications are not available, a registered professional engineer shall determine limitations.

Attachments to the crane shall not exceed the capacity, rating or scope recommended by the manufacturer.

No modifications or additions, which affect the capacity of safe operation of the crane or derrick shall be made without manufacturer's written approval or approval by a registered professional engineer.

Instruction, rated load capacities, speeds and special hazard warnings shall be conspicuously posted so that it is visible to the operator. Only qualified operators familiar with the crane shall operate it. The operator or competent person shall be designated to inspect the crane daily prior to and during use to ensure its safe operating condition. Any deficiency found shall be repaired before continued use.

An illustration of hand signals prescribed by ANSI shall be posted at the job site.

A thorough, annual inspection shall be made by a competent person, government or private agency recognized by the United States Department of Labor. Additionally, the crane shall be inspected monthly in accordance with NYS Industrial Code Rule 23, Motor Cranes, Tower Cranes and Derricks and shall possess a valid NYC inspection certificate and all operators shall possess current NYC licenses for the crane capacity used at the site. The Franklin Company Contractors Co., Inc. or its subcontractor(s) shall maintain such certifications and inspection records, which include items inspected, signature of the inspector and serial number of crane or other identifier.

The NYC crane inspection certificate and a copy of the most recent NYSDOL monthly inspection checklist shall remain in the cab.

All wire rope found to be defective (broken strands or distortion) shall be taken out of service. Wire rope safety factors shall be in accordance with ANSI B30.5-1989 or ANSI/SAE J959-Oct. 80.
All belts, gears, shafts, drums, flywheels (rotating or reciprocating moving parts) shall be guarded if such parts are exposed to contact by employees. Guarding shall meet those requirements described in ANSI B15.1-1984.

Accessible areas within the swing radius of the rear of the rotating superstructure of the crane shall be barricaded in such a manner as to prevent the employee from being struck or crushed by the crane.

Employees are to keep clear of suspended loads. The bucket or clamshell shall never swing over workers. Tag Lines shall be used to control suspended loads.

All windows in cabs shall be of safety glass or equivalent that produces no visible distortion that will interfere with safe operation. Guardrails, handholds and steps shall be provided for each access in accordance with ANSI b30.5-1989. Platforms and walkways shall be non-skid surfaces.

A portable "BC" class fire extinguisher of at least 10 pounds shall be maintained in the cab. If the supporting soil below the crane is soft, substantial mats or planking (cribbing) shall be installed prior to work.

For overhead electrical lines 50 KV or below, the minimum clearance between the line and any parts of the crane or load is ten feet. For lines over 50 KV, the minimum clearance shall be ten feet plus .4 inch for each 1 KV. In transit, with the boom lowered, equipment clearance shall be four feet for voltages less than 50 KV and10 feet for voltages from 50 KV up to 345 KV.

18.0 CONFINED SPACE

A written permit is required for the Contractor's personnel to enter a confined space. The written permit must contain:

- Methods to identify and evaluate confined space hazards before entry
- Test conditions of the confined space before entry
- Perform appropriate atmospheric test (in the following sequence) for oxygen, combustible gases and toxic gases. Only workers wearing a full-face airline respirator with a five minutes escape bottle or operated in a pressure demand mode will be allowed to enter a tank or an oxygen deficient atmosphere. Any Lower Explosive Limit (LEL) recorded will prohibit entry until the LEL is reduced to zero by purging or ventilating. Testing will be re-performed if workers leave the space for break or lunch.
- Develop measures to prevent unauthorized entry into confined spaces
- Eliminate or control hazards necessary for safe permit operations.
- Identify job duties.
- Provide personal protection equipment for safe entry.
- Ensure an attendant is stationed outside during entry operations.
- Coordinate entry operations when more than one Contractor is working in a confined space.
- Possess a procedure for summoning rescue services (EMS).
- Establish in writing, a system of preparation, issue, use and cancellation of entry permits
- Review program annually.

All work within underground tanks shall be considered permit required confined space. If hazardous conditions are detected during entry, employees must leave the space and the confined space must be reevaluated to determine the cause of the hazardous atmosphere. The hazardous atmosphere must be eliminated prior to reentry.

If more than one contractor is performing work in the confined space, other contractors will be informed of the permit space entry requirements. All contractors must coordinate entry operations.

A permit signed by the entry supervisor, and verifying that pre-entry verifications have been completed verifying the space is safe to enter, must be posted at entrances or otherwise be made available before entrants enter the permit space. The duration of the permit must not exceed the time required to complete the assignment.

The entry supervisor must cancel the permit when the work is completed or when new conditions exist. New conditions must be noted on the cancelled permit.

Entry permits must include the following information regarding:

- Test results and tester's initials or signature
- Name and signature of supervisor who authorized entry
- Name of permit space, purpose of entry an know space hazards
- Measures taken to isolate permit spaces
- Name and telephone number of rescue squad
- Date and authorization for entry
- Acceptable entry conditions
- Communication procedures and equipment
- Special equipment and procedures as well as additional work permits

Prior to entry, all employees shall be trained in confined spaces. This training shall include recognition and understanding of confined spaces as well as the skills necessary to evaluate those hazards. Upon completion of training, workers will receive a certificate of training that includes the workers name, signature or initials of the trainer including the dates of training.

The authorized entrant shall:

- Know the hazards of the space including mode of exposure, signs or symptoms of exposure.
- Use the appropriate personal protective equipment. All authorized entrants shall don a full-face airline respirator with a five-minute escape bottle operated in the pressure demand mode and wear a full body harness with an attached retrieval line. The retrieval line will be attached to a mechanical extraction device.
- Maintain communication with the attendant and alert the attendant when a prohibited condition exists.

The attendant's duties shall include:

- To remain outside the permit space during operations and ready to perform non-entry rescue, if necessary.
- Know the existing and potential hazards of the space including the hazards over exposure.
- Order an evacuation of the space when prohibited conditions exist or when a worker shows signs of hazard exposure.
- Summon rescue and other services during an emergency.
- Ensure that unauthorized personnel are kept away from confined space and inform the entry supervisor of unauthorized entry.

The attendant shall perform no other duties that would interfere with the primary duties of the attendant.

The entry supervisor shall:

- Know the hazards of the space including information on the mode of exposure.
- Verify emergency plans and specified entry conditions such as test, equipment and procedures.
- Terminate entry and cancel permits when the operation is completed or a new condition arises.
- Take appropriate measures to remove unauthorized entrants
- Ensure that entry operations remain consistent with the entry permit and that acceptable entry conditions are maintained.
- Maintain written information or Material Safety Data Sheets on substances contained in the tank.

All rescuers responding to a confined space incident shall be certified in first aid and CPR. Rescuers will be knowledgeable in the proper use of personal protective equipment and rescue equipment.

19.0 WORK AREA PROTECTION

Active thoroughfares are located in front of and adjacent to exclusion areas where tank cleaning, removal and abandonment activities are going to occur. Approved work area protection devices such as traffic cones, stanchions barricade tape and/or type I barricades shall be extensively utilized. At the Site Safety Officer's discretion, "Men Working" signs shall be placed accordingly to warn traffic entering and existing the facility. Battery power warning lights shall surround those excavations which remain open during evening hours.

Barricade tape will be utilized to separate the exclusion zone from the support zone.

20.0 PAVEMENT BREAKERS AND PORTABLE AIR COMPRESSORS

All Franklin Company Contractors Co., Inc. employees and its subcontractor employees shall utilize additional safety equipment outlined below when operating equipment (pavement breakers) powered by compressed air:

- Sanke Foot Guards or substantial leather work boots with metatarsal guards;
- Hearing protection;
- Goggles;
- Disposable respirators (Dust Masks). Full-face air purifying respirators with combination organic vapor/HEPA cartridges may be used if the SSO believes it is necessary to protect the health of the workers.

Additionally, all portable air drive tools shall possess safety chains between the powered air tool and the air supply hose. All air hoses shall be secured together at their connections. Where applicable, noise abatement mufflers shall be attached to powered air tools.

21.0 ELECTRICAL SAFETY

All equipment used in atmospheres containing flammable and combustible vapors shall be classified as intrinsically safe by a nationally recognized laboratory (UL or FM) for Class I, Groups A, B, C and D. All associated electrical installations located near and within the exclusion zone shall be isolated, locked out and grounded to prevent static discharges. This includes metering systems, cathodic protection systems and electrical services to the pump motors and lighting systems.

All electrical equipment used shall be connected to a Ground Fault Circuit Interrupter (GFCI). All GFCIs shall be inspected at the beginning of the day to determine their operational status. All portable electric equipment used on site shall be inspected prior to sue to ensure it is free of defects.

Temporary electrical conductors shall be adequately protected from the hazards of vehicular traffic by shunt boards.

22.0 HAZARD COMMUNICATION

The Franklin Company will be provided with copies of updated Material Data Safety Sheet (MSDS) of all chemical substances and compounds to be brought on site by subcontractors prior to use. The Franklin Company will approve or disapprove chemical substances brought on site based on its need, quantity, flammability, reactivity and health effects. Based on the information and MSDSs provided, the Franklin Company will maintain a chemical inventory for each site as well as a listing of MSDSs for those materials found on site. All subcontractors will ensure that their workers have been made aware of the chemical hazards stemming from their own operations or the operations of other subcontractors while on site. A written hazard communication plan shall be available for review and all chemical compounds used on site shall be appropriately labeled.

23.0 FIRE PREVENTION

Because flammable vapors are anticipated to be found, smoking, flames or spark producing devices shall be prohibited within fifty feet of the exclusion zone when the tank is being cleaned, opened, purged and cut free. At least three 20-pound BC rated fire extinguishers shall be provided and remain within 30 feet of the exclusion zone.

The subcontractor shall ensure its employees are adequately trained in the use of portable fire extinguishers.

24.0 GENERAL SAFETY REQUIREMENTS OF CONCRETE WORK

24.1 CAST IN PLACE CONCRETE

Formwork shall be designed, erected, supported and maintained so that it is capable of supporting without failure, and vertical and lateral loads that may reasonably be anticipated to be applied to the formwork.

Drawings and plans including all revisions of formwork and shoring shall be available at the site. Shoring equipment shall be inspected prior to sue to determine that the equipment meets the requirements of the formwork in use. Shoring equipment shall be immediately inspected prior to, during and immediately following concrete placement.

The design of the shoring system shall be prepared by a licensed professional engineer and shall be inspected by a licensed professional engineer once erected.

Reinforcing steel shall be adequately supported to prevent collapse or worker injury. Protruding reinforcing steel rods shall be capped to prevent injury. Measures shall be taken to prevent unrolled wire mesh from recoiling.

Forms and shoring shall not be removed until it has been determined that the concrete has gained sufficient strength to support its weight and superimposed loads. Plans and specifications will stipulate the conditions for the removal of formwork and shoring.

24.2 *PRECAST CONCRETE INSTALLATION*

If used, precast concrete panels and structures shall be properly supported to prevent injury.

Lifting inserts which are embedded or otherwise attached to precast members shall be capable of withstanding four times the maximum load applied or transmitted to them. Lifting hardware shall be capable of withstanding five times the maximum intended load.

No employee shall stand under precast sections being lifted.

25.0 EQUIPMENT TAGOUT/LOCKOUT

A. General

1. Before work may be performed on, in or near equipment and/or circuits which could cause bodily injury by contact with electrically energized parts, by accidental start-up of machinery, by release of flue pressure (air, team, hydraulic, etc.) or by contact with acids, corrosives, flammables or other hazardous materials, electrical circuits shall be de-energized, valves shall be closed, pressures shall be bled off, hazardous materials shall be drained from lines and/or vessels when necessary.

B. Requirements

1. Equipment or circuits that are de-energized shall be rendered inoperative either by physical removal of control capabilities or placement of a lockout mechanism) and have tags attached at all points where such equipment or circuits can be energized.

2. Controls that are to be deactivated during the course of work on energized or de-energized equipment or circuits shall be tagged and locked if deemed necessary.

3. Tags shall be placed to identify plainly the equipment or circuits being worked on.

C. Definition

An energized or de-energized piece of equipment or circuit is that which either supplies to or receives energy from the system (equipment and/or circuits) which is being worked on. Energy is to be interpreted as electricity, flue (liquid and gaseous) pressure, mechanical drive, etc.

D. Procedure

1. Before work may be performed on, in or near equipment and/or circuits which cause bodily injury by contract with electrically energized parts by accidental start-up of machinery, by release of fluid pressure

Accomplish the work will place a lockout mechanism in such a way as to prevent the operation or access to energizing switches or valves.

a Check for Safety. The supervisor in charge of the work to be performed will physically inspect the equipment or systems prior to the actual work operation-taking place. The supervisor will also make certain that all switches and/or valves are physically inoperative, that all fluid pressures are bled off, that all stored electrical charges (static, capacitance, etc.) are discharged, and if necessary, all hazardous materials are drained and removed from the immediate work area.

b Removal of Lockout Mechanisms. After each portion of the work is completed, the individual who places the lockout mechanism will be responsible for its immediate removal. If more than one work operation is being performed on a piece of equipment or system, it will be necessary for each individual to remove their lockout mechanism immediately after their work their lockout mechanism must notify the contractor in charge that all work has ended. It will then be the responsibility of that contractor to ensure that all work has indeed ended prior to release of the equipment and/or system for normal operation.

c The individual who places a lockout mechanism on an electrical disconnect or valve is the only one permitted to remove it. However, if an individual forgets to remove the lockout mechanism, all attempts must be made by the appropriate contractor to contact that individual to arrange for the lockout mechanism removal. If the individual is unavailable, only then after physical inspection by the Contractor's Representative and Construction Manager to verify that all work has been completed and the safety of the equipment and/or system is ensured can a lockout mechanism be removed.

d Unauthorized removal of tags and lockout mechanisms is not permitted. Infraction of this rule will result in disciplinary action or removal from the project of that individual.

26. COMPRESSED GAS & GENERAL STORAGE REQUIREMENTS

A. General

1. Serious accidents may result from the misuse, abuse or mishandling of compressed gas cylinders. The two most commonly use compressed gas cylinders found on construction sites are oxygen and acetylene.

2. Employees whose work involves compressed gas cylinders are to be indoctrinated as to the safe method of their handling, storing and using.

B. General Storage Requirements

1. Cylinders shall be kept away from radiators and other sources of heat.

2. Inside of buildings, cylinders shall be stored in a well ventilated, well protected, dry location at least 20 feet from highly combustible materials such as oil or shavings. Cylinders should be stored in definitely assigned places away from elevators, stairs or gangways. Assigned storage spaces shall be located where cylinders will not be knocked over or damaged by passing or falling objects or subject to tampering by unauthorized persons. Cylinders shall not be kept in unventilated enclosures such as lockers or cupboards.

3. Empty cylinders shall have their valves closed.

4. Storage of empty cylinders shall be separate from fully charged cylinders

5. Valve protection caps, where cylinder is designed to accept a cap, a cap shall always be in place, hand tight except when cylinders are in use or connected for use.

6. Protection from solar radiant heat shall be provided where cylinders are directly exposed to sunlight.

7. Compressed gas cylinders shall be secured in an upright position at all times except, if necessary, for short periods of time while cylinders are actually being hoisted or carried.

?7. SPILL RESPONSE PLAN

During working hours, the Franklin Company will have on hand measures to clean up a petroleum spill. Franklin will have absorbants, clay and a 55 gallon drum on site in the event a hydraulic line on a piece of equipment ruptures. Although this occurrence is rare, Franklin will be prepared for this type of scenario.

EXHIBIT 2

FIELD MEDICAL DATA SHEET

*Name:*_____ *Phone:*_____
Address: _____
Date of Birth: _____ *Height:* _____
Weight: _____
Allergies: _____
Particular Sensitivities: _____

Do you wear contacts: Note: Contacts are not permitted on-site

List exposures to hazardous chemicals if any an resultant illness or symptoms

_____
_____
_____

List Medications you presently use: _____
_____
_____

List any other Medical Restrictions: _____
_____
_____

Special Medical or Incident Response Training: _____
_____
_____

EXHIBIT 2 (CONTINUED)

FIELD MEDICAL DATA SHEET

Name, Address and phone number of personal physician:

_____

_____

_____

_____*Nearest Relative:* _____

Phone: _____

_____ _____

Employee Signature *Date*

EXHIBIT 3

CONTRACTOR OCCUPATIONAL HEALTH AND SAFETY CERTIFICATION

Project: _____

Contractor: _____

1. *Contractor certifies that the following personnel to be employed during these tank removal activities have met the following requirement of the OSHA Hazardous Waste Operations Standard (29 CFR 1910.120) and other applicable OSHA standards. (Indicate date below).*

Contractor Medical Personnel			
Examination	*Training*	*Respirator Certification*	
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

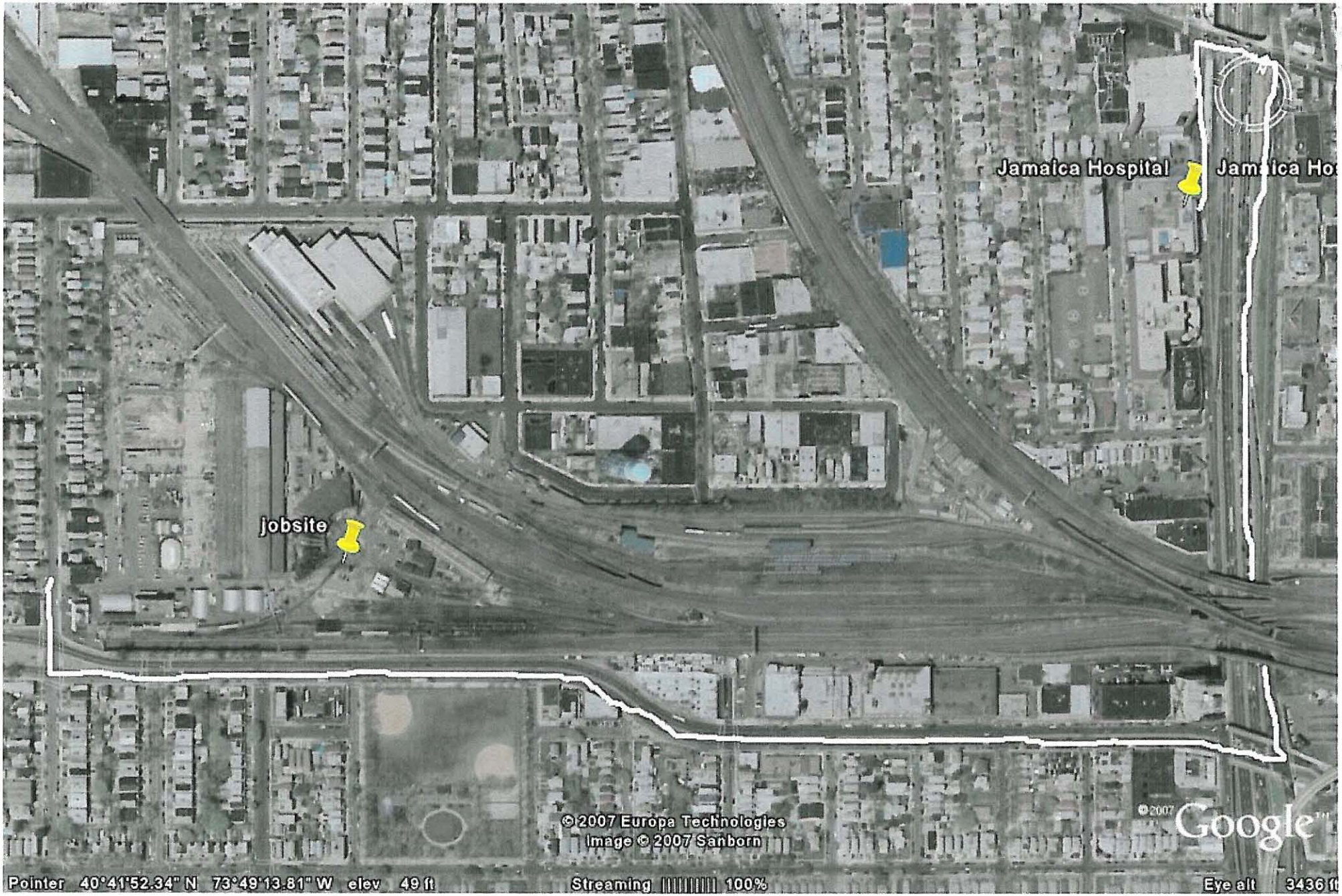
2. *Contractor certifies that it has received a copy of the Site Health and Safety Plan and will ensure that its employees are informed and will comply with its requirements.*
3. *Contractor further certifies that it has read and understands and will comply with all provisions of its contractual agreement with The Franklin Company Contractors, Inc.*

*Signed*_____ *Date*_____

APPENDIX A

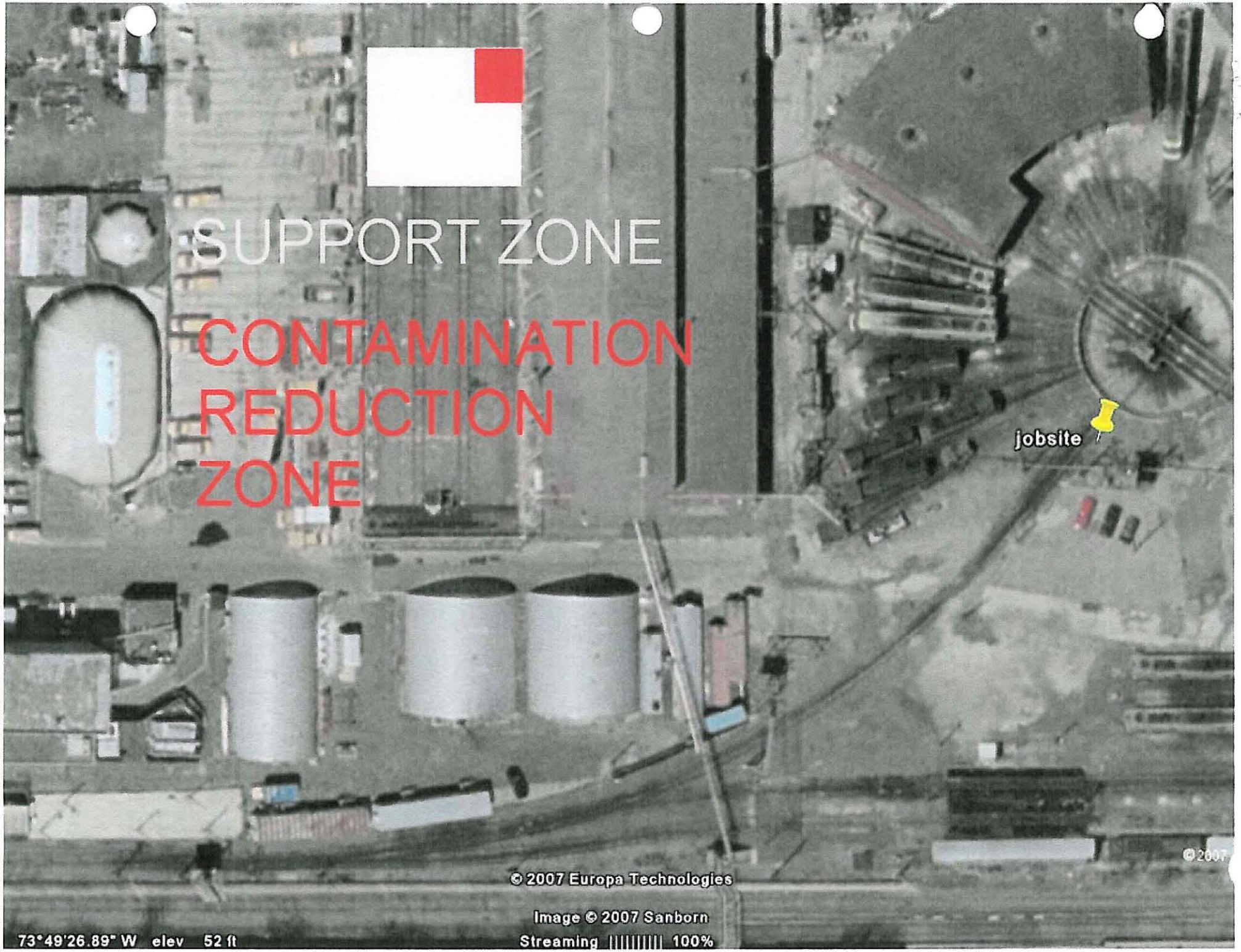
Directions to Jamaica Hospital are as follows; go east on Atlantic Ave. toward 123rd ST., turn left onto Van Wyck Expy. north, turn left onto Jamaica Ave., turn left onto Van Wyck Expy. south, arrive at hospital.

A detailed map of the location is attached.


Jamaica Hospital
jobsite
© 2007 Europa Technologies
Image © 2007 Sanborn
© 2007
Google
Pointer 40°41'52.34" N 73°49'13.81" W elev 49 ft
Streaming 100%
Eye alt 3436 ft

APPENDIX B

Support Zone and Contamination Reduction Zone


SUPPORT ZONE
CONTAMINATION REDUCTION ZONE
jobsite
© 2007 Europa Technologies
Image © 2007 Sanborn
Streaming |||||||||| 100%
73°49'26.89" W elev 52 ft