OFF-SITE INVESTIGATION WORK PLAN

58TH STREET SIDEWALK

MASPETH, QUEENS, NY

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MASPETH, QUEENS, NY

1.0 INTRODUCTION

The former Maspeth Substation, located between Rust Street and 58th Street in Maspeth, Queens, New York, has been the subject of remedial investigations and remediation activities since 1996. Remediation activities on-site were completed in June 2008 and remediation activities off-site in the backyards of three row houses (57-40, 57-42, and 57-48 57th Drive) were completed in July 2008. The location of the Site is shown on Figure 1. Recent remediation activities included on-site excavation and disposal of soils impacted by polychlorinated biphenyls (PCBs) from within the former Consolidated Edison Company of New York, Inc. (Con Edison) property currently owned by M & A Linens. The Final Engineering Report (FER) for on-site remediation activities is currently being prepared for transmittal to the New York State Department of Environmental Conservation (NYSDEC) in March 2009.

During the course of the investigation and remediation of the former Con Edison property, PCB impacts (soil and groundwater) from the Site were observed beneath the 58th Street sidewalk, located immediately adjacent to and east of the Site. Off-site impacts were observed in two sampling locations, MW-301 and MW-302 (Figure 2). Both of these sampling points are located within the western sidewalk of 58th Street, immediately adjacent to the Site. Based on these observations, the NYSDEC has requested that Con Edison prepare a Work Plan to investigate and delineate the extent of these soil and groundwater impacts.

2.0 HISTORICAL OBSERVATIONS

2.1 Off-site Groundwater

Groundwater impacts were initially observed in two monitoring wells installed within the sidewalk between the former Site and 58th Street in 2000 (MW-302) and 2001 (MW-301). The two monitoring wells are shown on Figure 2. The impacts consisted of free-phase product detected on the water table during sampling and/or gauging episodes on November 2, and December 5, 2000 (MW-302) and October 9, 2001 (MW-301). On November 2, 2000, a sample of the free-phase product was collected from MW-302 and analyzed for PCBs and "fingerprinted" to determine the potential source of the material. The analytical results indicated that the product contained PCBs at 214 parts per million (ppm). The type of PCB reported was Arochlor 1260, the same arochlor as detected within the soil and groundwater beneath the former Con Edison property. The fingerprinting results identified the free-phase product as Suntrans transformer oil. On October 11, 2005, a sample of the free-phase product was collected from MW-301 and analyzed for PCBs and fingerprinting. The analytical results indicated that the product contained PCBs at 229 ppm. In addition, the type of PCB reported was Arochlor 1260. The fingerprinting results identified the free-phase product as 10C transformer oil.

On- and off-site monitoring wells were gauged on a regular basis from January 2001 through June 2004. When remedial activities began on-site, monitoring wells were gauged on a sporadic schedule. Following remediation activities, the monitoring wells have been gauged approximately monthly for a total of six events, and currently are on a quarterly gauging schedule. The off-site monitoring wells in the vicinity of the two impacted monitoring wells, MW-303, MW-401, and MW-402 did not contain free-phase product, thus minimizing the apparent extent of the free-phase product off-site. The results of the gauging events on monitoring wells MW-301 and MW-302 are tabulated in Table 1.

The water quality of the groundwater samples collected from monitoring wells located east of the former Con Edison property has been analyzed on four occasions, April 2001, July 2008, November 2008, and January 2009. Table 2 contains the compounds detected in the groundwater collected from MW-301 and MW-302 during the four groundwater sampling events.

Only two compounds have been reported over its NYSDEC Technical and Operational Guidance Series (TOGS) groundwater standard in MW-301 during the four sampling events. PCB Arochlor 1260 was detected above its groundwater standard of 0.09 ug/l at a value of 0.85 ug/l during the April 2001 groundwater sampling event and PCB Arochlor 1254 was detected above its groundwater standard of 0.09 ug/l at a value of 0.128J ug/l during the January 2009 groundwater sampling event.

At MW-302, three compounds have been detected above their respective groundwater standards during the four groundwater sampling episodes. During the July 2008 sampling event, PCB Arochlor 1260 was reported above its groundwater standard of 0.09 ug/l at 1.99 ug/l, bis(2-Ethylhexyl)phthalate was detected above its groundwater standard of 5 ug/l at 53.5

ug/l, and 1,4 dichlorobenzene was detected above its groundwater standard of 3 ug/l at 12.3 ug/l. During the November 2008 groundwater sampling event, 1,4 dichlorobenzene was detected at 9.45 ug/l (above its groundwater standard of 3 ug/l) and bis(2-Ethylhexyl)phthalate was detected at 7.72 ug/l. During the January 2009 groundwater sampling event, 1,4 dichlorobenzene was detected at 10.8 ug/l (above its groundwater standard of 3 ug/l).

Based on the groundwater analytical data presented above, the installation and groundwater sampling of additional monitoring wells beneath the 58th Street sidewalk is recommended. The following text outlined in this Work Plan is intended to address the extent of PCB impacts in the groundwater beneath the 58th Street sidewalk.

2.2 Off-site Soils

Soil samples were collected for chemical analyses during the installation of off-site monitoring wells MW-301 and MW-302 (Figure 2) and MW-303. The analytical results were compared to the NYSDEC Technical and Administrative Guidance Memorandum ("TAGM") #4046 Recommended Soil Cleanup Objectives (RSCO) for PCBs in surface (0 to 2 ft bgs) soils (1 ppm) and subsurface (2 ft bgs) soils (10 ppm). Soil samples collected from MW-301 and MW-302 both indicated the presence of PCBs (see Table 3), however, below the RSCOs. At MW-301, PCBs were observed at 1.35 ppm at 15 to 17 feet below ground surface (ft bgs). At MW-302, PCBs were observed at 0.414 ppm at 13 to 14 ft bgs. No PCBs were detected in any of the soil samples collected from MW-303. The highest concentration of PCBs in each of these soil borings was located in the "smear zone", where the water table (and associated floating product) fluctuates based upon hydrologic conditions.

Post-excavation confirmatory soil samples were collected during the remedial excavation of the former Con Edison property. These soil samples were collected from the eastern wall of the on-site excavation following excavation to depth. As shown in Table 4, ten soil samples were collected as end-point samples along the eastern wall during remedial excavation activities. The locations of these samples are shown on Figure 2. Initial confirmatory soil samples were collected at the boundary of the excavation (at the x-location of zero according to the excavation-specific location ID). However, at locations y equals 24 and y equals 23, the collected soil samples indicated residual soil impacts were present. These soils were located on the former Con Edison property. Figure 2 shows that the limit of excavation (the lagging) was located approximately two feet west of the property boundary. The areas behind the lagging where impacted soils had been identified were hand-excavated to the extent practicable between the lagging and the property boundary.

Additional confirmatory soil samples were collected from beneath the sidewalk. At the four locations, PCBs were detected in soil at concentrations less than ten parts per million (ppm), the off-site RSCO for soils at depth. The locations of these soil samples are shown on Figure 2. At locations (-2, 23) and (-2, 24), soil samples collected from seven feet bgs and 16 feet bgs contained PCB concentrations of 7.14 and 1.43 ppm, respectively. At location (-2, 38), PCBs were detected at 2.1 ppm at 17 feet bgs and at (-2, 40) the PCB concentration was lower than the RSCO (10 ppm) at 0.095 ppb at a depth of five feet.

Based on these analytical soil data, the nature and extent of the off-site soil impacts appear to have been delineated. However, soil samples collected at x, y locations (0, 9) and (0, 15) at depths of 13 and 17 feet document the extent of the PCB concentrations in soil to the south. Soil samples previously collected at four depth intervals at x, y location (0, 57) document the PCB concentrations in soil to the north, but not to adequate depths. Based on the analytical soil data presented above, additional soil sampling at depth beneath the 58th Street sidewalk is recommended. The following text outlined in this Work Plan is intended to address the extent of PCB observations in the soil beneath the 58th Street sidewalk.

2.3 On-site Soils

Prior to the implementation of remediation activities at the Site, the on-site soils contained various concentrations of PCBs that ranged from 1.5 to 10.2 ppm at varying depths. In addition to PCBs, other compounds were also detected in the soils. VOCs (acetone and methylene chloride) were detected at concentrations that exceeded their respective SCGs ranging from 0.297 to 140 ppm and 1.8 ppm, respectively. SVOCs including benzo (a) pyrene (0.0919 to 0.233ppm), benzo (a) anthracene (0.283 ppm), and dibenzo (a,h) anthracene (0.048 ppm) were also detected on-site prior to the implementation of remediation activities at the Site.

2.4 On-site Groundwater

Prior to the implementation of remediation activities at the Site, groundwater collected from the on-site monitoring wells contained various concentrations of PCBs that ranged from 0.38 to 1.5 ppb. A VOC (1,4 - dichlorobenzene) was detected at concentrations that exceeded its TOGS groundwater standard ranging from 12.5 to 12.7 ppb in monitoring well MW-103A. An SVOC (1,4 - dichlorobenzene) was detected at concentrations that exceeded its TOGS groundwater standard ranging from 6.6 to 6.9 ppb in monitoring well MW-103A.

With the exception to PCBs, these compounds are generally not associated with dielectric fluids associated with the Con Edison electrical operations (feeders). In addition, two EPRI Reports: "Insulating Oil Characteristics Volume 1: Characterization Results" December 1996 and "Mineral Insulating Oils Used in the Power Industry, Chemical Composition and Dissolution Characteristics," September 2000 were consulted. Based on the analytical testing performed on Con Edison and non-Con Edison oil samples, 1,4 - dichlorobenzene was not detected in the oil.

3.0 WORK PLAN APPROACH

In order to determine the extent to which these PCB observations in soil and groundwater may exist, a total of three borings will be advanced. Monitoring wells will then be installed and groundwater sampled beneath the 58th Street sidewalk as outlined below. Figure 2 shows a total of three proposed monitoring well locations within the sidewalk area in the vicinity of existing monitoring wells MW-301 and MW-302. One location is to be advanced approximately 10 feet north of monitoring well location MW-301, and one south of monitoring well location MW-302. The final monitoring well is to be located adjacent to the western curb of 58th Street in the parking lane between MW-301 and MW-302.

4.0 WORK PLAN CONTENTS

This section is presented to describe the supporting documents associated with this Work Plan. The existing supporting documents associated with the previous investigative on-site work will be used for the off-site investigation. Only minor adjustments to these documents will be made to address the specific scope of work. The supporting documents include the Environmental, Health and Safety Plan (EHASP), the Community Air Monitoring Plan (CAMP), and the Quality Assurance/Quality Control Plan (QA/QCP). Each of these documents is discussed briefly, below.

4.1 Environmental, Health and Safety Plan (EHASP)

The current EHASP was updated from the May 7, 2007 version and is attached as Appendix A. Edits made to the existing EHASP, including the following:

- The description was expanded to include the impacts detected beneath the sidewalk;
- The task list was limited to soil boring advancement activities and monitoring well installation; and
- Waste Management was revised to conform to the daily collections described in the Scope of Work, below.

4.2 Community Air Monitoring Plan (CAMP)

The CAMP, attached as Appendix B, has been updated for the monitoring of the monitoring well installation. Additional modifications included:

- The title, referencing the sidewalk and parking lane setting;
- The limited tasks;
- An update of anticipated PCB and VOC concentrations in soils; and
- Referral to the hollow stem auger drilling method.

4.3 Quality Assurance/Quality Control Plan (QA/QCP)

The current QA/QCP was updated from the October 2004 version and is attached as Appendix C. Modifications to the QA/QCP were made and including the following:

- The title, referencing the sidewalk and parking lane setting;
- A description of soil sampling within the proposed hand cleared locations;
- A description of soil sampling within the proposed monitoring well locations;
- The use of an alternative DUSR subcontractor;
- The tabulation of the limited analytical requirements; and

- Removal of description of Field Screening of Soil with Immunoassay Test Kit.

5.0 SCOPE OF WORK

5.1 Coordination with Local Utilities and Permitting

Prior to the initiation of any subsurface work, the selected subcontractor will initiate a New York State Industrial Code Rule 753 to alert their utility companies to the upcoming work at minimum 72 hours before the start of work. These utilities will markout their respective utilities in the vicinity of the proposed sampling locations. Con Edison's Utility Clearance Protocol will be followed, which includes obtaining plates, drawings, and utility maps and reviewing them against the markouts. Previous utility clearance notifications have identified water and sewer mains along the 58th Street sidewalk and roadway. These drawings, plates and maps will be evaluated against the utility markouts to safely locate the proposed sampling locations in the field.

A request for a sidewalk and parking lane opening permit will be made by the subcontractor to the NYCDOT. This permit will allow the subcontractor to advance the monitoring well locations within the sidewalk and in the parking lane and to install monitoring wells. Upon receipt of the permit, the stipulations noted on the permit will be reviewed and any adjustment to work hours, sidewalk and/or parking lane closure, etc. will be implemented. Con Edison and NYSDEC will be notified of any special conditions relative to the work. The Federal Manual of Uniform Traffic Control Devices will be implemented during this scope of work.

5.2 Hand Clearing Monitoring Well Locations

A total of three proposed sampling locations have been selected for advancement of soil borings via hollow stem auger (H.S.A.) method in order to characterize the subsurface soils beneath the sidewalk. The proposed locations of these soil borings are shown on Figure 2. Prior to the commencement of H.S.A. advancement, the soil boring locations will be hand-cleared to five feet below grade utilizing a Vactron. The surficial concrete will be saw-cut in a 2 foot by 2 foot square and the concrete containerized in a 55-gallon drum as C&D. Following removal of the concrete, soils will be loosened with various hand tools and then vacuumed out using the Vactron. If the excavated soils are visibly impacted, give off an odor, and/or have elevated PID readings, then a soil sample will be collected for PCB analyses and the soil will be containerized in a 55-gallon steel drum for off-site transportation and disposal. The excavation would be backfilled with clean sand and either plated or covered temporarily with asphalt patch. If the soils are not impacted, the soils will be returned to the excavation and plated or covered temporarily with asphalt patch. The following day a drill rig will set up and drill right through the pre-cleared excavations. See Section 5.3 for further details on borehole advancement.

5.3 Borehole Advancement

Once the soil boring locations have been cleared to 5 ft bgs, the borehole will be advanced with a truck mounted H.S.A. drilling rig or track mounted drilling rig based on potential height clearance issues. Samples will be collected continuously from 8 feet bgs in two foot intervals using split-spoon samplers. A total of five samples will be collected per boring and composited

into the following depth intervals (8-12 ft, 12-16 ft, 16-20 ft, 20-24 ft and 24-28 ft). The soil samples will be field-classified for soil type using the Unified Soil Classification System. All five soil samples from each boring will be collected for laboratory analysis. Samples will be kept in a cooler with ice maintained at 4°C and will be shipped via courier at the end of each day to the laboratory for chemical analyses. Samples will be analyzed for PCBs via Method 8082 and TPH via Method 8100.

If free-phase product is detected at the water table at these proposed sampling locations during soil sampling activities, the observation will be documented in the field logbook.

5.4 Monitoring Well Installation/Development/Sampling

Following advancement of the soil borings to depth, three monitoring wells will be installed within the 58th Street sidewalk/parking lane area.

Monitoring Well Installation

Each monitoring well will consist of 2-inch diameter PVC riser and approximately 15 feet screen (0.020 slot) (straddling the water table) and installed to a depth of approximately 25 feet bgs. A 1 foot sump will be installed below the screened interval to collect fines that may enter the monitoring well. The annulus around the screen will be filled with Morie No. 1 sand approximately 2 feet above the screened interval. A 2 foot bentonite pellet seal will be installed above the sand pack and hydrated with water for 30 minutes. The remainder of the borehole will be filled with a cement-bentonite grout to within 1 foot of the ground surface. A flushmount box will be cemented into place over the well fitted with a locking J-plug. The cement at the surface will be sloped for water to drain away from the cover.

Well Development

Following installation, the three monitoring wells will be developed in accordance with the following procedure. The workers will wear the appropriate personal protective clothing and perform ambient air monitoring of the work areas, as dictated by the EHASP and the CAMP. The driller will prepare the area around the monitoring well by laying out clean plastic sheeting on the ground surface near the monitoring well and place equipment and materials to be used on the plastic. Depth to water and depth to the bottom of the well will be measured using an electronic oil/water interface probe prior to developing. Dedicated polyethylene tubing with a Waterra™ check valve and surge-block will be installed in each monitoring well. The bottom of the tubing will be positioned so that it is at the approximate center of the water column or screened interval. A sufficient length of tubing will remain above ground to allow connection to a peristaltic or bladder pump.

The Waterra oscillating pump will be used to remove water and sediments from the monitoring well as well as the surrounding formation directly outside the screened interval. Periodically, a peristaltic pump or bladder pump will be attached to the dedicated polyethylene tubing to pump the monitoring well at periodic rates of one to two liters per minute to clear the well. All discharge water will be placed in fifty-five-gallon bung-topped NYSDOT-approved steel drums

for appropriate off-site disposal by Con Edison. This process will be repeated several times to maximize sediment removal from each monitoring well.

After several surge and pump sequences, the monitoring well will then be purged using low-flow development/sampling techniques, such as via a bladder pump or a peristaltic pump through a closed flow-through cell (for field parameter monitoring). During this stage of development, a low-flow pumping rate of 200 to 500 ml/minute will be utilized initially to further develop the monitoring well and to determine the appropriate flow rate that will result in a stabilized water level (i.e. at rate which creates a drawdown of 0.3 feet or less).

Throughout the low-flow development process, pH, Eh (redox potential), specific conductivity, temperature, dissolved oxygen, and turbidity parameters will be recorded every five minutes. Well development will continue until the aforementioned field parameters have stabilized for three consecutive readings or a maximum of four (4) hours for each monitoring well. The stabilization criteria are as follows:

+/- 0.1 for pH

+/- 3% for specific conductivity

+/- 10% for Eh (redox potential)

+/- 10% for dissolved oxygen and turbidity

The NYSDOT drums will not be filled more than 50% and, upon completion of development, will be labeled as "solid waste and purge water pending analysis" and temporarily stored off-site prior to disposal.

Groundwater Gauging

The three new monitoring wells will be gauged on a quarterly basis. The first gauging event for the new monitoring wells will begin in approximately May 2009 pending NYSDEC approval of this Work Plan. Prior to each event, oil absorbent pads will be placed around the monitoring wells to soak up any potential product spills during gauging. For the initial event, the depth to product and to the water table will be measured with an electronic oil/water interface probe. The oil/water interface probe shall be decontaminated using Simple Green® or equivalent between each monitoring well. If a measurable thickness of product is observed in a monitoring well, the product in the well will be removed via bailing with a polyethylene disposable bailer. Bailing will be performed at a relatively slow rate to facilitate additional product to enter the monitoring well. Product removed from each monitoring well will be collected in 5-gallon buckets and subsequently transferred to a NYSDOT-approved 55-gallon bung-topped drum for appropriate disposal by Con Edison. Oil absorbent wicks (such as Soakease® wicks) will then be placed into the well(s) that have shown measurable product and/or sheen.

At the start of subsequent gauging events, the absorbent wicks if present will be removed, placed directly into a 5-gallon bucket, and then transferred into a NYSDOT-approved 55-gallon open-topped drum. Each monitoring well will be allowed to stabilize for approximately 30

minutes. The monitoring wells will be gauged for depth to product and depth to water with the oil/water interface probe. New oil absorbent wicks will then be placed in the monitoring well and the well cap secured until the next quarterly gauging event.

All waste will be placed into drums and properly labeled. All solid waste (absorbent wicks, gloves, pads, etc.) will be contained in DOT-approved 55-gallon open-topped drum. All fluids will be contained in a DOT-approved 55-gallon bung-topped drum. The drums will be labeled as "solid waste and purge water pending analysis" and temporarily stored off-site in an area designated by Con Edison.

Groundwater Sampling

Following water level measurements, each of the three new monitoring wells will be purged and sampled using the low-flow method as described below. Initial samples will be collected approximately two weeks after completion of well development on the three new monitoring wells and then on a quarterly basis.

Appropriate personal protective clothing will be worn by Field Technician and ambient air monitoring will be performed in the work areas with a PID, as dictated by the EHASP. The Technician will prepare each sampling location by laying out clean plastic sheeting on the ground surface near the monitoring well and place equipment and materials to be used on the plastic. Prior to groundwater sampling, a decontaminated electronic oil/water interface probe will be used to gauge depth to product (if any) and depth to groundwater in each monitoring well. The measurements and observations will be recorded in the field logbook.

To purge and sample the monitoring wells, the Technician will position the bottom of dedicated polyethylene tubing, so that the bottom of the tubing is at the approximate center of the water column or screened interval. Sufficient length of tubing should remain above ground to allow connection to a positive displacement pump (i.e. bladder pump) and a closed flow-through cell for field parameter monitoring. The Technician will then purge groundwater at a rate of 200 to 500 ml/minute from the monitoring well. If the well is pumped dry, then time will be allowed for the monitoring well to recover to collect a groundwater sample.

During well purging, pH, Eh conductivity, temperature, dissolved oxygen, and turbidity will be measured every five minutes and recorded. These stabilization parameters will be measured every five minutes until these parameters have stabilized as described below. Every effort will be made to lower the turbidity to < 50 NTU before sampling. If the turbidity cannot be reduced below 50 NTU's, samples may be collected if other parameters are stable. Measurements will be recorded in the field logbook.

Parameter stabilization is considered to be achieved when three consecutive readings collected at each well volume, are within the following limits:

+/- 0.1 for pH

+/- 3% for specific conductivity

+/- 10% for Eh (redox potential)

+/- 10% for dissolved oxygen and turbidity

During well purging, the Technician will record pump tubing intake depth, water level, water level drawdown, and flow rate in the field logbook. The key field parameter for samples to be analyzed for VOCs is dissolved oxygen. The key field parameter for all other analytes is turbidity.

Well purging will continue in this manner until the aforementioned field parameters have stabilized for three consecutive readings or a maximum of four (4) hours for each well. If one or more of the key field parameters fails to stabilize after four hours, the monitoring well will be secured and purging (as described above) and sampling will be conducted the next day, as described in the USEPA's Groundwater Sampling Procedure for Low Stress (Low Flow) Purging and Sampling, and as preferred by NYSDEC.

After purging has been completed, and/or stabilization has been achieved, and/or the monitoring well has been allowed to recover, a groundwater sample will be collected through the dedicated tubing at a flow rate of approximately 100-250 ml/minute. Groundwater quality samples will be collected and submitted to an independent, certified, and approved laboratory for analysis of PCBs, and VOCs.

After completion of the sampling process at each monitoring well, the bladder pump will be disconnected from the polyethylene sampling tubing. The purge water collected in 5-gallon buckets during the purging process will be transferred to a NYSDOT-approved bung-topped 55-gallon drum. Drums will not be filled more than half way and properly labeled. The drums will be labeled as "purge water - pending analysis" and temporarily stored off-site in an area designated by Con Edison. The probe shall be decontaminated using Simple Green® or equivalent.

6.0 SUMMARY REPORT

Upon completion of analyses of the soil and/or groundwater, the data will be tabulated and evaluated against the TAGM 4046 RSCO and the TOGS groundwater standards. A Summary Report will be prepared detailing the results of the soil and groundwater sampling program. The areal and vertical extent of impacted soils will be delineated on a figure. The groundwater PCB concentrations in the monitoring wells will be shown on a figure and recommendations will be made regarding any further investigation activities.

6.1 Remedial Action Work Plan (RAWP)

If the proposed sampling program outlined herein delineates the soil and groundwater impacts at the off-site location, then a Remedial Action Work Plan will be prepared following evaluation of several remedial alternatives.

The goal of the remedy selection process is to remediate the Site to a level that is protective of public health and the environment under the conditions of the Site's Contemplated Use. Remediation activities must be protective of public health and the environment under the conditions of the Contemplated Use of the Site. Options include:

- **Unrestricted** - To qualify for the unrestricted use category, Site conditions after remediation must be such that no engineering controls, use restrictions, or any other institutional controls are needed to make the Site protective of public health and the environment under any use. This also applies to sites where a no further action decision has been made after the Site investigation.

- **Restricted Residential** - Residential uses such as homes, apartments, mobile home parks, dormitories, schools, and day-care facilities are allowed but require engineering and/or institutional controls for the use to be protective.

- **Restricted Commercial** - Residential uses are not allowed in this category. Commercial uses are allowed but require engineering controls and/or institutional controls. Some types of "commercial" uses that could create "residential" types of exposures are excluded such as day-care and health care facilities.

- **Restricted Industrial** - Residential and commercial uses are not allowed. Industrial uses are allowed but they require the use of engineering controls and/or institutional controls.

7.0 SCHEDULE

The following schedule is based upon approval of this Work Plan by the NYSDEC and receipt of authorization to proceed from Con Edison.

Milestone	Initiation Date
Receipt of Authorization to Proceed (A.T.P)	Based on A.T.P
Hand Clearing of Monitoring Well Locations	Week 2
Monitoring Well Drilling/Installation/Development	Week 2
Groundwater Sampling and Analyses	Week 5
Preparation of Summary Report	Week 8

TABLES

TABLE 1
MW-301 and MW-302 Historic Product/Water Levels

Well	Date	Measuring Point Elevation (ft AD [2])	Measured Depth To Product (ft TOPVC) [1]	Measured Depth To Water (ft TOPVC) [1]	Measured Product Thickness (feet)	Corrected Product Thickness (feet)	Corrected Depth to Water (ft TOPVC)	Corrected Groundwater Elevation (feet AD [2])	Volume Water/Product Removed (gal)	NOTES
MW-301	8-Jan-01	99.50	NM	NM	NA	NA	NA	NA	NA	Well Constructed
	15-Jan-01	99.50	None Detected	15.07	NA	NA	15.07	84.43	NA	
	1-Feb-01	99.50	None Detected	13.02	NA	NA	13.02	86.48	NA	
	3-Apr-01	99.50	None Detected	12.08	NA	NA	12.08	87.42	NA	
	27-Sep-01	99.50	None Detected	13.19	NA	NA	13.19	86.31	NA	
	9-Oct-01	99.50	14.90	15.02	0.12	0.07	14.91	84.59	NPR	Presence of oil called in to Mark Warrell
	26-Oct-01	99.50	15.30	15.63	0.33	0.19	15.33	84.17	NPR	Placed Soakease in well
	8-Nov-01	99.50	15.75	15.77	0.02	0.01	15.75	83.75	trace	Replaced Soakease in well
	20-Nov-01	99.50	None Detected	15.86	NA	NA	15.86	83.64	NA	Soakease removed from MW-301
	7-Dec-01	99.50	15.79	16.11	0.32	0.19	15.82	83.68	NPR	
	21-Dec-01	99.50	None Detected	14.87	NA	NA	14.87	84.63	NA	
	4-Jan-02	99.50	15.50	15.68	0.18	0.11	15.52	83.98	trace	Soakease placed in MW-301
	16-Jan-02	99.50	15.15	15.26	0.11	0.06	15.16	84.34	NPR	Re-placed Soakease in well with skimmer
	30-Jan-02	99.50	14.88	15.00	0.12	0.07	14.89	84.61	trace	Hand bailed
	14-Feb-02	99.50	15.27	15.42	0.15	0.09	15.29	84.21	trace	Hand bailed
	1-Mar-02	99.50	16.60	16.86	0.26	0.15	16.63	82.87	NPR	
	15-Mar-02	99.50	14.76	14.88	0.12	0.07	14.77	84.73	NPR	
	27-Mar-02	99.50	12.67	12.78	0.11	0.06	12.68	86.82	trace	Hand bailed
	12-Apr-02	99.50	14.84	15.03	0.19	0.11	14.86	84.64	trace	Hand bailed
	26-Apr-02	99.50	13.71	13.98	0.27	0.16	13.74	85.76	trace	Hand bailed
	10-May-02	99.50	14.24	14.60	0.36	0.21	14.28	85.22	trace	Hand bailed
	24-May-02	99.50	13.47	13.71	0.24	0.14	13.50	86.00	NPR	
	7-Jun-02	99.50	12.41	12.59	0.18	0.11	12.43	87.07	trace	Hand bailed
	21-Jun-02	99.50	14.56	14.91	0.35	0.21	14.60	84.90	trace	Hand bailed
	3-Jul-02	99.50	14.86	15.13	0.27	0.16	14.89	84.61	trace	Hand bailed
	18-Jul-02	99.50	15.64	15.99	0.35	0.21	15.68	83.82	trace	Hand bailed
	31-Jul-02	99.50	15.72	16.14	0.42	0.25	15.76	83.74	0.15	Hand bailed
	14-Aug-02	99.50	15.14	15.25	0.11	0.06	15.15	84.35	0.15	Hand bailed
	28-Aug-02	99.50	15.04	15.24	0.20	0.12	15.06	84.44	0.15	Hand bailed
	11-Sep-02	99.50	12.87	13.26	0.39	0.23	12.91	86.59	NPR	
	9/12/2002	99.50	12.87	13.26	0.39	0.23	12.91	86.59	0.25	Hand bailed
	3-Oct-02	99.50	13.26	13.61	0.35	0.21	13.30	86.20	0.25	Hand bailed
	18-Oct-02	99.50	11.74	12.55	0.81	0.48	11.83	87.67	0.12	Hand bailed
	31-Oct-02	99.50	12.97	13.42	0.45	0.27	13.02	86.48	0.12	Hand bailed
	14-Nov-02	99.50	12.45	12.85	0.40	0.24	12.49	87.01	0.13	Hand bailed
	27-Nov-02	99.50	Oil on Probe	13.13	NA	NA	13.13	86.37	0.13	Hand bailed
	11-Dec-02	99.50	13.95	14.10	0.15	0.09	13.97	85.53	0.13	Hand bailed
	24-Dec-02	99.50	13.20	13.42	0.22	0.13	13.22	86.28	NPR	
	30-Dec-02	99.50	12.79	13.02	0.23	0.14	12.81	86.69	trace	Hand bailed
	13-Jan-03	99.50	13.22	13.40	0.18	0.11	13.24	86.26	trace	Hand bailed
	27-Jan-03	99.50	13.41	13.60	0.19	0.11	13.43	86.07	trace	Hand bailed
	18-Apr-03	99.50	None Detected	14.41	NA	NA	14.41	85.09	trace	Bailed trace amount
	19-May-03	99.50	13.90	13.96	0.06	0.04	13.91	85.59	trace	Bailed 8 ounces +/-
	13-Jun-03	99.50	16.43	16.70	0.27	0.16	16.46	83.04	trace	Bailed 8 ounces +/-

TABLE 1
MW-301 and MW-302 Historic Product/Water Levels

Well	Date	Measuring Point Elevation (ft AD [2])	Measured Depth To Product (ft TOPVC) [1]	Measured Depth To Water (ft TOPVC) [1]	Measured Product Thickness (feet)	Corrected Product Thickness (feet)	Corrected Depth to Water (ft TOPVC)	Corrected Groundwater Elevation (feet AD [2])	Volume Water/Product Removed (gal)	NOTES
MW-301	20-Jun-03	99.50	14.41	14.50	0.09	0.05	14.42	85.08	trace	Bailed 8 ounces +/-
(cont)	18-Jul-03	99.50	14.86	15.15	0.29	0.17	14.89	84.61	0.25	Bailed 0.25 gallons
	22-Aug-03	99.50	14.17	14.53	0.36	0.21	14.21	85.29	trace	Bailed trace amount
	19-Sep-03	99.50	15.35	15.61	0.26	0.15	15.38	84.12	0.5	Bailed 0.5 gallon
	22-Sep-03	99.50	15.61	15.61	sheen	NA	15.61	83.89	NPR	
	21-Oct-03	99.50	16.00	16.19	0.19	0.11	16.02	83.48	trace	Bailed trace amount.
	21-Nov-03	99.50	None Detected	13.03	NA	NA	13.03	86.47	0.25	Replaced spent Soakease (TM) with new one.
	19-Dec-03	99.50	13.00	13.00	sheen	NA	13.00	86.50	0.25	Replaced spent Soakease (TM) with new one.
	9-Jan-04	99.50	14.15	14.15	sheen	NA	14.15	85.35	0.25	Replaced Soakease
	14-Jan-04	99.50	None Detected	14.25	NA	NA	14.25	85.25	NA	
	20-Feb-04	99.50	14.56	14.57	0.01	0.01	14.56	84.94	NA	Inspected/returned soakease
	19-Mar-04	99.50	None Detected	12.76	NA	NA	12.76	86.74	NA	Inspected/returned soakease
	23-Apr-04	99.50	13.75	13.75	sheen	NA	13.75	85.75	trace	bailed trace amount
	25-May-04	99.50	None Detected	14.16	NA	NA	14.16	85.34	NA	
	18-Jun-04	99.50	14.75	14.76	0.01	0.01	14.75	84.75	trace	bailed trace amount
	11-Oct-05									Collected oil sample for PCB and fingerprint analysis
	1-Mar-06	99.50	16.08	16.11	0.03	0.02	16.08	83.42	NA	
	3-Aug-06	99.50	16.42	16.78	0.36	0.21	16.46	83.04	NA	
	5-Dec-07		NM	NM						Pulled socks from MW-301 and 302
	6-Dec-07	99.50	15.85	15.95	0.10	0.06	15.86	83.64	NA	
	21-Jul-08	99.50	15.66	15.81	0.15	0.09	15.68	83.82	NA	WLs measured during development of 501 & 502
	28-Jul-08	99.50	None Detected	16.12	0.00	0.00	16.12	83.38	NA	
	29-Sep-08	99.50	None Detected	16.58	0.00	0.00	16.58	82.92	NA	
	5-Nov-08	99.50	None Detected	16.63	0.00	0.00	16.63	82.87	NA	
	2-Dec-08	99.50	None Detected	15.79	0.00	0.00	15.79	83.71	NA	
	8-Jan-09	99.50	None Detected	15.05	0.00	0.00	15.05	84.45	NA	
	28-Jan-09	99.50	None Detected	15.28	0.00	0.00	15.28	84.22	NA	
MW-302	14-Sep-00	99.22	NM	NM	NA	NA	NA	NA	NA	Well Constructed
	5-Dec-00	99.22	13.56	13.70	0.14	0.08	13.57	85.65	NPR	
	3-Apr-01	99.15	None Detected	8.82	NA	NA	8.82	90.33	NA	
	20-Jun-01	99.15	None Detected	9.62	NA	NA	9.62	89.53	NA	
	22-Aug-01	99.15	13.09	13.12	0.03	0.02	13.09	86.06	NPR	
	4-Sep-01	99.15	13.41	13.44	0.03	0.02	13.41	85.74	NPR	
	27-Sep-01	99.15	10.1	10.11	0.01	0.01	10.10	89.05	NPR	
	9-Oct-01	99.15	None Detected	12.71	NA	NA	12.71	86.44	NA	
	26-Oct-01	99.15	None Detected	13.46	NA	NA	13.46	85.69	NA	
	8-Nov-01	99.15	14.28	14.30	0.02	0.01	14.28	84.87	NPR	
	20-Nov-01	99.15	14.03	14.04	0.01	0.01	14.03	85.12	NPR	
	7-Dec-01	99.15	14.16	14.21	0.05	0.03	14.17	84.98	NPR	
	21-Dec-01	99.15	None Detected	12.75	NA	NA	12.75	86.40	NA	

TABLE 1
MW-301 and MW-302 Historic Product/Water Levels

Well	Date	Measuring Point Elevation (ft AD [2])	Measured Depth To Product (ft TOPVC) [1]	Measured Depth To Water (ft TOPVC) [1]	Measured Product Thickness (feet)	Corrected Product Thickness (feet)	Corrected Depth to Water (ft TOPVC)	Corrected Groundwater Elevation (feet AD[2])	Volume Water/Product Removed (gal)	NOTES
MW-302 (cont)	4-Jan-02	99.15	13.64	13.66	0.02	0.01	13.64	85.51	NPR	
	16-Jan-02	99.15	13.29	13.30	0.01	0.01	13.29	85.86	trace	0.01 ft of product in skimmer
	30-Jan-02	99.15	13.03	13.04	0.01	0.01	13.03	86.12	trace	0.01 ft of product in skimmer
	14-Feb-02	99.15	None Detected	13.54	NA	NA	13.54	85.61	NA	0.01 ft of product in skimmer
	1-Mar-02	99.15	14.20	14.25	0.05	0.03	14.21	84.94	NPR	
	15-Mar-02	99.15	12.89	12.91	0.02	0.01	12.89	86.26	trace	0.2 ft product in skimmer
	27-Mar-02	99.15	7.06	7.07	0.01	0.01	7.06	92.09	trace	0.01 ft product in skimmer
	12-Apr-02	99.15	None Detected	13.04	NA	NA	13.04	86.11	NA	
	26-Apr-02	99.15	None Detected	9.20	NA	NA	9.20	89.95	NA	
	10-May-02	99.15	12.44	12.44	0.00	0.00	12.44	86.71	trace	0.01 ft product in skimmer
	24-May-02	99.15	None Detected	11.25	NA	NA	11.25	87.90	NA	
	7-Jun-02	99.15	5.97	5.97	0.00	0.00	5.97	93.18	NPR	Well seal damaged/replaced
	21-Jun-02	99.15	None Detected	12.41	NA	NA	12.41	86.74	NA	
	3-Jul-02	99.15	None Detected	12.93	NA	NA	12.93	86.22	NA	
	18-Jul-02	99.15	None Detected	13.93	NA	NA	13.93	85.22	NA	
	31-Jul-02	99.15	None Detected	13.82	NA	NA	13.82	85.33	NA	
	14-Aug-02	99.15	None Detected	13.58	NA	NA	13.58	85.57	NA	
	28-Aug-02	99.15	None Detected	13.32	NA	NA	13.32	85.83	NA	
	11-Sep-02	99.15	None Detected	11.26	NA	NA	11.26	87.89	NA	
	3-Oct-02	99.15	None Detected	11.31	NA	NA	11.31	87.84	NA	
	18-Oct-02	99.15	None Detected	7.84	NA	NA	7.84	91.31	NA	
	31-Oct-02	99.15	None Detected	10.73	NA	NA	10.73	88.42	NA	
	14-Nov-02	99.15	None Detected	8.12	NA	NA	8.12	91.03	NA	
	27-Nov-02	99.15	None Detected	10.04	NA	NA	10.04	89.11	NA	
	11-Dec-02	99.15	None Detected	12.00	NA	NA	12.00	87.15	NA	
	24-Dec-02	99.15	None Detected	10.39	NA	NA	10.39	88.76	NA	
	30-Dec-02	99.15	None Detected	9.51	NA	NA	9.51	89.64	NA	
	13-Jan-03	99.15	None Detected	11.14	NA	NA	11.14	88.01	NA	
	27-Jan-03	99.15	None Detected	12.92	NA	NA	12.92	86.23	NA	
	18-Apr-03	99.15	None Detected	10.43	NA	NA	10.43	88.72	NA	
	19-May-03	99.15	None Detected	13.41	NA	NA	13.41	85.74	NA	
	13-Jun-03	99.15	None Detected	6.20	NA	NA	6.20	92.95	NA	
	20-Jun-03	99.15	None Detected	8.15	NA	NA	8.15	91.00	NA	
	18-Jul-03	99.15	13.28	13.29	0.01	0.01	13.28	85.87	trace	Bailed trace amount
	22-Aug-03	99.15	None Detected	12.61	NA	NA	12.61	86.54	NA	
	19-Sep-03	99.15	14.44	14.47	0.03	0.02	14.44	84.71	trace	Bailed trace amount
	22-Sep-03	99.15	13.54	13.54	sheen	NA	13.54	85.61	NPR	
	21-Oct-03	99.15	None Detected	12.41	NA	NA	12.41	86.74	NA	
	21-Nov-03	99.15	None Detected	6.96	NA	NA	6.96	92.19	NA	
	19-Dec-03	99.15	None Detected	8.31	NA	NA	8.31	90.84	NA	
	9-Jan-04	99.15	None Detected	11.46	NA	NA	11.46	87.69	NA	
	14-Jan-04	99.15	None Detected	12.45	NA	NA	12.45	86.70	NA	
	20-Feb-04	99.15	None Detected	12.91	NA	NA	12.91	86.24	NA	

TABLE 1
MW-301 and MW-302 Historic Product/Water Levels

Well	Date	Measuring Point Elevation (ft AD [2])	Measured Depth To Product (ft TOPVC) [1]	Measured Depth To Water (ft TOPVC) [1]	Measured Product Thickness (feet)	Corrected Product Thickness (feet)	Corrected Depth to Water (ft TOPVC)	Corrected Groundwater Elevation (feet AD [2])	Volume Water/Product Removed (gal)	NOTES
MW-302	19-Mar-04	99.15	None Detected	9.24	NA	NA	9.24	89.91	NA	
(cont)	23-Apr-04	99.15	None Detected	11.54	NA	NA	11.54	87.61	NA	
	25-May-04	99.15	None Detected	12.02	NA	NA	12.02	87.13	NA	
	18-Jun-04	99.15	None Detected	11.30	NA	NA	11.30	87.85	NA	
	1-Mar-06	99.15	None Detected	15.46	NA	NA	15.46	83.69	NA	
	3-Aug-06	99.15	None Detected	15.88	NA	NA	15.88	83.27	NA	
	5-Dec-07		NM	NM						Pulled socks from MW-301 and 302
	6-Dec-07	99.15	None Detected	15.27	NA	NA	15.27	83.88	NA	
	28-Jul-08	99.15	None Detected	14.91	NA	NA	14.91	84.24	NA	
	29-Sep-08	99.15	None Detected	14.85	NA	NA	14.85	84.30	NA	
	5-Nov-08	99.15	None Detected	15.95	NA	NA	15.95	83.20	NA	
	2-Dec-08	99.15	None Detected	15.17	NA	NA	15.17	83.98	NA	
	8-Jan-09	99.15	None Detected	14.52	NA	NA	14.52	84.63	NA	
	28-Jan-09	99.15	None Detected	14.49	NA	NA	14.49	84.66	NA	

NA = Not Applicable
NM = Product detected but not measured, no interface probe
NPR = No Product Recovered
* = Indicates a sheen but no measurable product

[1] Top of PVC riser pipe

[2] Assumed Datum: Paint spot on facilty assumed to be 100.00 feet

Corrected Product Thickness = (Measured Product Thickness) x (Actual/measured thickness)
Actual/measured thickness = 0.59

Corrected Depth to Water = Measured Depth to Product + [(Product Thickness) * (1 - Specific Gravity)]

Specific Gravity:

Gasoline	0.72 to 0.76 60° F
Diesel	0.80
No. 2 diesel	0.78 to 0.82 60° F
Motor oil	0.84

Field Tests Indicated Specific Gravity of Product = 0.89 to 0.90

TABLE 2
MW-301 and MW-302 Reported Compounds in Groundwater

Sample Location Sample Date		MW-301 4/4/2001	MW-301 7/28/2008	MW-301 11/7/2008	MW-301 1/30/2009	MW-302 4/4/2001	MW-302 7/28/2008	MW-302 11/6/2008	MW-302 1/30/2009
Analyte	GW Quality Stnd (ppb)								
PCBs - Arochlor 1254	0.09				**0.128 J**				
PCBs - Arochlor 1260	0.09	**0.85**					**1.99**		
Acenaphthylene	NS						0.189		
bis(2-Ethylhexyl)phthalate	5	1.90 B		2.66 J		1.60 JB	**53.5**	**7.72**	3.43 J
chlorobenzene	5						2.1		1.2
1,3 dichlorobenzene	3						1.2	1.41 J	1.2
1,4 dichlorobenzene	3	0.96 J		0.894 J	1.7	0.77 J	**12.3**	**9.45**	**10.8**
Di-n-butylphthalate	50	0.76 J				0.82 J			
Flourene	NS or 50*						0.256		
Naphthalene	10*	1.20				1.50			
1,2,4 Trimethylbenzene	5				0.8 J				

Notes:
All results reported in parts per billion (ppb)
Groundwater Quality Standard from: NYSDEC Technical and Operational Giidance Series (TOGS) groundwater standards.
* Regulated Compounds Specifically Listed in STARS Memo # 1, Appendix B - Table 2.
NS = No Standard
Blank Space: Indicates not present at its respective MDL.
Bold: Indicates compound reported above Regulatory Standards
B: Detected in method blank
J: Estimated value below calibrated Method Detection Limit

Table 3
MW-301, MW-302, and MW-303 PCB in Soil Results

Sample Location		MW-301	MW-301	MW-302	MW-302	MW-303	MW-303
Sample Depth (ft below ground)		9 - 11	15 - 17	13 - 14	17 - 19	13 - 15	23 - 25
Sample Date		9/13/2000	9/13/2000	9/14/2000	9/14/2000	9/15/2000	9/15/2000
PCBs (Method 8082)	NYSDEC RSCO (ppm)						
	10 (Residential)	0.653	1.35	0.414	0.087	ND	ND

Notes:
PCBs = Polychlorinated bibhenyls
ppm = parts per million
ND = Not Dectected

All results reported in ppm; all samples analyzed for PCBs according to Method 8081 or 8082.
Values in **Bold** denote exceedence of NYSDEC TAGM RSCO Recommended Cleanup Objective of 10 ppm for soils

Table 4
East Wall Post Excavation Confirmatory Samples

Former Maspeth Substation

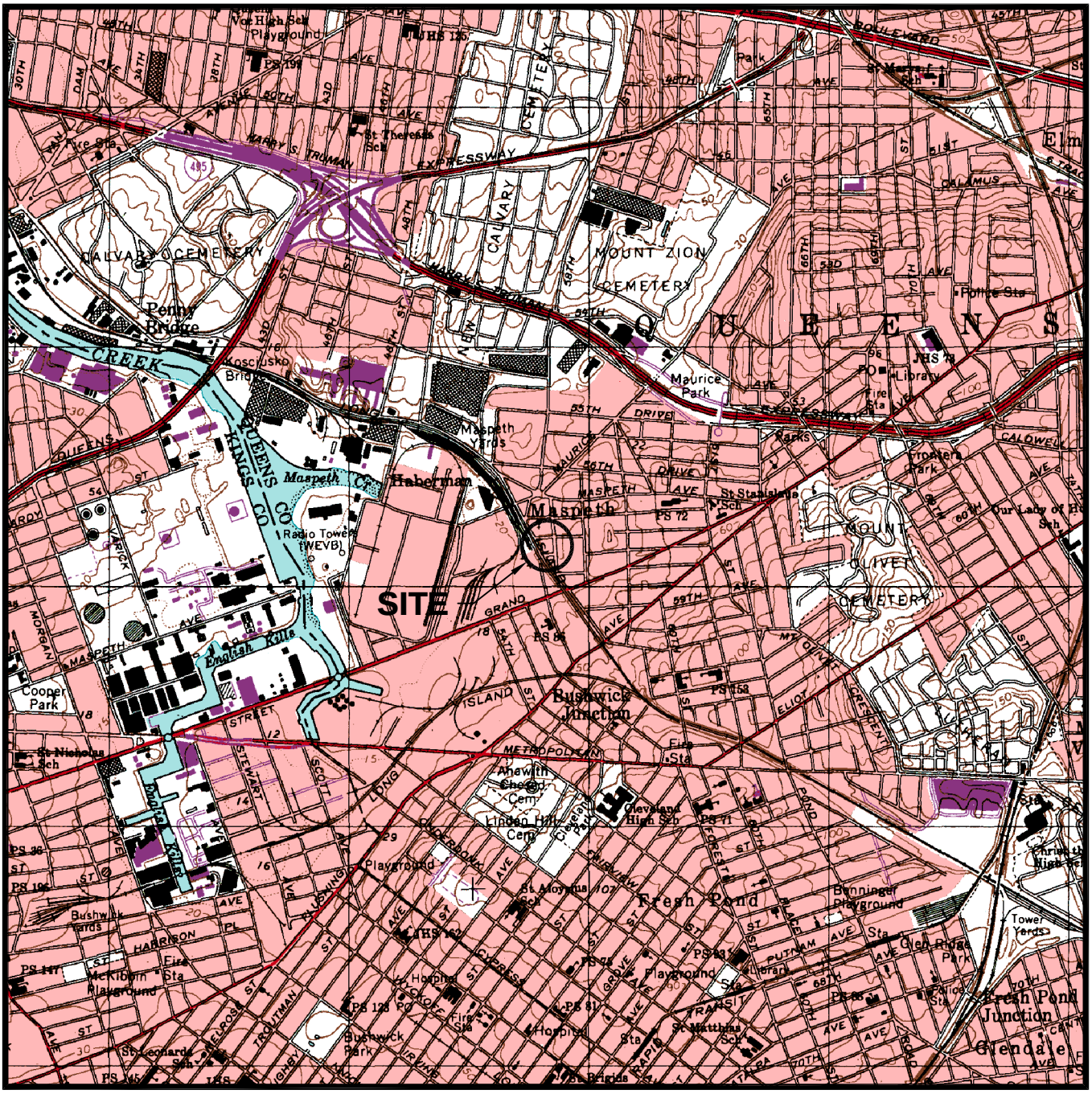
Sample Location	Sample Date	Depth (feet bls)	Head Space (ppm)	Analytes	Lab COC	TOTAL PCBs (ppm)	TOTAL TPH (ppm)	Comments
EAST WALL								
MA-SW-0,9(13)	11/3/2005	13	na	PCBs, TPH	0511140	0.33	3140	PCB 1260. 10C Transformer
MA-SW-0,15(17)	11/3/2005	17	na	PCBs, TPH	0511140	0.2	1350	PCB 1260. 10C Transformer
MA-SW-2,24 (7)	1/12/2006	7	na	PCBs, TPH, VOCs, SVOCs	0601223	**7.14**	4600	PCB 1260. 10C Transformer
MA-SW-2,23 (16)	1/27/2006	16	na	PCBS	0601505	**1.43**	NA	PCB 1260
MA-SW-2,40 (5)	1/24/2006	5	na	PCBs	0601479	0.095	NA	PCB 1260
MA-SW-2,38 (17)	1/26/2006	17	na	PCBs, TPH	0601479	**2.10**	10800	PCB 1260. 10C Transformer
MA-SW-0,57 (0-2)	8/18/2005	1.5	2.1	PCBs, TPH	0508465	0.82	710	PCB 1260. 10C Transformer
MA-SW-0,57 (2-6)	8/17/2005	4	0.0	PCBs, TPH	0508465	< 0.0067	< 40.3	-
MA-SW-0,57 (6-10)	8/17/2005	9	1.3	PCBs, TPH	0508465	< 0.0069	< 42.1	-
MA-SW-0,57 (12)	11/1/2005	12	na	PCBs, TPH, VOCs, SVOCs	0511021	0.015	< 44.6	PCB 1260. 10C Transformer

Notes:
Grab Samples collected at 25-foot intervals at the following vertical depths : 0-2 ft, 2-6 ft, 6-10 ft, 10-14 ft, 14-18 ft.

bls = below land surface
COC = Chain Of Custody
PCBs = Polychlorinated bibhenyls
TPH = Total Petroleum Hydrocarbons
ppm = parts per million
NA = Not Analyzed
< = Less than laboratoy method detection limits

Bold: Indicates compound reported above Recommended Soil Cleanup Objective (1.0 ppm for PCBs)

FIGURES



MAP SOURCE:

TOPOZONE.COM

USGS BROOKLYN [NY] QUAD
1995

NORTH

2000 0 2000

Scale in feet

Jacques Whitford Company, Inc.

JACQUES WHITFORD LOCATION: PORTSMOUTH, NEW HAMPSHIRE				
DATE PREPARED: 7-16-04	DESIGNED BY: DFM	DRAWN BY: TS	CHECKED BY: BSB	REVIEWED BY: DFM
REVISION DATE: 4-17-07	REVISION NO:	DRAWN BY: ADK	CHECKED BY: DFM	REVIEWED BY: DBH
PROJECT NAME/FILE NAME: CON EDISON MASPETH/SITE		PROJECT NUMBER/PHASE: 1012163.	SCALE: 1:24000	

DRAWING TITLE:

SITE LOCATION PLAN

FORMER MASPETH SUBSTATION
57-77 RUST STREET
MASPETH, QUEENS, NEW YORK

PREPARED FOR: CON EDISON

FIGURE NO. 1

ROWHOUSES

FORMER MASPETH SUBSTATION

MW-301	
SAMPLE DEPTH (ft bgs)	CONCENTRATION (ppm)
(9–11)	0.653
(15–17)	1.35

MW-302	
SAMPLE DEPTH (ft bgs)	CONCENTRATION (ppm)
(13–14)	0.414
(17–19)	0.087

MA-SW-0,57
(0–2) 0.82
(2–6) <0.0067
(6–10) <0.0069
(12) 0.015

MW-301

MA-SW-(-2,40)
(5) 0.095

MA-SW-(-2,38)
(17) 2.1

MA-SW-(-2,24)
(7) 7.14

MA-SW-(-2,23)
(16) 1.43

MW-302

MA-SW-0,15
(17) 0.2

MA-SW-0,9
(13) 0.33

58th STREET
ONE-WAY

Legend

- EXISTING MONITORING WELL
- SOIL TESTING LOCATION WITH NO PCB EXCEEDANCES
- SOIL TESTING LOCATION WITH PCB EXCEEDANCES
- PROPOSED MONITORING WELL

NOTES:

1. ALL CONCENTRATIONS IN PARTS PER MILLION (ppm)
2. LOCATIONS OF PROPOSED EXPLORATIONS ARE APPROXIMATE AND MAY CHANGE BASED ON SUBSURFACE CONDITIONS.

NORTH

SCALE IN FEET
5 0 5

Jacques Whitford Engineering Group, Inc., P.C.

JACQUES WHITFORD LOCATION: PORTSMOUTH, NEW HAMPSHIRE				DRAWING TITLE: SIDEWALK SAMPLE LOCATIONS
DATE PREPARED: 12-30-08	DESIGNED BY: GD	DRAWN BY: ADK	CHECKED BY: GD	REVIEWED BY: GD
REVISION DATE:	REVISION NO:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
PROJECT NAME/FILE NAME: MASPETH/SITE		PROJECT NUMBER/PHASE: 1012163.	SCALE: AS SHOWN	PREPARED FOR: CON EDISON

FORMER CON EDISON MASPETH SUBSTATION
57-77 RUST STREET
MASPETH, NEW YORK

FIGURE NO. 2

APPENDIX A

Environmental Health and Safety Plan (EHASP)

ENVIRONMENTAL, HEALTH AND SAFETY PLAN

JACQUES WHITFORD COMPANY, INC.

PROJECT IDENTIFICATION

Project Name:	CON ED- MASPETH
Jobsite Address:	58th Street Sidewalk, Queens, New York
Jacques Whitford Project Number:	1012163.
Con Edison Order No.	615464-017
Client:	Consolidated Edison Company of New York, Inc.
Date Prepared:	May 29, 1998 Revised: March 18, 1999; November 1, 1999; July 31, 2000; September 16, 200; October 1, 2003; October 14, 2004; May 2, 2007; December 7, 2008, March 31, 2009
Anticipated Date of Work Start-Up:	Fall 2004, May 7, 2007; May 2009

TABLE OF CONTENTS

INTRODUCTION

This Environmental, Health and Safety Plan (EHASP) establishes guidelines and requirements for safety of on- and off-site personnel as well as visitors to the site during the conduct of field activities associated with the referenced project. All employees of JACQUES WHITFORD COMPANY, INC. (Jacques Whitford) involved in field activities of this project are required to abide by the provisions of this EHASP. They are required to read the EHASP and sign the attached Compliance Agreement. Subcontractors involved in field activities of this project will be advised of all risks that may be present while working on the 58th Street Sidewalk ("the Site"). Subcontractors are strongly encouraged to adopt this or a similar plan for the protection of their employees. The subcontractor has the responsibility of implementing environmental, health and safety precautions for their employees based on health hazard information provided by Jacques Whitford.

The environmental, health and safety guidelines and requirements presented herein are based on a review of available information and an evaluation of potential hazards. This EHASP outlines the environmental, health and safety procedures and equipment required for activities at this Site to minimize the potential for exposure to hazardous situations by field investigative personnel.

PERSONNEL TRAINING AND CERTIFICATIONS

All personnel (Jacques Whitford and subcontractors) involved in field activities must have taken the 40-hour hazardous waste training program and respirator fit testing as specified by the Occupational Safety and Health Administration (OSHA) regulations codified at 29 CFR 1920.120. Additionally, all yearly 8-hour updates must be completed and documented. Those personnel acting as Site supervisors shall have also completed the one-time 8-hour supervisor training program. Certifications will be provided to Con Edison if requested.

All Jacques Whitford Site workers shall be regularly monitored as part of corporate medical surveillance program. Subcontractors must show their compliance with an equivalent program. All on-site personnel must read the plan, understand it, agree to comply with all of its provisions, and acknowledge by signing the Environmental, Health and Safety Compliance Agreement attached herein.

ABBREVIATIONS

The following abbreviations will be used throughout the remainder of this EHASP:

PPL -	Personal Protection Level
SCBA -	Self-contained Breathing Apparatus
APR -	Air Purifying Respirator
PEL -	Permissible Exposure Limit
TLV -	Threshold Limit Value
LEL -	Lower Explosive Limit
SHSO -	Site Health and Safety Officer
REZ -	Radiation Exclusion Zone
MSDS -	Material Safety Data Sheet
STEL -	Short Term Exposure Limit
PPM -	Parts Per Million

SITE DESCRIPTION

The former Maspeth Substation is located in the Borough of Queens at 57-77 Rust Street and contains one building and a fenced and gated outdoor parking lot area. The total area is approximately 0.5 acres. The parking lot area encompasses approximately 0.2 acres. The location of the former Maspeth Substation is shown on Figure 1

The former Maspeth Substation, located between Rust Street and 58th Street in Maspeth, Queens, New York, has been the subject of remedial investigations and remediation activities since 1996. Recent remediation activities included on-site excavation and disposal of soils impacted by polychlorinated biphenyls (PCBs) from within the former Consolidated Edison Company of New York, Inc. (Con Edison) property currently owned by M & A Linens. Remediation activities on-site were completed in June 2008. During the course of the investigation and remediation of the former Con Edison property, PCB impacts (soil and groundwater) from the former Maspeth Substation were observed beneath the 58th Street sidewalk, located immediately adjacent to and east of the former Maspeth Substation. Off-site impacts were observed in two sampling locations, MW-301 and MW-302 (Figure 2). Both of these sampling points are located within the western sidewalk of 58th Street, immediately adjacent to the former Maspeth Substation.

SITE HISTORY

The former Maspeth Substation was an active electrical substation from 1925 to 1985. In 1996, Site remediation activities were conducted by Con Edison during which PCB-contaminated soils, that contained >10 parts per million (ppm) PCBs, were excavated and disposed of accordingly. In December 1996, three monitoring wells were drilled and installed in order to obtain confirmatory groundwater samples. In the course of that investigation, PCB containing oil was found in one of the monitoring wells. In March 1999 Jacques Whitford completed subsurface investigations to assess the extent of PCB-contaminated oils at the site. Results are presented in the report Interim Report for the former Consolidated Edison of NY, Inc. Maspeth Substation, Queens, NY (Jacques Whitford, June 1999). In 2000 and 2001 Jacques Whitford completed additional subsurface investigations to evaluate the horizontal and vertical extent of PCB-contaminated oils at the site. Results are presented in the report Supplemental Remedial Investigation Report For The Former Consolidated Edison Company of NY, Inc. Maspeth Substation, Queens, NY (Jacques Whitford, May 2002). Surface and subsurface soil samples collected during these investigations were laboratory analyzed for PCBs, VOCs, SVOCs, and metals. The data indicate the soils do not contain levels of these parameters above regulatory standards. The data further suggested that a source of the free product was not evident. Additional work has been conducted by Jacques Whitford since the RIR, including a pumping test evaluation and a Qualitative Human Health Exposure Assessment, that were designed to evaluate remedial options. Finally, in February 2004, a pilot test was conducted to determine the applicability of using Pressure Pulse Technology as a cleanup option. Results of the pilot test indicated that the Site was unsuitable for this type of remediation. Based upon the analytical data and discussion with the NYSDEC, Con Edison selected an excavation/disposal approach to the on-site remediation. As part of the confirmation sampling conducted as part of that project, PCB- impacted soils were detected beneath the sidewalk east of the facility. The scope of work proposed herein is to delineate these soil impacts beneath the adjacent sidewalk.

PROJECT OVERVIEW

Task 1: Monitoring Well Installation

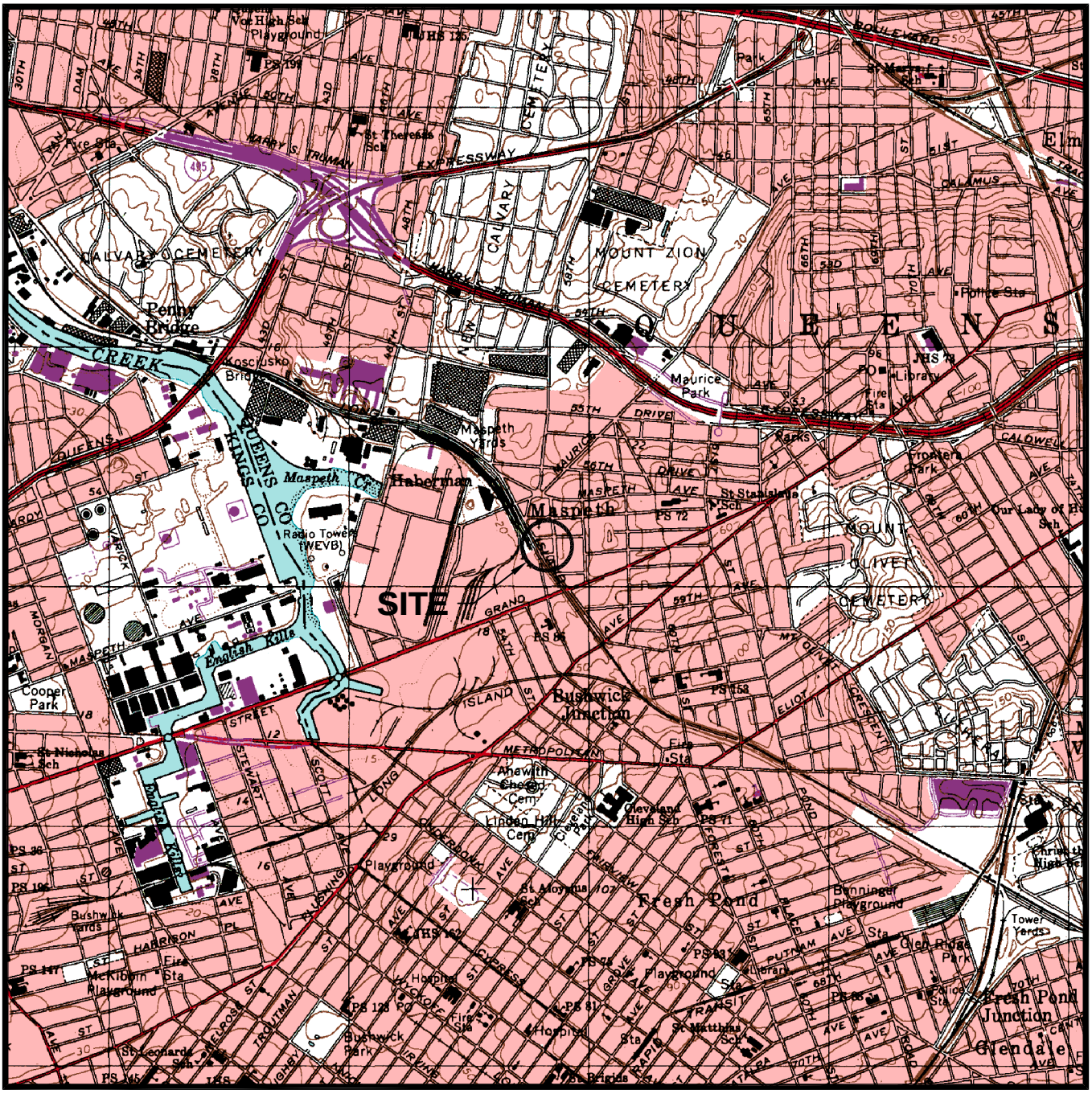
Up to 3 2-inch diameter PVC monitoring wells may be advanced within the 58th Street sidewalk following the evaluation of the soil analytical data and observations made in the field. The wells will be used for the collection of groundwater samples to determine groundwater quality and to document the presence/absence of free-phase product. Each well will be approximately 25 feet deep and the screened interval will be set such that it straddles the water table. All drilling spoils will be placed in DOT approved 55-gallon open topped drums.

Task 2: Monitoring Well Development, and Sampling

After completion of monitoring well installation, the wells will be properly developed using either positive displacement submersible or peristaltic pumps. Once developed, they will be sampled using USEPA developed low-flow sampling techniques. All sampling equipment will be decontaminated appropriately. All decontamination, development, and purging fluids will be placed in DOT approved 55-gallon bung topped drums.

WASTE MANAGEMENT, CHARACTERIZATION, AND DISPOSAL

All concrete, soils, product, and water generated from the scope of work during the remedial activities will be transported under appropriate manifest to an approved licensed disposal facility on a daily basis. At the present time the disposal facility(s) has not been identified. It will be selected by Con Edison.



MAP SOURCE:

TOPOZONE.COM

USGS BROOKLYN [NY] QUAD
1995

NORTH

2000 0 2000

Scale in feet

Jacques Whitford Company, Inc.

JACQUES WHITFORD LOCATION: PORTSMOUTH, NEW HAMPSHIRE				
DATE PREPARED: 7-16-04	DESIGNED BY: DFM	DRAWN BY: TS	CHECKED BY: BSB	REVIEWED BY: DFM
REVISION DATE: 4-17-07	REVISION NO:	DRAWN BY: ADK	CHECKED BY: DFM	REVIEWED BY: DBH
PROJECT NAME/FILE NAME: CON EDISON MASPETH/SITE		PROJECT NUMBER/PHASE: 1012163.	SCALE: 1:24000	

DRAWING TITLE:

SITE LOCATION PLAN

FORMER MASPETH SUBSTATION
57-77 RUST STREET
MASPETH, QUEENS, NEW YORK

PREPARED FOR: CON EDISON

FIGURE NO. 1

ROWHOUSES

FORMER MASPETH SUBSTATION

MW-301	
SAMPLE DEPTH (ft bgs)	CONCENTRATION (ppm)
(9–11)	0.653
(15–17)	1.35

MW-302	
SAMPLE DEPTH (ft bgs)	CONCENTRATION (ppm)
(13–14)	0.414
(17–19)	0.087

MA-SW-0,57
(0–2) 0.82
(2–6) <0.0067
(6–10) <0.0069
(12) 0.015

MW-301

MA-SW-(-2,40)
(5) 0.095

MA-SW-(-2,38)
(17) 2.1

MA-SW-(-2,24)
(7) 7.14

MA-SW-(-2,23)
(16) 1.43

MW-302

MA-SW-0,15
(17) 0.2

MA-SW-0,9
(13) 0.33

58th STREET
ONE-WAY

Legend

- EXISTING MONITORING WELL
- SOIL TESTING LOCATION WITH NO PCB EXCEEDANCES
- SOIL TESTING LOCATION WITH PCB EXCEEDANCES
- PROPOSED MONITORING WELL

NOTES:

1. ALL CONCENTRATIONS IN PARTS PER MILLION (ppm)
2. LOCATIONS OF PROPOSED EXPLORATIONS ARE APPROXIMATE AND MAY CHANGE BASED ON SUBSURFACE CONDITIONS.

NORTH

SCALE IN FEET
5 0 5

Jacques Whitford Engineering Group, Inc., P.C.

JACQUES WHITFORD LOCATION: PORTSMOUTH, NEW HAMPSHIRE				DRAWING TITLE: SIDEWALK SAMPLE LOCATIONS
DATE PREPARED: 12-30-08	DESIGNED BY: GD	DRAWN BY: ADK	CHECKED BY: GD	REVIEWED BY: GD
REVISION DATE:	REVISION NO:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
PROJECT NAME/FILE NAME: MASPETH/SITE		PROJECT NUMBER/PHASE: 1012163.	SCALE: AS SHOWN	PREPARED FOR: CON EDISON

FORMER CON EDISON MASPETH SUBSTATION
57-77 RUST STREET
MASPETH, NEW YORK

FIGURE NO. 2

WORK PLAN		Primary Level	For Invasive Tasks, Has Code 53 Been Called In
1) Monitoring Well Installation, ,	(x) Invasive ( ) Non-Invasive	( ) A ( ) B ( ) C (x) D (x) Modified	( ) Yes (x) No By Whom: Date: TBD If No, is property private? ( ) Yes (x) No
2) Monitoring Well Development and Sampling	(x) Invasive ( ) Non-Invasive	( ) A ( ) B ( ) C (x) D (x) Modified	( ) Yes (x) No By Whom: Date: TBD If No, is property private? ( ) Yes (x) No

PERSONNEL AND RESPONSIBILITIES (Include Subcontractors)

NAME	FIRM	RESPONSIBILITIES	ON-SITE?
Craig Gendron	Jacques Whitford	Senior Engineer	Task - ( )1 ( )2 ( )3
Gregory DelMastro	Jacques Whitford	Program Manager	Task- ( )1 ( )2 ( )3
David B. Hill	Jacques Whitford	Admin. Project Manager	Task - ( )1 ( )2 ( )3
Donald Moore	Jacques Whitford	Project Hydrogeologist	Task - (x)1 (x)2 ( )3
Bruce P. Bline	Jacques Whitford	Construction Inspector	Task - (x)1 (x)2 ( )3
David Chapman	Jacques Whitford	Staff Hydrogeologist	Task - (x)1 (x)2 ( )3

Jacques Whitford field personnel listed on this page have completed the training, medical, and respiratory program of the Jacques Whitford Health and Safety Program and OSHA Standard 29 CFR 1910.120.

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC. PERSONNEL

Jeff Rutowski	Construction Management Supervisor
Edward Wiederkehr	Project Manager

HAZARDOUS MATERIAL SUMMARY

Waste Type (check as many as applicable)

(x) Liquid (x) Solid ( ) Sludge ( ) Gas ( ) Unknown
( ) Other (specify)

Waste Characteristics (check as many as applicable)

( ) Corrosive (x) Toxic ( ) Inert ( ) Flammable (x) Volatile
( ) Reactive ( ) Radioactive ( ) Unknown ( ) Other (specify)

Chemicals	Solids	Sludges	Solvents	Oils
( ) Acids	( ) Flyash/Bottom Ash	( ) Paint Pigments	( ) Halogenated Solvents	( ) Oily Wastes
( ) Pickling Liquors	( ) Asbestos	( ) Metals Sludges	( ) Non-Halogenated Solvents	(x)Other (specify) Oil from transformers
( ) Caustics	( ) Milling/Mine Tailings	( ) POTW Sludge	( ) Other (specify)	
( ) Pesticides	( ) Ferrous Smelter	( ) Aluminum		
( ) Dyes/Inks	( ) Non-Ferrous Smelter	( ) Other (specify)		
( ) Cyanides	(x) Other (specify)			
( ) Phenols	Soils containing petroleum			
( ) Halogens				
(x) PCBs				
(x) Metals				
( ) Other (specify)				

Other

( ) Laboratory
( ) Pharmaceutical
( ) Hospital
( ) Radiological
( ) Municipal
( ) Other (specify)

HAZARDS OF CONCERN

(x) Heat Stress (see attached guidelines)

(x) Cold Stress (see attached guidelines)

( ) Explosive/Flammable Substances

( ) Oxygen Deficient Atmosphere

( ) Radiological

( ) Biological

(x) Noise

( ) Inorganic Chemicals

(x) Organic Chemicals

(x) Other (specify)

Electrical hazards associated with power distribution. All vehicles/equipment will follow Con Edison grounding procedures.

Chemical	PEL/REL./TLV	HEALTH HAZARDS
Petroleum hydrocarbons as gasoline	TLV = 300 ppm, 500 ppm STEL PEL = none	Irritate eyes and mucous membrane, dermatitis, headache, blurred vision, dizziness, slurred speech, liver and kidney damage, carcinogen
PCB-1242	REL = 0.001 mg/m^3 PEL = 1 mg/m^3 TLV = 1 mg/m^3	Irritate eyes, chloracne, liver damage, reproductive effects, carcinogen
PCB-1254	REL = 0.001 mg/m^3 PEL = 0.5 mg/m^3 TLV = 0.5 mg/m^3	Irritate eyes, chloracne, liver damage, reproductive effects, carcinogen
Arsenic	REL = 0.002 mg/m^3 PEL = 0.01 mg/m^3 TLV = 0.01 mg/m^3	Ulceration of nasal septum, dermitits, GI disturbances, respiratory irritation, hyperpigmentation of skin, carcinogen
Cadmium	REL = Not promulgated PEL = 0.005 mg/m^3 TLV = 0.002 mg/m^3	Pulmonary edema, chest tightening, headache, chills, nausea, vomiting, diarrhea, mild anemia, carcinogen
Chromium	REL = 0.05 mg/m^3 PEL = 1.0 mg/m^3 TLV = 0.15 mg/m^3	Irritates eyes, skin and lungs
Lead	REL = 0.10 mg/m^3 PEL = 0.05 mg/m^3 TLV = 0.15 mg/m^3	Weakness, insomnia, pallor, constipation, tremors kidney disease, hypotension, irritated eyes
Mercury	REL = 0.1 mg/m^3 PEL = 0.1 mg/m^3 TLV = 0.025 mg/m^3	Irritate eyes and skin, cough, chest pain, tremors, insomnia, irritability, indecision, headache, fatigue, stomatitis
Selenium	REL = 0.2 mg/m^3 PEL = 0.2 mg/m^3 TLV = 0.2 mg/m^3	Irritate eyes, nose and throat, headache, chills, fever, metallic taste, garlic breath, GI disturbances, anemia, spleen damage
Silver	REL = 0.01 mg/m^3 PEL = 0.01 mg/m^3 TLV = 0.1 mg/m^3	Blue-gray eyes, nasal irritation, throat and skin irritation, skin ulceration, GI disturbances
Benzene	REL = 0.10 ppm PEL = 1.0 ppm TLV = 10.0 ppm	Irritates eyes, skin and nose; reepiratory effects, giddiness, headache, nausea, staggered gait, fatigue, carcinogen
Ethylbenzene	REL = 100 ppm PEL = 100 ppm TLV = 100 ppm	Irritate eyes, skin, mucous membranes, headache, dermatitis, narcolepsy, coma

Toluene	REL = 100 ppm PEL = 200 ppm TLV = 50 ppm	Irritate eyes, nose, fatigue, weakness, confusion euphoria, dizziness, headache, dilated pupils, liver and kidney damage
Xylenes	REL = 100 ppm PEL = 100 ppm TLV = 100 ppm	Irritate eyes, skin, nose, throat, dizziness, excitement, drowsiness, staggering gait, nausea, vomiting, dermatitis
Base Neutrals	No exposure data for these compounds	N/A
PEL = OSHA Permissible Exposure Limit REL = NIOSH Recommended Exposure Limit TLV = ACGIH Threshold Limit Value		

OVERALL HAZARD EVALUATION

.

Task 1: Monitoring Well Installation

( ) High ( ) Medium (x) Low ( ) Unknown

Justification:

High - Exposure hazard justifies level A or B PPL.
Medium - Exposure hazard justifies Level C PPL.
Low - Exposure hazard justifies Level D PPL.
Unknown - Knowledge of existing hazards insufficient to determine proper level of protection. Use most conservative PPL (A or B) until site reconnaissance completed

Task 2: Monitoring Well Development, and Sampling

( ) High ( ) Medium (x) Low ( ) Unknown

Justification:

High - Exposure hazard justifies level A or B PPL.
Medium - Exposure hazard justifies Level C PPL.
Low - Exposure hazard justifies Level D PPL.
Unknown - Knowledge of existing hazards insufficient to determine proper level of protection. Use most conservative PPL (A or B) until site reconnaissance completed

PROTECTIVE CLOTHING

Task 1: Monitoring Well Installation

Protection Level: ( ) A ( ) B ( ) C (x) D (x) Modified

Respiratory: (x) Not needed

( ) SCBA, Airline: _____
( ) APR: _____
( ) Cartridge: _____
( ) Escape Mask: _____
( ) Other: _____

Protect. Clothing: (x) Not needed

( ) Encapsulated Suit: _____
( ) Splash Suit: _____
( ) Apron:
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Coverall: _____
( ) Other:

Boots: ( ) Not needed

(x) Boots: steel toe required
( ) Overboots:

( ) Other (specify below)

Head, Eye, and Ear: ( ) Not needed

(x) Safety Glasses _____
( ) Face Shield: _____
( ) Goggles: _____
(x) Ear Plugs: _____
(x) Hard Hat: color cannot be blue or white
( ) Other:

Gloves: ( ) Not needed

( ) Undergloves:
(x) Gloves: latex surgical
( ) Overgloves: PVC preferred
( ) Other:

Comments:
Work anticipated in Modified Level D (no respiratory protection but dermal and hearing protection required during Task).

Task 2: Monitoring Well Development, and Sampling

Protection Level: ( ) A ( ) B ( ) C (x) D (x) Modified

Respiratory: (x) Not needed

( ) SCBA, Airline: _____
( ) APR: _____
( ) Cartridge: _____
( ) Escape Mask: _____
( ) Other: _____

Protect. Clothing: (x) Not needed

( ) Encapsulated Suit: _____
( ) Splash Suit: _____
( ) Apron:
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Coverall: _____
( ) Other:

Boots: ( ) Not needed

(x) Boots: steel toe required
( ) Overboots:

( ) Other (specify below)

Head, Eye, and Ear: ( ) Not needed

(x) Safety Glasses _____
( ) Face Shield: _____
( ) Goggles: _____
(x) Ear Plugs: _____
(x) Hard Hat: color cannot be blue or white
( ) Other:

Gloves: ( ) Not needed

( ) Undergloves:
(x) Gloves: latex surgical
( ) Overgloves: PVC preferred
( ) Other:

Comments:
Work anticipated in Modified Level D (no respiratory protection but dermal protection required during Task).

MONITORING EQUIPMENT: Specify by task, indicate type as necessary. Attach additional sheets as necessary.

INSTRUMENT	TASK	ACTION LEVELS
Photoionization Detector	(x) 1 ( ) 2 ( )3	Parameter: Total Volatile Organics

Type: HNu/Microtip/Mini Rae

PPL Level	At Concentration
C	5.0 ppm to 50 ppm above background
B	50 - 500 ppm above background

( ) Not needed

COMMENTS:
Action levels must be sustained for 15 minutes at the breathing zone to justify implementing specific PPL. The above action levels only apply if types of contaminants are unknown. If contaminants are known, contaminant-specific exposure data will be used to determine action levels. Background to TLV for specific compound will justify use of Level D PPL. TLV to compound-specific STEL or 3 x TLV will justify use of Level D PPL for 15 minutes only. If concentrations between TLV and STEL/3 x TLV are maintained for greater than 15 minutes, Level C will be implemented Project manager will be notified of any upgrade of PPL.

	TASK	ACTION LEVELS
Dust Particle Monitor	(x) 1 ( ) 2 ( )3	Parameter: Particulates

Type: MIE pDR-1000AN

PPL Level	At Concentration
D	Background to 150 $\mu g/m^3$ (micrograms per cubic meter) above background (see CAMP)
C	> 150 $\mu g/m^3$ above background (see CAMP)

( ) Not needed

COMMENTS:
Action levels must be sustained for 15 minutes at the breathing zone to justify implementing specific PPL. The above action levels only apply if types of contaminants are unknown. If contaminants are known, contaminant-specific exposure data will be used to determine action levels. Background to TLV for specific compound will justify use of Level D PPL. TLV to compound-specific STEL or 3 x TLV will justify use of Level D PPL for 15 minutes only. If concentrations between TLV and STEL or 3 x TLV are maintained for greater than 15 minutes, Level C will be implemented. Level B action levels will be determined on a project-specific basis. Project manager will be notified of any upgrade of PPL.

	TASK				
Detector Tubes	( ) 1 ( ) 2 ( )3	Contaminant	TLV	STEL	Tube Type

Type: Draeger

(x) Not needed

COMMENTS:

PERSONNEL DECONTAMINATION PROCEDURES

ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, AND SUPPORT ZONES (x) Not needed

Level C

* Wash overboots and overgloves with detergent (i.e., Alconox) solution.
* Rinse with potable water.
* Remove tape from overboots and wrists.
* Remove overboots, overgloves, and coverall.
* Discard all into plastic bag.
* Remove respirator.
* Remove undergloves and discard into plastic bag.
* Wash face and hands with soap and water.

Modified Level D

* Remove work gloves and disposable coveralls and place into secure drum; label and place drum in designated storage area.
* Remove undergloves and discard into secure drum; label and place drum in designated storage area.
* Wash face and hands with soap and water.

Respirators will be dissembled and rinsed with potable water in the field and allowed to drip dry, then inserted into a plastic bag after each use. They will be cleaned at the end of each day using alcohol wipes. Non-expendable reusable equipment (i.e., outer gloves, boots, hard-hats) will be thoroughly washed at the decontamination location. Decontamination will consist of scrubbing contaminated gloves and boots with an alconox (or equal) detergent followed by a water rinse. Equipment will either be allowed to drip dry or be wiped off with paper towels which will be collected in secure drums. The drums will be labeled and disposed of off-site on a daily basis.

( ) Not needed

Containment and Disposal Method (Personnel Protective Equipment)

Disposable protective clothing and non-reusable equipment will be collected in secure drums. The drums will be labeled and then placed in a designated storage area pending final disposal. Reusable protective equipment will be thoroughly washed at the decontamination location. Decontamination will consist of scrubbing contaminated gloves and boots with an alconox (or equal) detergent followed by a water rinse. Equipment will either be allowed to drip dry or be wiped off with paper towels which will be collected in secure drums. The drums will be labeled and disposed off-site on a daily basis.

EQUIPMENT DECONTAMINATION

Sampling Equipment

All sampling equipment will be decontaminated between each sampling station using the following procedures:

* Wear clean surgical gloves (and outer gloves if task-required).
* Dissemble equipment and place component parts on polyethylene sheeting.
* Clean all component parts with warm detergent solution (i.e., alconox) using a brush to clean inside and outside surfaces.
* Triple rinse surfaces with potable water or deionized water.
* Allow all components to air dry.
* Reassemble equipment.

( ) Not needed

Containment and Disposal Method (Sampling Equipment)

Materials will be containerized (solids and water separately) and labeled with a permanent marker indicating the site, date, and medium (solid or water). Containerized materials will be disposed of daily by Con Edison.

( ) Not needed

Drilling Equipment

Drilling equipment will be decontaminated by steam cleaning prior to use and between separate boring locations. Steam cleaning will be conducted over a sheet plastic lined decon pit which will capture the decon fluids. The decon area will be located in an approved area of the Site before drilling commences.

( ) Not needed

Containment and Disposal Method (Drilling Equipment)

All fluids that are generated during decon/steam cleaning will be retained by the plastic lined containment area, and then pumped into a 55 gallon drum(s). Wastes generated at the site will be collected each day by Con Edison and properly disposed of off-site.

( ) Not needed

Construction Equipment

Construction equipment will be decontaminated by water pressure-rinse prior to departure from the Site. During the excavation process, water rinsate will be recovered at the decontamination pad and pumped to the on-site Fluid Treatment System. Particular care will be made to completely clean trucks and roll-offs that are transporting excavated soils from the Site. Excavation equipment will be periodically rinsed in the excavation. Final rinse will occur immediately prior to the equipment leaving the Site

(x) Not needed

Containment and Disposal Method (Construction Equipment)

All fluids that are generated during decon/water cleaning will be pumped to the on-site Fluid Treatment System, for treatment and disposal as described in the RAWP.

(x) Not needed, all fluids disposed daily

SITE CONTROL AND COMMUNICATIONS

Site workers should minimize contact of personnel and equipment with contaminated or potentially-contaminated materials. Access to the site for non-project personnel should be limited by the use of barriers such as tape, fencing, etc.

On-site personnel shall be made aware of environmental, health and safety precautions through review of this plan.

Emergency communications shall be facilitated by an on-site cell phone.

HEAT/COLD STRESS MONITORING AND SAFETY CONSIDERATIONS

The SHSO or Alternate shall monitor ambient temperature and implement the following work/rest regimes accordingly:

* For ambient temperatures between -15^0 and 70^0F, standard rest breaks (i.e., fifteen minutes every four hours should be used).

* For temperatures below -15^0F, work will be done at the discretion of the SHSO or Alternate.

* For temperatures above 70^0F, the following regime shall be followed for workers wearing permeable coveralls:

Adjusted Temperature (a)	Normal Work Ensemble (b)	Impermeable Ensemble
90^0F or above	after 45 min. of work	after 15 min. of work
87.5^0F to 90^0F	after 60 min. of work	after 30 min. of work
82.5^0F to 87.5^0F	after 90 min. of work	after 60 min. of work
77.5^0F to 82.5^0F	after 120 min. of work	after 120 min. of work
77.2^0F to 77.5^0F	after 150 min. of work	after 120 min. of work

a) Calculate the adjusted air temperature (ta adj) by using this equation: ta adj degrees F = ta ^{0}F + 13^0 x sunshine). Measure air temperature (ta) with a standard mercury-in glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun causes shadows. (100 percent sunshine -no cloud cover and a sharp, distinct shadow; 0 percent sunshine - cloudy, no shadows).

b) A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

Workers wearing semi-permeable or impermeable encapsulating protective clothing should be monitored when the temperature in the work area is above 70^0F. To monitor the worker, measure:

1. **Heart Rate** - Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third. If the heart rate exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third. An alternate test is if the heart rate exceeds 140 beats per minute at the end of the work period, and 100 beats per minute at the end of the rest period, shorten the work cycle by one-third or lengthen the rest period by one-third.

2. **Oral Temperature** - Use a clinical thermometer (3 minutes under the tongue or similar device to measure the oral temperature at the end of the work period (before drinking). If oral temperature exceeds 99.6 F, shorten the next work cycle by one-third. If oral temperature still exceeds 99.6 ^{0}F at the beginning of the next rest period, shorten the following work cycle by one-third.

Do not permit a worker to wear a semi-permeable or impermeable garment when their temperature exceeds 100.6^0F. Workers shall not be required to continue working if they feel any of the symptoms of heat stress. Rest periods should be a minimum of 15 minutes. Length of rest periods should be extended as appropriate or as recommended by the SHSO or Alternate.

EMERGENCY PROCEDURES

PERSONNEL EXPOSURE

General practice exposure emergency actions shall include:

Inhalation Exposure - The following actions should be taken based on the condition of the effected employee.

* If symptoms are present (dizziness, nausea, headache, shortness of breath, burning sensation in mouth, throat, or lungs), the victim should be escorted from the work zone immediately.

* If unconscious, the victim should be removed from the work zone immediately. Rescuers must be wearing proper respiratory and protective equipment before attempting the rescue.

* If the victim is no longer breathing, cardiopulmonary resuscitation (CPR) or some other form of artificial respiration should begin immediately and medical support personnel notified.

Skin Exposure - The skin should be thoroughly washed with copious amounts of soap and water. If clothing is contaminated, it should be removed immediately and the skin washed thoroughly with running water. All contaminated parts of the body, including the hair, should be thoroughly decontaminated. It may be necessary to wash repeatedly.

Ingestion - Medical support should be obtained immediately.

Eyes - If a toxicant should get into the eyes, flush with generous amounts of water. Washing should be continued for at least fifteen minutes and medical attention should be obtained if deemed necessary by the SHSO or Alternate.

PERSONNEL INJURY

The following contingency plan will be enacted in the event of personnel injuries.

1. **Initial alarm and first aid**. Upon observation of an injury, quickly get attention of other nearby workers. Immediately act to protect the injured person from a life-threatening situation. Render appropriate first aid. Warn unsuspecting persons of the potential hazard.

2. **Notify SHSO**. Utilizing freon air horn or other rapid method, notify the SHSO or the SHSO representative of the situation. Identify the injured person, the type of injury and the project site location.

3. **Ambulance and hospital services**. The SHSO or other appropriate personnel will immediately assess the situation and, if necessary, notify the designated ambulance service and hospital of the emergency situation.

4. **Follow-up**. The Site Safety Officer will determine why the injury occurred and will take appropriate steps to prevent a similar recurrence. Events associated with the injury will be recorded in the project safety logbook.

FIRE/EXPLOSION

Upon notification of a fire or explosion on site, the designated emergency signal shall be sounded and all site personnel assembled at the designated access points. The Fire Department shall be alerted and all personnel moved to a safe distance from the involved area. Personnel in the immediate vicinity of a fire shall use fire extinguishers or other immediately available means if this can be done safety and the fire can be immediately controlled or stopped from spreading, but should not attempt to fight major fires or fires involving potential explosives. The Fire Department will be notified regarding site activities and should respond in case of an emergency.

EMERGENCY PROCEDURES (continued)

SPILLS

In the event of a liquid/solid spill:

1. **First aid will be administered to injured/contaminated persons.** Any person observing a spill will act immediately to safely remove and protect injured/contaminated persons from any life-threatening situation. First aid and decontamination procedures will be implemented as appropriate.

2. **Warn unsuspecting persons/vehicles of the hazard.** All personnel will act to prevent any unsuspecting persons from coming in contact with spilled materials by alerting other nearby persons and by obtaining assistance of other personnel who are familiar with spill control and clean-up techniques.

3. **Stop the spill at the source, if possible.** Without taking unnecessary risks, personnel will attempt to stop the spill at the source. This may involve activities such as uprighting a drum, closing a valve or temporarily sealing a hole with a plug. Personnel will not expend more than a brief effort prior to notifying the Project Manager.

4. **Notify the Jacques Whitford and Con Edison Project Managers.** Utilizing available mobile phone communications or other rapid communication procedures, the Con Edison Construction Management Inspector and the Project Managers will be notified of the spill, including information on material spilled, quantity, personnel injuries and immediate life-threatening hazards.

5. **Spill assessment and primary containment.** The SHSO will make a rapid assessment of the spill and direct primary containment measure. Depending upon the nature of the spill, primary containment measures may include, but are not limited to:

    * construction of a temporary containment berm utilizing on-site absorbent material;
    * digging a sump, installing a polyethylene liner and diverting the spill material into the sump;
    * placing drums under the leak to collect the spilling material before it flows over the ground;
    * transferring the material from its original container to another container.

6. **The Project Manager will discuss with and obtain the SHSO's concurrence as to secondary spill containment procedures, if necessary.** He will make a determination regarding the requirements for notifications of backup response personnel, and State and local officials including emergency response teams, and the National Response Center.

7. **Spill clean-up procedures.** The Project Manager will develop spill clean-up procedures taking into consideration associated hazards, quantity of spilled material, disposal methods, and costs.

8. **Spill clean-up.** Personnel will clean up spills following the spill clean-up plan developed by the Project Manager. The Project Manager will supervise the procurement of supplies necessary to clean up a spill. Such items may include, but are not limited to: front end loader, shovels, rakes, clay absorbent, polyethylene, personal safety equipment, steel drums, pumps and miscellaneous hand tools. All material and equipment will be located in the Containment Reduction Zone.

9. **Spill clean-up inspection.** The Project Manager will inspect the spill site to determine that the spill has been cleaned up satisfactorily. If necessary, soil, water or air samples may be taken and analyzed to demonstrate the effectiveness of the spill clean-up effort.

10. **Identify the cause of the spill and remedial action to prevent recurrence.** The Project Manager will determine the cause of the spill and determine remedial steps to ensure that recurrence is prevented.

EMERGENCY PROCEDURES (continued)

EVACUATION PROCEDURES

If at any time, the entire project site needs to be evacuated, the following procedures are to be carried out immediately:

1. The Project Manager or SHSO will initiate the site evacuation.

2. The SHSO will instruct that the evacuation signal will be given. This signal will consist of a repetitive three (3) blasts from the alarm system (air horn).

3. All personnel will immediately halt work and proceed off site by the shortest upwind route.

4. Unless otherwise directed, all site personnel will report to the field office or other staging area.

Following an emergency situation, the SHSO will fill out a Hazardous Waste Incident Report (copy attached) and submit it to the Corporate Health and Safety Officer and Project Manager for review and evaluation.

EMERGENCY EQUIPMENT

The following safety equipment is included in the standard Jacques Whitford Level D or Level C "Ready Bags". This equipment will provide appropriate protection from chemical and noise in most situations encountered. However, for a particular job, certain items which are not included in a standard ready bag may be required. The Project Manager and SHSO will be consulted on what extra or alternate equipment is needed.

Level D

* Hard hat with winter liner
* Latex gloves
* Neoprene gloves
* Standard tyvek suit
* Polycoated tyvek suit
* Tyvek hood
* Safety glasses and goggles
* Disposable ear plugs
* Disposable overboots
* First aid kit
* Eyewash kit
* Fire extinguisher
* Air horn
* Duct tape

Level C (in addition to Level D equipment)

* Full-face air-purifying respirator
* Suitable cartridges
* Nose-cup insert
* Protective lenses
* Respirator disinfectant (alcohol wipes)

EMERGENCY CONTACTS

CONTACTS	NAME	PHONE NUMBER	LOCATION
Jacques Whitford Admin. Project Manager	David B. Hill	(603) 431-4899	Portsmouth, NH
Jacques Whitford Program Manager	Greg DelMastro	(201) 587-9040 (914) 391-9608 (cell)	Rochelle Park, NJ
Con Edison Project Manager	Edward Wiederkehr	(718) 267-3868 (917) 497-8921 (cell)	
Con Edison Construction Management	Jeff Rutowski	(646) 296-3133	
Fire Department		(718) 430-0261 or 911	
Police or Sheriff's Department	49th Precinct	(718) 918-2000 or 911	
City Poison Control Center		(212) 764-7667	
State Hazmat Emergency Agency		(800) 457-7362	
State Environmental Agency		(718) 482-4933 x 7114	
National Response Center		(800) 424-8802	Washington, DC
USEPA Environmental Response Team		(201) 321-6660	
Association of American Railroads Response Team		(202) 293-4048	
US Coast Guard Environmental Response Team		(800) 424-8802	
CHEMTREC		(800) 424-9300	

MEDICAL EMERGENCY

Hospital Name and Telephone Number:	Wyckoff Heights Medical Center (718) 963-7272
Hospital Address:	374 Stockholm Street, Brooklyn, NY
Name of Contact at Hospital:	Emergency Room
Telephone of 24-hour Ambulance:	911
Distance to Hospital:	Approximately 0.5 miles
Route to Hospital:	Go south on Rust Rd to Flushing Rd. Go west on Flushing Rd to Wyckoff Avenue. Turn left onto Wyckoff Ave, turn left onto Stockholm Street, hospital is on right

Map showing route to hospital attached

Hospital Route Map

ENVIRONMENTAL, HEALTH AND SAFETY PLAN APPROVALS

Signature:_____ Date:_____
Jacques Whitford Corporate Health & Safety Coordinator

Signature:_____ Date:_____
Jacques Whitford Project Manager

ENVIRONMENTAL, HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT

I (signatory below), have received a copy of the Environmental, Health and Safety Plan for the former Con Edison Maspeth Substation site. I have read the plan, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the safety requirements specified in the plan.

Signature/Firm_____ Date:

Signature/Firm_____ Date:

Signature/Firm_____ Date:

Signature/Firm_____ Date:

Signature/Firm_____ Date:

Signature/Firm_____ Date:

Signature/Firm_____ Date:

Signature/Firm:_____ Date:

Signature/Firm:_____ Date:

Signature/Firm:_____ Date:

Signature/Firm:_____ Date:

Signature/Firm:_____ Date:

Signature/Firm:_____ Date:

ENVIRONMENTAL, HEALTH AND SAFETY PLAN REVISIONS

Date:

SHSO Approval:_____

Corporate Health and Safety Officer Approval:_____
Revision (describe below)

_____

_____

_____

_____

_____

_____

Date:

SHSO Approval:_____

Corporate Health and Safety Officer Approval:_____
Revision (describe below)

_____

_____

_____

_____

_____

_____

Date:

SHSO Approval:_____

Corporate Health and Safety Officer Approval:_____
Revision (describe below)

_____

_____

_____

_____

HAZARDOUS WASTE INCIDENT REPORT

DATE OF INCIDENT_____ DATE OF REPORT

DESCRIPTION OF INCIDENT, INCLUDING INJURIES, PROPERTY DAMAGE AND EMERGENCY ACTION TAKEN AND PERSONNEL INVOLVED (use additional sheets if needed):

_____

_____

_____

WITNESS OF INCIDENT:

_____

_____

_____

POSSIBLE OR KNOWN CAUSES:

_____

_____

_____

WHAT ACTIONS ARE NEEDED TO PREVENT A SIMILAR INCIDENT?

_____

_____

_____

OSHA TRAINING CERTIFICATES FOR
ON-SITE PERSONNEL

The National Water Well Association

recognizes

Bruce Bline

for completion of all requirements for

Safety at Hazardous Materials Sites: A Hands-On Workshop

October 19-23, 1987
(Date of Course)

Valhalla, New York
(Place of Course)

40 hours - 29CFR 1910.120(e)(2)

Steven P. MacSaughy
(Signature)

CERTIFICATE OF COMPLETION

this is to certify that

BRUCE BLINE

has successfully completed the

OSHA 10-HR CONSTRUCTION
&
HAZWOPER 8-HR REFRESHER

on

OCTOBER 8, 2008

Regional Safety Specialist

www.jacqueswhitford.com

Jacques Whitford

ENVIROBUSINESS, INC.
TRAINING SERVICES

Jason Ward

HAS BEEN CERTIFIED AS OF

July 20, 2001

701 CONCORD AVENUE
CAMBRIDGE, MA 02138
TEL: (800) 786-2346
FAX: (617) 868-3132

CATE OF ACHIEVEMENT

EBI TRAINING SERVICES CAMBRIDGE, MA

HAZARDOUS WASTE OPERATIONS

THIS IS TO CERTIFY THAT

Jason Ward

HAS SUCCESSFULLY COMPLETED 40 HOURS OF TRAINING IN HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE IN ACCORDANCE WITH THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS 29 CFR 1910.120 AND 1926.65

EnviroBusiness, Inc.
701 Concord Ave.
Cambridge, MA 02138
800-786-2346

Julie MacDonald
Training Manager
July 20, 2001

CERTIFICATE OF COMPLETION

this is to certify that

JASON WARD

has successfully completed the

OSHA 10-HR CONSTRUCTION
&
HAZWOPER 8-HR REFRESHER

on

OCTOBER 8, 2008

Richard M Petitto

Regional Safety Specialist

www.jacqueswhitford.com

Jacques Whitford

SELECTED CON EDISON
HEALTH & SAFETY
PROCEDURES

CON EDISON
ENVIRONMENT, HEALTH, AND SAFETY
WORK PLAN GUIDE

9.0 – EXCAVATION AND TRENCHING

Overview

Excavation operations are among the first actions taken at a project site. Accidental cave-ins of earth that has been excavated account for a large majority of fatalities each year. In many cases, workers receive no warnings when excavated ground collapses and are suddenly trapped under tons of soil.

Minimum Excavation Requirements

In order to perform work on any Con Edison facility or project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- **ALL UTILITIES MUST BE MARKED-OUT BY APPROPRIATE AUTHORITIES PRIOR TO ANY EXCAVATION.**
- A trench is considered an excavation.
- All underground hazards (electric lines, gas/water lines, boulders, etc.) must be de-energized or removed/supported appropriately.
- Hand digging must be conducted near known or suspected underground systems.
- Ramps or runways used as a means of entry/exit for excavations must be designed by a competent person.
- A ladder or other safe means of exit must be used in excavations greater than four feet deep and cannot be greater than 25 feet from all workers in the excavation.
- Entering an excavation during digging is prohibited.
- When the atmosphere in an excavation is/can become hazardous, Proper atmospheric testing must be conducted as required by the Confined Space Program, Section 6 in this manual.
- Daily inspections of the excavation and surrounding areas must be conducted by a competent person before work begins and as needed during the shift.
- Excavations must be shored or braced if nearby structures (buildings, sidewalks, etc.) may become unstable.
- All material, including excavated soil, must be stored at least two feet from the side of the excavation.

9.0 – EXCAVATION AND TRENCHING

- Workers may only pass over an excavation on properly constructed walkways/bridges with guardrails in place.

- Adequate physical barriers must be provided around all excavations.

- Adequate protective systems must be used in excavations unless:

  - The excavation is entirely in stable bedrock; or
  - The excavation is less than five feet deep AND has been examined by a competent person who has found no signs of potential cave-ins.

- All excavations greater than five feet deep must be properly sloped, shored, braced, shielded, or protected by a system designed by a professional engineer.

- If a potentially hazardous material is encountered during excavation, all work must stop until the material can be evaluated by an industrial hygienist, or equivalent.

Regulatory Citations

A complete text of the requirements for Excavations can be found in Title 29 Code of Federal Regulations, Part 1926, Subpart P.

Contacts

For additional information regarding Excavation requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378). The OSHA website can be found at www.OSHA.gov.

13.0 - HAZARD COMMUNICATION PROGRAM

Overview

OSHA requires that the hazards associated with all chemicals used or stored at a job site be evaluated. This information must be communicated to employees who may be exposed to these chemicals or use them in their daily jobs. The process for informing employees about the chemicals, their locations, and potential hazards is called a Hazard Communication (HAZCOM) program. In general, this program includes requirements and procedures for container labeling and other forms of warning, procedures for obtaining and retaining material safety data sheets (MSDSs) and employee training.

Minimum HAZCOM Requirements

In order to work in any Con Edison facility or on any project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- If any hazardous material is used or stored at the job site, the contractor's **written** HAZCOM program must be available to all contractor and Con Edison personnel for review upon request.

- The HAZCOM program must include procedures for:

  - Labeling containers and the use of warning forms;
  - Obtaining and retaining MSDSs;
  - Specific worker training requirements;
  - Documentation that these training requirements have been completed by each worker;
  - A list or inventory of hazardous material at the job site.

- The supervisor must inform all workers about the hazardous materials at the job site when they first are first assigned to a project and whenever a new hazardous material is brought to the site.

- Workers must be informed of the location of:

  - The HAZCOM program;
  - The list/inventory of hazardous substances;
  - The locations of MSDSs and the procedures for obtaining a copy of an MSDS;
  - These must all be available for each worker to review during their work period.

- The Con Edison representative must be informed of all chemicals brought to the site.

13.0 - HAZARD COMMUNICATION PROGRAM

- Each contractor must obtain information from the Con Edison representative regarding chemicals that Con Edison uses or stores at the site.

- When more than one contractor is working at a job site, each contractor must inform the other(s) concerning the location of their MSDSs and procedures for labeling and worker protection.

- **THE PRIME CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE HAZCOM PROGRAM ON THE JOB SITE.**

- **ALL** containers will be labeled.

  - Labels on hazardous material containers will not be defaced or removed.
  - The labels will identify the substance in the container and appropriate warnings about the substance.
  - The material identity will match the material currently in the container, its MSDS, and the overall list/inventory.

- An MSDS must be available at the job site for every chemical that is present at that site.

- A documented training program will be provided to every worker at the job site. This training will include:

  - Information regarding the HAZCOM program;
  - Health and environmental hazards of every chemical used at the job site;
  - Ways to detect the presence of hazardous materials at a job site (including monitoring methods and devices used);
  - How to read and understand the information contained on an MSDS; and
  - How workers can protect themselves from harmful exposure (e.g., safe work practices, personal hygiene, and protective equipment).

Regulatory Citations

A complete text of the requirements for HAZCOM can be found in Title 29 Code of Federal Regulations, Part 1910, Section 1200, and Title 29 Code of Federal Regulations, Part 1926, Section 59.

Contacts

For additional information regarding HAZCOM requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378). The OSHA web site can be found at www.OSHA.gov.

CON EDISON
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14.0 - HEARING CONSERVATION

Overview

Noise is defined as unwanted sound. Noise can cause sudden traumatic temporary hearing loss, long-term slowly occurring hearing loss that is irreversible, disruption of communication, and masking of warning devices and alarms. These long-term effects may occur at noise levels lower that are constant and daily.

Minimum Hearing Conservation Requirements

In order to perform work on any Con Edison facility or project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental, Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- Workers must not be exposed to noise levels above those stated in the regulations.
- All noise levels must be measured on the A-weighted scale by a trained person.
- When noise exposure includes two or more periods at different noise levels, the combined noise exposure must be calculated.
- When noise levels exceed the permissible limits, worker exposure must be controlled through engineering controls, administrative controls, personal protective equipment (PPE), or a combination of these.
- Engineering controls consist of isolating, enclosing, or insulating equipment or operations or substituting quieter equipment or operations.
- Engineering controls are always preferred over other controls.
- Administrative controls involve rotating workers to jobs having lower noise exposures and reducing the time that each worker is exposed.
- PPE, for example earplugs and earmuffs, must be rated to reduce the noise exposure to within acceptable limits.
- A noise exposure at or above 85 decibels on the A-weighted scale (dBA) averaged over an eight hour time period (with or without PPE) requires a formal written hearing conservation program.
- A hearing conservation program must include:
  - Noise monitoring;

14.0 - HEARING CONSERVATION

- Procedures for employee notification;
- Provisions to permit employees to observe monitoring;
- Initial and annual audiometric testing, and an evaluation of the audiogram by a qualified professional;
- A noise training program for all affected workers; and
- Formal record keeping.

- The following table is a guide to common noise levels:

Permissible Duration	dBA	Examples of Noise Sources
No protection or time exposure calculation required.	15	Wooded Forest
	25	Quiet Bedroom
	35	Library
	65	Normal Speaking
	75	General Office Area
Action Level for Hearing Conservation Program	85	Average Machine Shop
8 Hours	90	
6 Hours	92	
4 Hours	95	
3 Hours	97	
2 Hours	100	Air Spray Operation
1.5 Hours	102	
30 Minutes	110	Power Table Saw
15 Minutes	115	
7.5 Minutes	120	
4 Minutes	125	Rock-n-Roll Concert
2 Minutes	130	Aircraft Jet Engine/Ear Pain Threshold
NOT TO EXCEED	140	

- A standard rule-of-thumb for noise states that when standing face-to-face at a distance of 1 to 2 feet, if it is necessary to raise your voice to be heard, the background noise exceeds 85 dBA.

Regulatory Citations

A complete text of the requirements for Hearing Conservation can be found in Title 29 Code of Federal Regulations, Part 1910, Section 95 and Part 1926, Section 52.

Contacts

For additional information regarding Hearing Conservation requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378). The OSHA website can be found at www.OSHA.gov.

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18.0 - MATERIALS HANDLING

Overview

Materials handling can be accomplished in a variety of ways, lifted and moved both manually or using a mechanical means, such as a fork truck or crane. All types of material handling operations require safety planning and practices that are clearly defined.

Minimum Materials Handling Requirements

In order to perform work in any Con Edison facility or on any project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental, Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- Whenever possible, objects will be lifted and moved by mechanical devices (cranes, manually operated chain hoists, fork trucks, etc.) rather than by manual effort.
- The mechanical devices will be appropriate for the lifting or moving task and will be operated only by trained and authorized personnel.
- Objects that require special handling or rigging will only be moved under the guidance of a person who has been specifically trained to move such objects.
- Lifting devices will be inspected, certified, and labeled to confirm their weight capacities.
- All devices shall be inspected by a trained and qualified individual at least once a year and will be inspected prior to each use by the user.
- Defective equipment will be taken out of service immediately and repaired or destroyed.
- Personnel will not pass under a raised load, nor will a suspended load be left unattended.
- Personnel will not be carried on lifting equipment, unless it is specifically designed to carry passengers
- The wheels of the truck being loaded or unloaded will be chocked to prevent movement.
- The lift and swing path of a crane will be watched and maintained clear of obstructions.
- Accessible areas within the swing radius of a crane will be guarded or barricaded.
- All reciprocating, rotating, or other moving parts will be guarded at all times.
- Accessible fire extinguishers will be available in all mechanical lifting devices.

18.0 - MATERIALS HANDLING

- Lifting devices will never be left near the edge of excavations or unstable areas.
- Mobile lifting equipment, equipped with outriggers will be set before any work is begun.
- Operations near overhead power lines are prohibited unless the power source has been shut off and locked out/tagged out or the appropriate clearance distances are maintained.
- Cranes may only be moved when directed by a signal person.
- Wire ropes will be removed from service when any abrasion, scrubbing, peening, evidences of corrosion, kinking, crushing, bird caging, or other damage exists.
- Unsafe behavior while driving a fork truck is not permitted.
- Each fork truck will be provided with an overhead guard.
- All mobile lifting devices shall be equipped with an audible backup warning device.
- All traffic regulations shall be observed when a lifting device is in operation.
- Only authorized personnel shall refill liquefied petroleum gas (LPG) tanks on fork trucks.
- Employees involved in heavy lifting will be properly trained in lifting procedures and should be physically qualified to protect the person and the material.
- Tiered or stacked material will be stored within acceptable height limits to avoid falling. Only material that will be immediately used may be stored on scaffolds or runways.
- Personnel will be trained in the procedures used for material handling. This training will address the requirements of applicable regulations, for example the training of personnel who operate powered industrial trucks.

Regulatory Citations

A complete text of the requirements for Materials Handling can be found in Title 29 Code of Federal Regulations, Part 1910, Subpart N and Part 1926, Subparts H and O.

Contacts

For additional information regarding Materials Handling requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378), or visit the OSHA web site at: www.OSHA.gov.

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21.0 - NOISE

Overview

Local laws and regulations require that the noise produced during construction/work activities is neither excessive nor intrusive. The contractor must identify the measures that will be taken to assure the noise limits for the area in which they are working will not be exceeded. The noise levels that are acceptable generally depend on the location where the noise is generated and the time of day. In general, most regulations require that facility and commercial operations do not produce unnecessary noise as compared to the surrounding community. For operations within a fixed facility (for example, a generating station), the noise levels measured at the facility perimeter are used to determine impacts on the community. For a discussion of worker protection from excessive noise, refer to the Hearing Conservation EH&S Work Plan Guide.

Prior to working in any Con Edison facility or on any Con Edison project, all contractors must, at a minimum, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental, Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

Minimum Noise Requirements

- Local noise ordinances should be reviewed to determine the maximum levels of noise that can be generated at the job site during specific work periods.
- Local noise ordinances should be reviewed to determine whether octave band measurements are required.
- Noise measurements should be obtained by qualified personnel using the guidance of the American National Standards Institute (ANSI) standards and the results should be compared to the applicable ordinances.
- The sampling should be performed by a qualified person who is familiar with the make and type of equipment used in the measurements and experienced in general noise data collection procedures.
- To comply with ordinances, sampling should evaluate the sound levels associated with specific types of noise, for example:

  Impulse noise is short bursts of noise.
  Periodic noise is steady, high-level noise

21.0 - NOISE

- The contractor is responsible for ensuring that all work performed by both his crew and subcontractors complies with applicable noise ordinances.

- Equipment and vehicles need to be maintained in good operating condition, i.e. mufflers, belts and tune-ups.

Regulatory Citations

A complete text of the requirements for noise can be found in the:

- New York City Administrative Code and Charter, Title 24, Chapter 2, Subchapter 6.
- New York City Zoning Resolutions Section 42-21, Article IV.
- Rockland County Health Code, Article IX.
- Westchester County regulations which can be obtained from local townships.

Contacts

For additional information regarding noise requirements or clarification of these requirements, contact the following agencies:

- For projects within the five boroughs, contact the New York City Department of Environmental Protection (NYCDEP) office located at 59-17 Junction Boulevard, 10th Floor, Corona, NY 11368 (718-337-4375 or visit their walk-up One Stop Information and Referral Center at 96-05 Horace Harding Expressway, Corona, NY 11368. NYCEP's web site can be found at www.ci.nyc.ny.us.

- For projects located in Rockland County, contact the Rockland County Department of Health on Sanatorium Road, Pamona, NY 10970 (914-634-2500). Rockland County's web site can be found at www.co.rockland.ny.us.

- For information on standard practices for monitoring noise, contact the American National Standards Institute (ANSI) at 11 West 42nd Street, New York, NY 10036 (212-642-4900). ANSIs web site can be found at www.ansi.org.

CON EDISON
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22.0 - OIL AND DIELECTRIC FLUID

Overview

Federal and State laws require that specific procedures are followed to properly handle oil and dielectric fluid to prevent spills. These procedures shall address storing, handling, transferring, and processing these materials. In addition, spills of oils and dielectric fluids must be managed to protect workers, clean up affected areas, and prevent further damage to unaffected areas.

Minimum Oil and Dielectric Fluid Requirements

Prior to working in any Con Edison facility or on any Con Edison project, all contractors must, at a minimum, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental, Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- Di-electric fluids are assumed to contain between 50 and 499 ppm PCBs, unless analytical sampling indicated differently. The Contractor Guide for PCBs shall be used.

- Barge operations of 400,000 gals of fluid (a major oil storage facility (MOSF)) requires:
  - Licensed by New York State Department of Environmental Conservation (NYSDEC).
  - Written Spill Prevention Control and Countermeasure (SPCC) Plan and/or Facility Response Plan (FRP) for spill prevention and response.
  - Fully insured to cover the costs associated with a potential spill.
  - Prepare monthly reports of barrels transferred to NYSDEC.

- In Rockland County, temporary oil and/or dielectric fluid storage tank/containers brought on site registered as Petroleum Bulk Storage Facilities must meet the following criteria:
  - The number, type and capacity of temporary tanks/containers brought on site.
  - Describe control measures for the storage of tanks/containers onsite.
  - Store containers in a protected leak-proof, diked, roofed area to prevent damage.
  - Describe handling of rainwater and other contaminated liquids in diked areas.
  - Describe inspection, reporting and cleanup program for temporary containers/tanks.

- For work in New York City, Fire Department (FDNY) permits for combustible liquid/mixture storage is required for storage of tanks/containers of petroleum on-site.

- A temporary oil and/or dielectric fluid tank larger than 660 gallons on site or more than 1,320 gallons of oil and/or dielectric fluid in several tanks, requires an SPCC Plan.

- Comprehensive spills management procedures will available.

22.0 - OIL AND DIELECTRIC FLUID

- Only trained personnel will handle oil/dielectric fluid as required by OSHA HazCom Standard (29CFR 1910.1200) and Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) and the HazCom EH&S Work Plan Guide.

- The contractor will ensure that all oil spills are reported as follows:
  - Report to Con Edison CIG on (212) 684-2030 or (800) 246-8CIG.
  - Report a spill of any size to a waterway to the federal National Response Center.
  - Non-de minimis spills must be reported to the NYS DEC.
  - Spills of 0.5 gallons (10 lbs.) of gasoline, naphtha, mineral spirits, or Stoddard solvents are reportable to the NYC Department of Environmental Protection.

Regulatory Citations

Requirements for management of oil/dielectric fluids less than 50 ppm PCBs can be found in:

- Title 29 Code of Federal Regulations (CFR) Part 1910.
- Title 33 CFR Parts 153 through 155, Title 40 CFR Parts 112 and 280.
- Title 49 CFR Part 194, Title 16 NYCRR Part 258
- Title 6 New York Code of Rules and Regulations (NYCRR), Parts 612 through 614.
- Title 17 NYCRR Parts 30 through 32, Title 27 NYC Administrative Code Chapter 4.
- Title 3 Rules of the City of New York (RCNY) Chapters 7, 8, 20, and 21.
- Title 15 RCNY Chapter 11, Article 22 of the Westchester County Sanitary Code.
- Article 10 of the Sanitary Code of the County of Rockland.

Contacts

For additional information or clarification of these requirements, contact the following agencies:

- For projects within the five boroughs, contact the Region 2 NYSDEC office located at Hunters Point Plaza, 47-40 21st Street, Long Island City, NY 11101 (718-482-4900). For projects in Westchester, Rockland and Dutchess Counties, contact the NYSDEC Region 3 office at 21 South Putt Corners Road, New Paltz, NY 12561 (914-256-3000). Contact the NYCDEP at 59-17 Junction Blvd, 10th Floor, Corona, NY 11368 (718-337-4375).

- Projects located in Westchester County, contact the Westchester County Department of Environmental facilities at 207 North Avenue, New Rochelle, NY 10810 (914-637-3000).

- For projects located in Rockland County, contact the Rockland County Department of Health on Sanatorium Road, Pamona, NY 10970 (914-634-2500).

- Region II office of the Environmental Protection Agency (EPA) is located at 290 Broadway, New York, New York 10007 (212-637-3000).

CON EDISON
ENVIRONMENT, HEALTH, AND SAFETY
WORK PLAN GUIDE

23.0 - PCB MANAGEMENT

Overview

Federal and State laws require that specific procedures be followed to manage materials containing polychlorinated biphenyls (PCBs). These procedures include those for characterizing, marking, inspecting, labeling, storing, transporting, and disposing of these materials. In addition, spills of PCBs must be cleaned up in such a way as to protect workers, fully clean up affected areas, prevent further damage to unaffected areas from the spilled materials, and document that the clean up was performed properly.

Minimum PCB Requirements

Prior to working in any Con Edison facility or on any Con Edison project, all contractors must, at a minimum, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental, Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- Dielectric fluids shall be assumed to contain between 50 and 499 ppm PCBs unless written documentation or current analysis identifies exact concentration.
- The EH&S Work Plan Guide are requirements for Oil and Dielectric Fluid.
- Contractor shall identify PCB concentration of fluid contained in equipment and supplies brought on site and mark or label the equipment as required by regulation.
- Contractor will determine concentration of PCBs in material prior to managing the waste.
- Combustible materials must be properly stored away from PCB-containing equipment.
- Cleanup of leaking PCB transformer must begin no later than 48 hours after discovery
- Wastes shall be labeled if 50 ppm or greater PCBs, or less than 50 ppm PCBs but came from a source material that contained 50 ppm or greater PCBs as follows:
  ID as "hazardous waste", contents, location generated, concentration or if unknown. Identify the accumulation start date (the date when waste was first placed in the container, or for equipment, the date when the item was determined to be waste).
  - Place markings on the container/waste article consistent with 40 CFR 761.45.
  - If analytical results are pending, include the words "pending analysis".
- Prior to off-site transport, attach a shipping label showing site name, address, telephone number, USEPA generator ID number; manifest document number; accumulation start date; appropriate waste code for the material, and USDOT description

23.0 - PCB MANAGEMENT

- If PCB wastes must be stored on-site, the contractor must determine whether they are permitted to use the facility's PCB waste storage area (if one is present at the facility) or maintain their own temporary PCB waste storage area.
  - Wastes can be stored for no more than 30 days in a temporary storage area.
  - The storage area must be marked "hazardous waste".
  - Storage areas must be inspected and logged on a weekly basis,.
  - Containers must be tightly closed during storage to prevent leaks and spills.

- All PCB spills must be reported to a Con Ed representative immediately. Cleanup is managed using approved procedures, trained personnel and appropriate disposal methods.

- When shipping PCB wastes for disposal, the contractor is responsible for completing hazardous waste manifests and land disposal restriction (LDR) forms. Prior to shipping wastes, the contractor must assure that the transporter:
  - signed the transported certification on the manifest, assigned a USEPA ID number.
  - Is carrying a copy of his/her valid current NYSDEC Part 364 transporter number.
    Is carrying a copy of the latest version of the "Emergency Response Guide".
    Has marked vehicle sides/rear with the NYS waste transporter permit number.
    Has marked the vehicle with the PCB label and Class 9 placard, if required.

- The contractor must identify the licensed disposal facility that will be used to dispose of PCB waste, including the facility's USEPA identification (ID) number and the method that will be used to dispose of each PCB waste type.

Regulatory Citations

The requirements for management of PCBs (50 ppm PCBs and greater) can be found in:

- Title 40 Code of Federal Regulations (CFR) Parts 262.31, 262.32, 262.34, and 761.
- Title 49 CFR Part 172.

Contacts

For additional information regarding PCB requirements or clarification of these requirements, contact the following agencies:

- For projects within the five boroughs, also contact the Region 2 NYSDEC office located at Hunters Point Plaza, 47-40 21st Street, Long Island City, NY 11101 (718-482-4900). For projects in Westchester, Rockland and Dutchess Counties, contact the NYSDEC Region 3 office at 21 South Putt Corners Road, New Paltz, NY 12561 (914-256-3000).

- Region II office of the USEPA is located at 290 Broadway, New York, New York 10007 (212-637-3000).

CON EDISON
ENVIRONMENT, HEALTH, AND SAFETY
WORK PLAN GUIDE

24.0 - PERSONAL PROTECTIVE EQUIPMENT

Overview

For many tasks, personal protective equipment (PPE) is as essential to the job as any tool. OSHA requires that every employer evaluate all tasks associated with a project to determine the hazards associated with these tasks and the appropriate PPE to be worn by each affected employee. This hazard assessment must be documented.

Minimum PPE Requirements

In order to perform work on any Con Edison facility or project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental, Health and Safety Plan submitted to Con Edison and include a process to meet these requirements.

- All employers must conduct a hazard assessment prior to the start of every project and as conditions change on the project to determine the types of PPE necessary for each task.
- The results of the hazard assessment must be communicated to every employee on the project prior to the start of work and as conditions change.
- All workers must be trained to recognize the need for and types of PPE necessary, the proper use of PPE, the limitations of PPE, and proper care and disposal of PPE.
- All workers must be trained in the procedures for inspecting PPE prior to use to ensure it provides the required protection.
- All PPE used must meet applicable American National Standards Institute (ANSI) standards.
- All PPE must be maintained in a sanitary and reliable condition.
- Where employees supply their own PPE, the employer is responsible for ensuring the adequacy, maintenance, and sanitation of this PPE.
- Hard hats must never be changed or modified in any way and must be appropriate for the type of work being performed. White hard hats are not permitted on any Con Edison site.
- Eye protection must be appropriate for the type of work being performed, and must be equipped with side shields.
- Burning goggles must be equipped with appropriate filtering lenses for the work being performed.

24.0 - PERSONAL PROTECTIVE EQUIPMENT

- Gloves must provide adequate wrist and hand protection based on the tasks being performed, and must be compatible with and resistant to any potential hazard (sharps, chemical, electrical, etc.).

- Safety shoes or boots must be fitted with protective toe guards.

- Additional PPE may be necessary for certain situations, for example overboots or rubber boots should be worn for wet conditions or chemical spills, etc.

- Protective clothing (reusable or disposable) must be appropriate for the type of work being performed.

- Orange reflective vests, approved by the U.S. Department of Transportation, must be worn when working in areas exposed to or adjacent to vehicle traffic.

- Fall protection devices must meet the requirements defined in the Con Edison EHS Work Plan Guide for ***Working at Elevation*** which is in Section 33 of this manual.

- Workers required to wear hearing protection must be allowed to select the type of device they wish to wear from a number of suitable devices.

- Flame resistant garments are required in areas where there is a potential for arc or flash.

Regulatory Citations

A complete text of the requirements for Personal Protective Equipment can be found in Title 29 Code of Federal Regulations, Part 1910, Subpart I, and Part 1926, Section 28 and Subpart E.

Contacts

For additional information regarding Personal Protective Equipment requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378). The OSHA website can be found at www.OSHA.gov.

CON EDISON
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26.0 - RESPIRATORY PROTECTION PROGRAM

Overview

Respiratory protection is often necessary to allow employees to work safely in hazardous environments. When an airborne contaminant or oxygen-deficient atmosphere exceeds the regulated exposure limits, an employer must eliminate the hazard through engineering and administrative controls or use of the proper respiratory protective equipment.

Minimum Respiratory Protection Requirements

In order to perform work on any Con Edison facility or project, all contractors must, at least, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job-specific Environmental, Health and Safety Plan submitted to Con Edison and to include a procedure to meet these requirements.

- Contractor must have available a written Respiratory Protection Program (RPP).
- Perform Exposure Assessments to assess the need for respiratory protection based on limits established by OSHA, American Conference of Governmental Industrial Hygienist, National Institute of Occupational Safety and Health or Con Edison.
- Selection of the proper Air Purifying Respirators (APR) or Supplied Air Respirators (SAR) will depend on the characteristics of the workplace and the level of protection necessary. Characteristics include the concentration of airborne contaminants, immediately dangerous to life or health (IDLH) conditions, oxygen-deficient atmospheres, and the protection factor (PF) of each respirator.
- APR's will not be worn in oxygen-deficient atmospheres, IDLH conditions, when the contaminant exceeds the PF of the respirator, or when cartridges do not exist for a particular contaminant.
- Breathing air quality must meet the Compressed Gas Association's definition of "Grade D" air for all supplied air respirator use. This includes breathing air cylinders and five minute escape cylinders. Compressors shall meet applicable OSHA standards.
- In IDLH atmospheres prior to entry, a rescue plan shall be conveyed to crew members.
- The contractor will follow OSHA regulations regarding maintenance, inspection, proper use of cylinders, fittings, hoses, manifolds, etc., and recordkeeping.
- Self-Contained Breathing Apparatus (SCBA) shall be used in situations where the contaminant or concentration of a contaminant is unknown.

26.0 - RESPIRATORY PROTECTION PROGRAM

- Respirator use requires training with the properly selected respirator, medical evaluation to wear the respirator, and proper fit-testing of the respirator.

- Respirators shall be inspected, maintained, cleaned, disinfected, and stored according to the manufacturers' directions and applicable OSHA guidelines..

- Emergency equipment shall be inspected monthly and all records will be kept on file.

- The RPP administrator shall maintain results of periodic program review, and shall identify, based on the results of the review, any necessary changes which may need to be made to the respiratory program. Records shall identify the name of the person conducting the review, the date, and any observations made during the review.

- Based on the RPP outlined in this work plan guide, the program manager shall maintain the following records at all times:

  - Hazard Assessments.
  - Employee Training.
  - Fit-Testing.
  - Medical Surveillance.
  - Respirator and Fit-Test Equipment Maintenance and Repair.

Regulatory Citations

A complete text of the requirements for Respiratory Protection can be found in Title 29 Code of Federal Regulations, Part 1910, Section 134.

Contacts

For additional information regarding Confined Space requirements or clarification of these requirements, contact the New York regional OSHA office located at 201 Varick Street, Room 670, New York, New York 10014 (212-337-2378), or visit the OSHA web site at: www.OSHA.gov.

CON EDISON
ENVIRONMENT, HEALTH, AND SAFETY
WORK PLAN GUIDE

29.0 - WASTE MANAGEMENT

Overview

Federal and State laws require that wastes be properly classified and managed as hazardous waste, solid waste, or universal waste. Waste classification will define the requirements for managing the materials. In general, waste management includes characterization, labeling, storage, transportation, disposal, personnel training, and reporting and recordkeeping.

Minimum Waste Management Requirements

Prior to working in any Con Edison facility or on any Con Edison project, all contractors must, at a minimum, meet the following requirements. Please note that additional requirements may be necessary based on job-specific activities. It is the responsibility of each contractor to identify these requirements in the job specific Environmental, Health and Safety Plan submitted to Con Edison, and include a process to meet these requirements.

- Contractors take title to all wastes generated if so stated in the specifications; however, CON EDISON RESERVES THE RIGHT TO TAKE TITLE TO ALL WASTES GENERATED BY THE CONTRACTOR'S ACTIVITIES AT CON EDISON FACILITIES AND WORK SITES.

- Contractor must have an active EPA waste generator identification for waste disposal.

- Contractor will comply with all applicable requirements for hazardous wastes generated, including:

  - Characterizing the waste, managing accumulated and stored waste.
  - Labeling of containers, storing the waste, inspecting the storage areas.
  - Filling out manifests and Land Disposal Restriction (LDR) forms.
  - Training of personnel concerning the proper procedures to use.
  - Ensuring that waste is disposed at a permitted facility.
  - Ensuring that reports and records are maintained.

- Contractor shall identify the procedures to classify wastes generated at the job site.

- Wastes shall be segregated when stored to prevent mixing of waste types.

- Storing of solid waste dumpsters will be properly maintained, able to store 150% of expected generation, and covered (with lids, doors, and/or tarps).

- Security measures will avoid non authorized personnel from tampering with wastes.

- Contractor must evaluate the waste generated for recycling, instead of disposing of waste

29.0 - WASTE MANAGEMENT

- Contractor must identify the transportation/disposal firms and their permit numbers to manage and transport Con Edison waste. Only permitted treatment/disposal facilities may be used to receive solid and hazardous wastes generated from a Con Edison job site.
- Department of Transportation (DOT) requirements will be adhered to for waste packaging, shipping, and transport, including container selection and vehicle placards.
- All hazardous and solid waste transporters must have the appropriate permits and certifications prior to hauling waste.
- The contractor shall provide copies of all shipping papers and certificates of disposal that are obtained and prepared for wastes generated at the job site.

Regulatory Citations

A complete text of the requirements for waste management can be found in:

- Title 40 CFR, US EPA, Parts 172, 173, 260 through 262, 264, 265, and 268;
- Title 6 NYCRR, Parts 360, 364, 367, 370 through 374, and 376;
- Title 6 Rules of the City of New York (RCNY) Chapter 2; Title 16 RCNY Chapter 1;
- Westchester County, Chapter 825 and Westchester County Local Law No. 14-1992;
- Dutchess County Local Law No. 4 of 1990

Contacts For additional information contact the following agencies:

- In five boroughs, contact the NYC Department of Sanitation at 125 Worth Street, NYC, NY 10013 (212-219-8090) www.ci.nyc.ny.us and Region 2 NYSDEC at 47-40 21st Street, Long Island City, NY 11101 (718-482 4900) "www.dec.state.ny.us".
- Projects in Westchester, Rockland and Dutchess Counties, contact the Region 3 NYSDEC office at 21 South Putt Corners Road, New Paltz, NY 12561 (914-256 3000). Projects in Westchester County, contact the local municipality. Projects in Rockland County, contact the Rockland County Department of Health on Sanatorium Road, Pamona, NY 10970 (914 634 2500) "www.co.rockland.ny.us". Projects in Dutchess County, contact the Dutchess County Health Department, Division of Environmental Health Services in Poughkeepsie, NY 12601 (914-486-3404) "www.dutchessny.gov".

APPENDIX B

Community Air Monitoring Plan (CAMP)

COMMUNITY AIR MONITORING PLAN

FOR THE

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
58th STREET SIDEWALK INVESTIGATION
MASPETH, NEW YORK

Prepared for:
Consolidated Edison Company of New York, Inc.
Long Island City, New York

Prepared by:
Jacques Whitford Company, Inc.
Portsmouth, New Hampshire
Elmsford, New York

April 2009

COMMUNITY AIR MONITORING PLAN
FOR THE
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
58TH STREET SIDEWALK INVESTIGATION
MASPETH, NEW YORK

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1.0 PURPOSE

The purpose of this Community Air Monitoring Plan (CAMP) is to provide an additional margin of safety to residents and/or businesses located in the vicinity of the 58th Street Sidewalk (Site) adjacent to the former Maspeth Substation. The Site is located on the western sidewalk of 58th Street between 57th Drive and 58th Avenue in Maspeth, New York. The location of the Site is shown on Figure 1. Dust and volatile compounds may be generated during proposed investigation activities at the Site. This CAMP is designed to conform to New York State Department of Health's Generic Community Air Monitoring Plan (revised 1/6/00).

The compounds of concern at the Site are soils potentially impacted with dielectric fluids containing PCBs and, to a limited extent, volatile organic compounds (VOCs). Soil samples collected and submitted for laboratory analyses during previous investigation work from areas beneath, or within the vicinity of, the 58th Street sidewalk detected levels of PCBs ranging from 0.1 ppm to 7.1 ppm. Total VOCs in similarly-placed soils were reported at levels ranging up to 0.7 ppm (1, 2, 4, Trimethylbenzene). The potential impact to nearby residents and/or businesses may be generated from fugitive dust (potentially containing PCBs), which may become airborne as a result of the investigation activities noted below.

The proposed investigation activities depicted on Figure 2 are briefly described below.

- install up to 3 monitoring wells within the western sidewalk of 58th Street for the purpose of delineating the impact of PCBs in soils beneath the 58th Street sidewalk.

A Site-specific Environmental, Health and Safety Plan (EHASP) and a Quality Assurance/Quality Control Plan (QA/QCP) have also been developed to address the proposed activities listed above. The EHASP outlines the guidelines and requirements for the safety of on- and off-site personnel and visitors to the Site involved in the proposed investigation field activities. The QA/QCP details the quality assurance measures to be implemented during this project, including a description of instrument calibration procedures and quality assurance sampling requirements. The EHASP and QA/QCP are presented as Appendix A and Appendix C, respectively, to the Investigation Work Plan.

2.0 MONITORING PLAN

The community air monitoring network will consist of one photoionization detector (PID) for monitoring total VOCs and two particulate/dust monitors. The PID meter will be used to record the background or upwind VOC levels prior to beginning each day's work and then placed at the downwind perimeter of the work areas for real-time recording throughout the work day. The two dust monitors will be placed one upwind and one at the downwind perimeter of the work area for continuous monitoring. Based on previous experience at the adjacent former Maspeth Substation (monitoring well installation work), the upwind location will likely be near the northern property (fence) line of the former Con Edison facility. The property is currently owned by M&A Linens. The downwind perimeter will be considered just beyond the immediate work areas. (i.e. just beyond the drill rig while advancing each well).

2.1 Continuous VOC Monitoring

Total VOC concentrations will be monitored at the downwind perimeter of the work areas on a continuous basis. The PID meter (Photovac Micro-tip or equivalent) will be operated daily, beginning each morning prior to the start-up of work activities and ending each afternoon following the completion of the day's work. Readings will be collected continuously. Fifteen-minute averages will also be collected. All readings will be recorded and downloaded at the end of each day. An action level of 5 ppm (parts per million) above the background or upwind reading has been specified in the NYSDOH's community air monitoring plan and will be utilized by Jacques Whitford at this Site.

The Jacques Whitford on-site representative will review the data from the downwind perimeter PID meter every 15 minutes. The data will be evaluated for the following:

A) If the VOC concentrations at the downwind perimeter of the work area do not exceed 5 ppm above background then investigation work activities will continue unabated.

B) If the VOC concentrations at the downwind perimeter of the work area exceed 5 ppm above background, for a 15-minute interval, investigation work activities will be stopped and monitoring continued as described below:

- If the organic vapor levels decrease at the downwind perimeter of the work area, per instantaneous readings, to below 5 ppm above background, investigation work activities will resume.

- If the organic vapor levels at the downwind perimeter of the work area, per instantaneous readings, remain greater than 5 ppm over background but less than 25 ppm over background, investigation work activities can resume provided:

  - The source of organic vapors is identified and corrective actions are taken to abate the emissions (see below).

  - The organic vapor level 200 feet downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background for the 15-minute interval.

C) If the concentration at the downwind perimeter of the work area, for a fifteen-minute average reading, exceeds 25 ppm above background, investigation work activities will be shut down and corrective actions will be taken to abate the emissions.

Abatement measures are identified below.

During Monitoring Well Installation

- During saw cutting of the concrete sidewalk, the surface will be wetted down to minimize the generation of dust.

- The soil and concrete that is generated will be placed in 55-gallon steel drums, and temporarily staged on the sidewalk before being transported off-site for disposal by Con Edison on a daily basis.

- If the soil boring being advanced is near the proposed finished depth at the end of the workday, the boring will be continued to the finished depth (approximately 25 ft bgs for monitoring wells), the tools will be pulled and the well will be installed with the proper filter sand and seals (two-foot bentonite seal and cement-bentonite grout).

- If the boring is not near the proposed completion depth at the end of the workday, then the excess soil will be placed in a 55-gallon drum, and temporarily staged on the sidewalk before being transported off-site for disposal by Con Edison on a daily basis. Boring advancement will cease, the tools will be removed, the borehole will be backfilled with clean sand, and the downwind perimeter will be monitored for 30 minutes. If the downwind VOC levels drop to less than 5 ppm above background, boring advancement will re-commence. If the downwind VOC levels do not drop to less than 5 ppm above background, the ground surface will be sealed with concrete, and the work stopped for the day and/or until the issue is mitigated.

Based on previous investigative work on the adjacent property, VOC concentrations are anticipated to be at a low concentration and not anticipated to exceed the 5 ppm above background action level. However, the above-mentioned action items will be implemented if the readings exceed the 5-ppm action level.

2.2 Continuous Dust Monitoring

Each respirable dust monitor (MIE Brand, pDR-1000AN Modelor) will be operated daily, beginning each morning with the start-up of monitoring well installation activities and ending each afternoon following the completion of the day's work. Readings will be collected continuously. Fifteen-minute averages will also be collected. All readings will be recorded and downloaded at the end of each day. Action levels of 100 and 150 $\mu g/m^3$ (micrograms per cubic meter) above background or upwind has been specified in the NYSDOH's community air monitoring plan and will be utilized by Jacques Whitford at this Site.

The Jacques Whitford on-site representative will review the data from the downwind perimeter dust meter every 15 minutes. The data will be evaluated for the following:

A) If the downwind perimeter particulate level does not exceed 100 $\mu g/m^3$ above background, for a 15-minute interval, then investigation work activities will continue unabated.

B) If the downwind perimeter particulate level is 100 µg/m^3 greater than the upwind location, for a 15-minute interval, then dust suppression activities will be undertaken (see below). Work will continue with dust suppression provided that the downwind particulate levels do not exceed 150 µg/m^3 greater than the upwind location and provided that no visible dust is migrating from the work area.

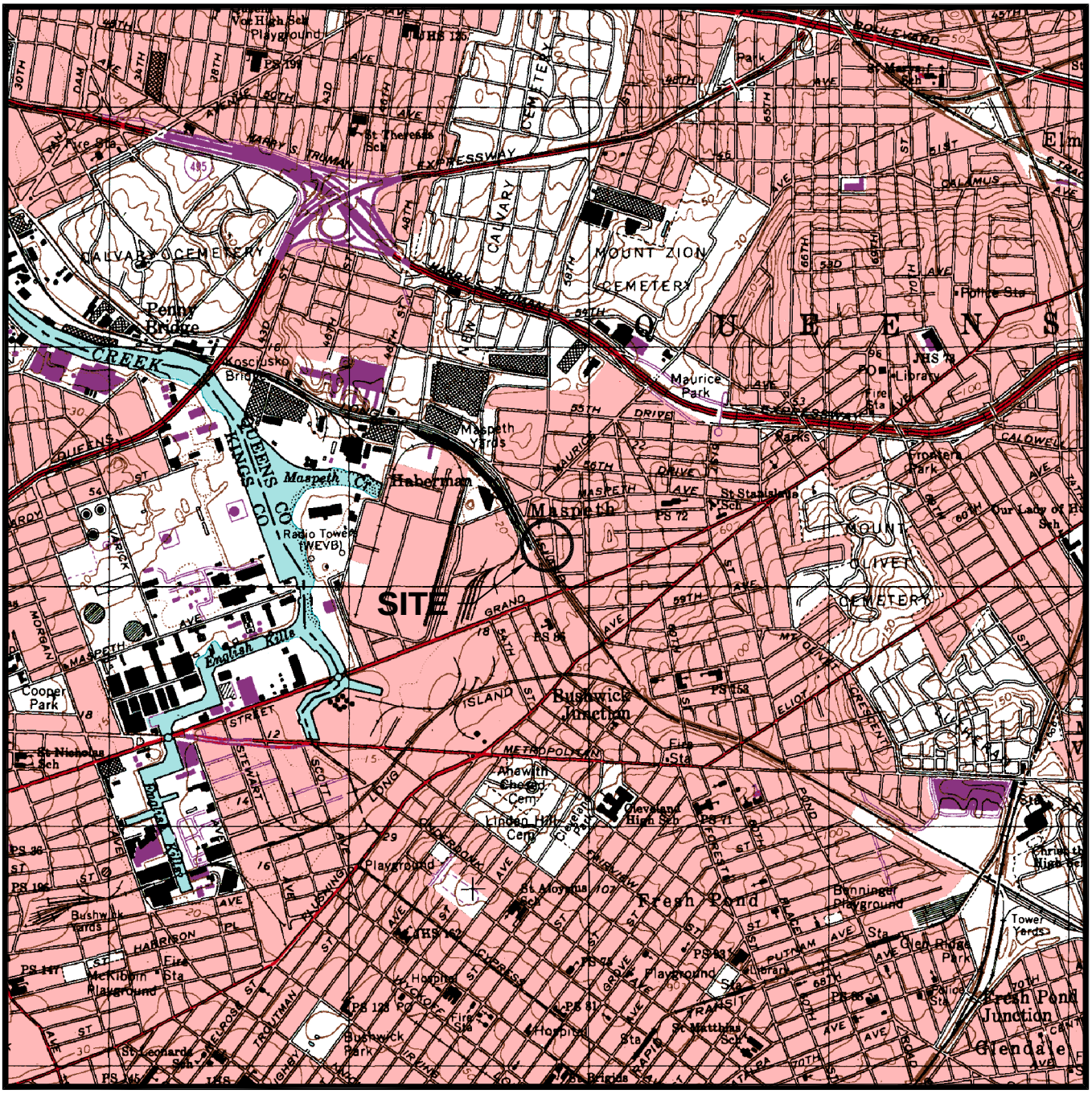
C) If, after re-starting work and dust suppression activities, the downwind perimeter particulate levels are greater than 150 µg/m^3 above the upwind level, work will be stopped for the day and corrective actions taken to abate the emissions.

Dust suppression techniques are identified below.

<u>During Monitoring Well Installation</u>

Jacques Whitford will mist the hollow stem augers with potable water using a portable 3 to 5-gallon garden sprayer to decrease the airborne dust production. During the saw cutting of the concrete sidewalk, the surface will be wetted with water to minimize the generation of airborne dust. Jacques Whitford will continue to evaluate the data from each dust monitor.

FIGURES



MAP SOURCE:

TOPOZONE.COM

USGS BROOKLYN [NY] QUAD
1995

NORTH

2000 0 2000

Scale in feet

Jacques Whitford Company, Inc.

JACQUES WHITFORD LOCATION: PORTSMOUTH, NEW HAMPSHIRE				
DATE PREPARED: 7-16-04	DESIGNED BY: DFM	DRAWN BY: TS	CHECKED BY: BSB	REVIEWED BY: DFM
REVISION DATE: 4-17-07	REVISION NO:	DRAWN BY: ADK	CHECKED BY: DFM	REVIEWED BY: DBH
PROJECT NAME/FILE NAME: CON EDISON MASPETH/SITE		PROJECT NUMBER/PHASE: 1012163.	SCALE: 1:24000	

DRAWING TITLE:

SITE LOCATION PLAN

FORMER MASPETH SUBSTATION
57-77 RUST STREET
MASPETH, QUEENS, NEW YORK

PREPARED FOR: CON EDISON

FIGURE NO. 1

ROWHOUSES

FORMER MASPETH SUBSTATION

MW-301	
SAMPLE DEPTH (ft bgs)	CONCENTRATION (ppm)
(9–11)	0.653
(15–17)	1.35

MW-302	
SAMPLE DEPTH (ft bgs)	CONCENTRATION (ppm)
(13–14)	0.414
(17–19)	0.087

MA-SW-0,57
(0–2) 0.82
(2–6) <0.0067
(6–10) <0.0069
(12) 0.015

MW-301

MA-SW-(-2,40)
(5) 0.095

MA-SW-(-2,38)
(17) 2.1

MA-SW-(-2,24)
(7) 7.14

MA-SW-(-2,23)
(16) 1.43

MW-302

MA-SW-0,15
(17) 0.2

MA-SW-0,9
(13) 0.33

58th STREET
ONE-WAY

Legend

- EXISTING MONITORING WELL
- SOIL TESTING LOCATION WITH NO PCB EXCEEDANCES
- SOIL TESTING LOCATION WITH PCB EXCEEDANCES
- PROPOSED MONITORING WELL

NOTES:

1. ALL CONCENTRATIONS IN PARTS PER MILLION (ppm)
2. LOCATIONS OF PROPOSED EXPLORATIONS ARE APPROXIMATE AND MAY CHANGE BASED ON SUBSURFACE CONDITIONS.

NORTH

SCALE IN FEET
5 0 5

Jacques Whitford Engineering Group, Inc., P.C.

JACQUES WHITFORD LOCATION: PORTSMOUTH, NEW HAMPSHIRE				DRAWING TITLE: SIDEWALK SAMPLE LOCATIONS
DATE PREPARED: 12-30-08	DESIGNED BY: GD	DRAWN BY: ADK	CHECKED BY: GD	REVIEWED BY: GD
REVISION DATE:	REVISION NO:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
PROJECT NAME/FILE NAME: MASPETH/SITE		PROJECT NUMBER/PHASE: 1012163.	SCALE: AS SHOWN	PREPARED FOR: CON EDISON

FORMER CON EDISON MASPETH SUBSTATION
57-77 RUST STREET
MASPETH, NEW YORK

FIGURE NO. 2

APPENDIX C

Quality Assurance/Quality Control Plan (QA/QCP)

QUALITY ASSURANCE/QUALITY CONTROL PLAN

FOR THE
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
58TH STREET SIDEWALK INVESTIGATION
MASPETH, NEW YORK

Prepared for:
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
Long Island City, New York

Prepared by:
JACQUES WHITFORD COMPANY, INC.
Portsmouth, New Hampshire
Elmsford, New York

April 2009

QUALITY ASSURANCE/QUALITY CONTROL PLAN
FOR THE
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
58TH STREET SIDEWALK INVESTIGATION
MASPETH, NEW YORK

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FOR THE
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
58TH STREET SIDEWALK INVESTIGATION
MASPETH, NEW YORK

1.0 INTRODUCTION

This Quality Assurance/Quality Control Plan (QA/QCP) was developed by the Jacques Whitford Company, Inc. (Jacques Whitford) on behalf of the Consolidated Edison Company of New York, Inc. (Con Edison). This QA/QCP details the protocols and procedures that will be implemented during investigation activities performed on the 58th Street sidewalk (Site), adjacent to the former Maspeth Substation located at 57-77 Rust Street in Maspeth, Queens County, New York (see Figure 1). The proposed Site Investigation activities include the advancement of approximately three monitoring wells through the western sidewalk of 58th Street, which is adjacent to and east of the former Con Edison property. The Site is surrounded by a mixed residential and commercial area.

The primary objectives of the QA/QCP are to provide quality assurance (QA) and maintain quality control (QC) during sampling and testing activities that will be conducted as part of the Site Investigation and monitoring activities. Implementation of the QA/QCP will ensure that investigation activities are performed in a manner consistent with the data quality objectives (DQOs) described herein.

In summary, this QA/QCP identifies project responsibilities and prescribes guidance and specifications to satisfy QA/QC objectives and thus, promote:

- Collection of representative samples;
- Generation of data that are valid for the objectives of the Site Investigation;
- Consistent and complete documentation of field activities performed during Site Investigation; and
- Accountability of field and laboratory activities.

The QA/QC objectives will be achieved by:

- Adhering to standard sample collection, sample handling and analytical protocols and procedures;
- Implementing a sample tracking system and adhering to chain-of-custody protocols;
- Confirming the quality of the sampling and analytical methods through quantitative and qualitative data assessment methods; and
- Ensuring that all aspects of the measurement process, from field through laboratory, are documented to provide data that are technically sound and legally defensible.

2.0 BACKGROUND

2.1 Site History

The Site is immediately adjacent to the former Maspeth Substation, which is located in a mixed residential and commercial area. The former Maspeth Substation is located at 57-77 Rust Street in Maspeth, Queens County, New York. The Site to be investigated is located on the sidewalk, immediately east of the former Maspeth Substation. The Site is bounded by 58th Street to the east, 57th Drive and residences to the north, the former Maspeth Substation to the west and 58th Avenue to the south.

Between 1925 and 1985, Con Edison and its predecessor, the New York and Queens Electric Light & Power Company, operated an electric distribution substation at the Site. In June 1996, Con Edison sold the Site to LDC Realty Holdings, L.L.C. ("Encore"). In December 1997, RAW Realty & Equipment Company ("Raw") acquired the Substation from Encore. Encore and Raw conducted tire-recapping operations at the Substation. The former Substation property is presently owned and occupied by M & A Linens, a wholesale fabric supplier.

Subsurface soil and groundwater samples were collected during several phases of investigation work at the former Substation property and analyzed for pertinent parameters (including polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals). The investigation results indicated that limited exceedances of regulatory standards existed in subsurface soil and groundwater at the former Substation property. The results further indicated that the main contamination issue at the former Substation property was free-phase product (at depth) containing PCBs. Free product had been measured in monitoring wells, located primarily within the properties boundaries, ranging from a sheen on the groundwater surface to approximately two feet in thickeness. Some free-phase product was observed/measured in a monitoring well located within the western sidewalk on 58th Street. The specific PCB compound in the product had been reported as Arochlor-1260 at concentrations from 1.1 to 328 ppm. The seasonal fluctuation of the water table on the Substation property further suggested the product had likely created a smear zone at depths of approximately 12 to 18 feet below land surface (bls).

Con Edison evaluated a number of options for the remediation of the PCB-contaminated soil and free phase product at the former Substation property. Based on a review of the data collected and subsequent discussions with the New York State Department of Environmental Conservation (NYSDEC), Con Edison selected a remedial action consisting of "Soil Excavation/Free Product Removal". The target depth of the excavation was 18 feet bls.

Between 2004 and 2008, contractors retained by Con Edison removed the impacted soils from beneath the former substation property. A Final Engineering Report (FER) for this work is currently being prepared for transmittal to the NYSDEC. During the investigation and remediation on the former Con Edison property, PCB impacts noted on the former Con Edison property had migrated over the property line and impacted soil and/or groundwater off-site. Off-site impacts were observed in two locations. To the north, soils were observed to be impacted in the backyards of several residences abutting the Con Edison property. The contaminated soils in the abutting residential backyards were removed and appropriately backfilled during 2007 and 2008. An Off-site

Final Engineering Report (Off-Site FER) for this work in the backyards is currently being prepared for transmittal to the NYSDEC. The second location where impacts were observed to have migrated off-site was to the east, beneath the 58th Street sidewalk. The impacts that were observed off-site to the east included impacts to both soil and groundwater. Further investigation of these off-site impacts is the subject of the accompanying Work Plan.

2.2 Project Objectives

The objectives of the Site Investigation are as follows:

- Determine the extent of impacted soils beneath the 58th Street sidewalk;
- Determine the extent of free-phase product and/or groundwater impacts beneath the 58th Street sidewalk;
- Evaluate appropriate means to address the impacted soils and/or groundwater, if appropriate.

2.3 Project Task Description

The proposed Site Investigation will be comprised of the advancement of up to three monitoring wells to depths of approximately 25 feet beneath the 58th Street sidewalk. The monitoring well locations will be spaced approximately ten feet north, east, and south of existing monitoring wells MW-301 and MW-302 (see Figure 2). Soil samples will be collected during borehole advancement from previously fixed intervals throughout the length of the borehole. The soil samples will be transported to a NYSDEC-approved laboratory to be analyzed for PCBs and TPH. Monitoring wells will be constructed in the boreholes as a means to collect groundwater samples. Groundwater samples will be transported to a NYSDEC-approved laboratory to be analyzed for PCBs and VOCs.

2.4 End Use Data

The laboratory data generated during the Site Investigation will be used to confirm the goals of the project have been achieved. The level of analytical support must be carefully considered to ensure the data are of sufficient quality to satisfy the goals of the Site Investigation. Analytical support will be employed for different components of the investigation as follows:

- Level III: Analysis Using New York State ASP Methods. - Level III analytical support data will be generated for laboratory analysis performed using SW-846 methodologies and methods contained in U.S. Environmental Protection Agency (EPA) "Methods for Chemical Analysis of Water and Waste," EPA-60014-79-020, 1983. All analyses will be in accordance with New York State ASP protocols with Category B deliverables. This level is used primarily in support of engineering studies using standard approved procedures. Level III analytical support will be used for analysis and reporting of all samples analyzed by the laboratory.
- Level I: Field Screening. - This level is characterized by the use of portable instruments, such as a photoionization detector (PID), and dust meters.

These field instruments can provide real-time data to assist in the optimization of sampling point locations and for health and safety support. All routine air monitoring (as discussed in the Community Air Monitoring Plan and EHASP) and soil screening will be conducted using Level I analytical support.

3.0 PROJECT MANAGEMENT

Activities of personal involved in this project include supervision of field activities, health and safety, and the evaluation and interpretation of data, as discussed below.

The individuals who are responsible for ensuring the collection of valid measurements and data and the routine assessment of measurement systems for precision and accuracy include the Con Edison Project Manager, Remediation Project Manager, Project QA/QC Officer, and Laboratory QA/QC Officer.

The key project personnel and their primary responsibilities are summarized below.

Con Edison EH&S Remediation:	Mr. Barry Cohen
Con Edison Project Manager:	Mr. Edward Wiederkehr
Remedial Engineer:	Mr. Craig R. Gendron, P.E.
Administrative Project Manager:	Mr. David Hill, Principal Geoscientist
Program/Project Manager:	Mr. Gregory DelMastro, PG
Project QA/QC Officer:	Mr. Donald Moore, Senior Scientist
Field Team Leader:	Mr. Bruce Bline, Field Geologist
Health and Safety Officer:	Mr. Bruce Bline, Field Geologist
Laboratory QA/QC Officer:	Ms. Dulce Litchfield
Third-Party Data Validator:	Mr. Donald Anne

3.1 Con Edison Project Manager

The Project Manager will serve as Con Edison's representative in reviewing the progress of work, overseeing all field activities, and participating in field meetings. In addition, the Con Edison Project Manager will be responsible for monitoring field activities to ensure compliance with the overall scope of work and health and safety requirements.

3.2 Investigation Project Manager

The Investigation Project Manager will be responsible for coordination and implementation of the elements of the Site Investigation. The Investigation Project Manager will be responsible for ensuring completion of the progress reports as well as participating in all major meetings with Con Edison, as needed, during the course of the project.

The Investigation Project Manager will also be responsible for adherence to project schedules; preparation of reports; development and monitoring of cost control measures; reviewing and assessing the performance of technical staff and laboratory subcontractors; maintaining complete, orderly project documentation; interacting with the Con Edison Project Manager and the NYSDEC throughout the project; and managing project-specific problems and resolving project related issues.

3.3 Project Quality Assurance and Quality Control Officer

The Project QA/QC Officer will be responsible for reviewing field notes and field laboratory measurements, for compliance with QA objectives (precision, accuracy and

completeness criteria) as stated in this QA/QCP, and notification to the Con Edison Project Manager of any QC deficiencies.

3.4 Laboratory Quality Assurance and Quality Control Officer

The Laboratory QA/QC Officer will be responsible for quality control procedures and QC checks in the laboratory, and will ensure strict adherence to laboratory protocols. In addition, the Laboratory QA/QC Officer will be responsible for tracking the movement of each sample from the time the samples are received at the laboratory until the final analytical data are assembled in the report. Test results and data management reports, including analytical data, quality control data, chain-of-custody documentation, the appropriate historical data, will be assembled electronically by the laboratory personnel under the supervision of the Laboratory QA/QC Officer. All calculations will be reviewed by the Laboratory QA/QC Officer.

3.5 Special Training / Certification

Training requirements beyond routine training for each of the project personnel are not warranted for the work prescribed in the Investigation Work Plan and/or this QA/QCP.

3.6 Project Documentation and Records

A project file will be maintained by the Investigation Project Manager, which will contain complete project documentation. This file will include project plans and specifications; field notebook(s); field logs and data records; photographs; maps and drawings; sample identification documents; chain-of-custody records; the entire analytical data package(s) provided by the laboratory including QC documentation; gas chromatograms; mass spectra; references and literature; report notes and calculations; progress and technical reports; correspondence; and other pertinent information. All such project records will be accessible to Con Edison and the NYSDEC.

4.0 QA OBJECTIVES FOR MEASUREMENT DATA

Data Quality Indicators (DQI) are qualitative and quantitative descriptors used to interpret the degree of acceptability or usability of data. The primary DQIs are precision, accuracy (bias), representativeness, comparability and completeness. Of these DQIs precision and accuracy are quantitative measures, and representativeness and comparability are qualitative measures of data quality.

Within a quantitative and qualitative context, the DQIs are evaluated and measured. In order to assess the data, laboratory and field QC samples will be collected. The QC samples include field duplicates; laboratory matrix spike/matrix spike duplicates; field, lab, and trip blanks; and laboratory control samples such as surrogates. The QC samples are discussed in Section 9.0 and are summarized in Table 3. To assess precision, comparability, and representativeness, QC samples will include field duplicates and laboratory matrix spike/matrix spike duplicates. Matrix spikes, blanks and laboratory control samples are used to assess accuracy; and blanks, and split-samples are used to assess representativeness.

4.1 Data Precision

Precision is a measure of mutual agreement among individual measurements of the same property. Precision is measured by analyzing field duplicate and laboratory duplicate samples. The relative percent difference or RPD of duplicate measurements can be used to evaluate analytical precision. The smaller a RPD, the greater the analytical precision. Relative Percent Difference is calculated from initial and duplicate sample analytical results using the following equation:

$$RPD\% = \frac{(C1-C2)}{(C1+C2)/2} \times 100$$

where:

C1 = The larger of the two observed values.
C2 = The smaller of the two observed values.

Both spike recovery and RPD can be determined using the analytical results of matrix spike and matrix spike duplicate samples (MS/MSD).

Duplicate samples will be used to assess the overall effects of the sample collection and analysis procedures on precision; some samples will be collected in duplicate. One of the duplicates will be given a “coded” identifier and will be submitted as a ‘blind’ duplicate, along with the original sample for analysis. Comparisons of the results from the original sample and the blind duplicate will allow for an evaluation of the precision RPD. One coded field duplicate will be collected for every twenty environmental samples or during each separate activity covered in the QA/QCP. Matrix spike and matrix spike duplicate samples will also be collected.

The referenced analytical methods cite precision control limits or give guidance on how to establish precision control limits. Control limits are typically generated from multiple analyses and inter-laboratory comparison studies. Control limits are method, compound, and matrix dependent.

Acceptable levels of laboratory precision will vary according to the sample matrix, the specific analytical methods, and the analyte concentration relative to the method detection limit (MDL). Quality assurance objectives for precision will also be supported through the use of written laboratory standard operating procedures (SOPs) and properly calibrated instruments. Laboratory precision will be assessed by the analysis of matrix spike/matrix spike duplicate and/or laboratory duplicates. Laboratory precision is evaluated using United States Environmental Protection Agency (USEPA) guidelines for the specific method reference in concert with laboratory SOPs and this project-specific QA/QCP.

4.2 Data Accuracy

Accuracy/bias is the degree of agreement of a measurement with an accepted reference or true value. The difference is usually expressed as a percentage or ratio. Accuracy is a measure of the bias of a system. The accuracy/bias of laboratory analytical measures is evaluated through the analysis of method blanks, sample matrix spikes, matrix spike duplicates, sample surrogate recoveries, performance evaluation samples, and Laboratory Control Samples. Accuracy/bias-contamination is assessed by trip blanks (VOCs), equipment blanks, method blanks, and instrument blanks that evaluate how the data is affected by contamination.

Accuracy may be expressed as a percent difference (%D) calculated by the following equation:

$$\%D = \frac{(V_t - V_m)}{V_t} \times 100$$

Where:

V_t = the true or real value expected.
V_m = the measured or observed value.

This same relationship holds for the expression of accuracy as a percent recovery (%R) of a known method analyte or surrogate spike:

$$\%R = \frac{(SSR - SR)}{SA} \times 100$$

Where:

SSR = the spiked sample result.
SR = the unspiked sample result.
SA = the value of the spike added.

Acceptable levels of accuracy and precision will be achieved by close adherence to all sampling procedures, sample preservation, decontamination procedures, and analytical methodology. Failure to achieve acceptable levels of accuracy and precision will trigger the implementation of a corrective action as described in Section 12.0 of this QA/QCP.

The objective for field measurement accuracy is to achieve and maintain the manufacturer's specifications for field equipment. The objective for accuracy of laboratory determinations is to maintain a system, which can be demonstrated to achieve measurements that are within accuracy criteria.

4.3 Data Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variation, or environmental condition. Representativeness will be controlled by the consistent collection and analysis of samples according to standardized procedures. Representativeness can be assessed through the measures of precision and accuracy. Field documentation, field duplicate analyses, laboratory QC sample results, and data trend analysis all provide indices for the evaluation of data representativeness.

The degree that the data collected during the Site Investigation represent actual conditions at the Site is a function of the:

- Number and location of data collection points;
- Choice of parameters for physical and chemical analysis; and
- Choice of specific technologies for data collection.

Samples collected must be representative of the population. The sampling program has been developed on a "biased" sampling approach. The sample locations (monitoring well locations and depths) have been selected based on a review of Site information and engineering practicability.

Representativeness of specific samples will be achieved by the following:

- Using appropriate sampling procedures, sample containers, and equipment;
- Using appropriate analytical methodologies for the parameters and detection limits required;
- Using applicable techniques for homogenizing samples prior to analysis where appropriate;
- Analyzing the sample within the appropriate holding time; and
- Properly preserving and storing the samples.

Sampling devices will be cleaned between sampling points to minimize the potential of cross-contamination between samples and thus producing samples that "misrepresent" actual sample quality. Decontamination procedures are described in Section 6.3 of this QA/QCP.

A trip blank, which consists of sampling glassware filled with deionized, analyte-free water at the laboratory, will be included in each cooler of soil and groundwater samples shipped to the laboratory for VOC analysis.

The laboratory will make every reasonable effort to assure that soil samples are adequately homogenized prior to taking aliquots for analysis, so that the reported results are representative of the sample received. It must be recognized that excess handling

may expose the sample to significant risk of contamination and will be avoided if possible.

4.4 Data Completeness

Completeness is a measure (percentage) of the amount of valid data obtained from a measurement system relative to the amount that would be expected to be obtained under correct, normal conditions. Valid data are data that are soundly founded as evidenced by the successful attainment of the Data Quality Objectives set forth for their determination.

$$\text{Completeness (A\%)} = \frac{\text{No. of valid values reported for parameter y} \times 100}{\text{No. of samples collected for analysis for y}}$$

Based on Site accessibility, it is believed that 100 percent of the proposed samples can be collected. It is expected that the laboratory will provide data meeting QC acceptance criteria for 95 percent of all samples analyzed. Laboratory data will be reviewed by the laboratory and project QA/QC Officers for completeness. Corrective actions to achieve a complete data set may include any of the following: re-analysis, re-extraction and/or re-sampling.

The QA objective for completeness will be optimized by employing and evaluating frequent QC checks throughout the analytical process so that sample data can be assessed for validity of results and to allow for reanalysis within the hold time when QC indicates a problem.

4.5 Data Comparability

Comparability expresses the confidence with which one data set can be compared to another. The data generated from this Site should be comparable with similar sample matrix measurements made by others such as previous on-site investigations.

To assure that the measurements are comparable, sample collection and analysis will follow standard EPA methods; also, standard-reporting units will be used for all data. Soil sample analytical data will be reported in units of micrograms per kilogram (ug/kg) or parts per billion (ppb). Aqueous sample data for organic analytes will be reported in micrograms per liter (µg/l).

The comparability objective for this project will be attained by:

- Previous studies at the site, equivalent sampling and testing will be used;
- Demonstrating traceability of standards to the National Institute of Standards and Technology or USEPA sources;
- Using standard methodologies;
- Reporting results from similar matrices in consistent units;
- Applying appropriate levels of QC within the context of the Laboratory Quality Assurance Program; and
- Participating in inter-laboratory performance evaluation studies in support of laboratory certification to document general laboratory performance.

4.6 Traceability

Traceability is defined as the ability to reconstruct and review all aspects of the measurement system through available documentation.

Field activities should have the following documentation to support traceability:

- Standard Operating Procedures;
- Field logbooks;
- Names of field personnel; and
- Field personnel training records.

The field measurements should be supported by the following additional documentation:

- Instrument identification numbers;
- Instrument calibration records;
- Instrument precision and accuracy data as measured in the field;
- Source and concentration of the standards; and
- Instrument maintenance records.

Laboratory data traceability documentation exists in two forms: that which links final numerical results to authoritative measurement standards, and that which explicitly describes the history of each sample from collection to analysis. The subcontracted laboratory will provide the sample histories as part of the analytical laboratory report.

5.0 ANALYTICAL PROCEDURES

5.1 Analytical Methods

Soil and groundwater will be analyzed using Level III Analytical Support, as defined in Section 2.3 of this QA/QCP. The analyses will be performed in accordance with U.S. EPA SW-846 methodologies and methods contained in the document titled, "Methods for Chemical Analysis of Water and Wastes" SW-846, 3rd Edition, November 1986 (as updated), EPA-600/4-79-020, 1983 (as updated) and in accordance with New York State ASP protocols. The selected laboratory shall be a NYS DOH ELAP laboratory as well as CLP Tier accredited for each of the sampling categories (i.e., PCBs, VOCs, and TPH) in the sampling program.

Level I Analytical Support will be utilized for screening of dust and VOCs in ambient air using dust meters and PIDs as defined in Section 2.3 of this QA/QCP.

The methodologies for the analyses are summarized in Table 1.

5.2 Sample Containers, Preservatives and Holding Times

The types of containers used for specified analyses as well as the required preservation and applicable holding times are detailed in Table 1 of this QA/QCP. All sample containers will be obtained from the subcontracted analytical laboratory. Sample containers will be cleaned and quality controlled in accordance with OSWER Directive No. 9240.0-50A "Specifications and Guidance for Obtaining Contaminant Free Sample Containers ".

All sample containers used will be IChem 300 Series, Eagle-Picher Level I, or equivalent. IChem 300 Series and Eagle-Picher Level I glassware come with a certificate of analysis.

6.0 SAMPLING METHODS AND FIELD MEASUREMENTS

This section of the QA/QCP outlines the procedures and requirements for sampling of soil, groundwater, and for field measurements. A summary of the scope of work for sample collection is included in Section 5 of the Work Plan. A detailed description of each task procedure is provided in the following Sections of the QA/QCP.

An effort will be made to utilize disposable sampling equipment during field sample collection. Should non-disposable sampling equipment be required, one field blank will be collected per twenty samples/media.

6.1 Soil and Groundwater Sampling

This section outlines the sample collection procedures that will be implemented during the Investigation program. The soil samples will be collected via the methods noted below.

6.1.1 Hand-Cleared Sampling

The following procedures apply to soil samples collected from the hand-cleared excavations (from 0 to 5 feet). One discrete grab sample from the sidewall will be collected from each of the three cleared excavations. Vertical sampling intervals will be from 0-2 feet (to monitor the surficial soil). This equals a total of three hand-cleared sampling locations.

- Wear the appropriate personal protective clothing and perform ambient air monitoring of the work areas, as dictated by the EHASP.
- Field locate the sampling locations by measuring distance relative to the established on-site 0,0 coordinate and using dimensions obtained from a scaled Site map.
- Clear the area to be sampled of any surface debris.
- Characterize the soil being removed by hand tools and Vactron in accordance with the Unified Soil Classification System (ASTM D2488-00).
- Use stainless steel utensils to collect discrete soil from the hand excavation and place material into a stainless steel bowl.
- Place in appropriate sample containers for the required PCBs testing.
- Samples for laboratory analyses will be labeled and placed in a laboratory-supplied cooler and packed on ice (to maintain a temperature of 4^0 C). The coolers will be picked up on-site by a laboratory courier and then transported to the laboratory for analyses.
- Decontaminate all non-disposable equipment following the procedures outline in Section 6.3 of this QA/QCP.
- Excess soil remaining after sampling will be containerized on-site for same-day removal.

6.1.2 Soil Boring Advancement

- Soil borings will be drilled with 4.25-inch (minimum) inner diameter (ID) hollow stem augers. Alternative methods may be used at the geologist's discretion with the authorization of Con Edison.
- Split-spoon samples will be collected continuously from the ground surface to the bottom of the boring (estimated at 25 feet).
- Split-spoon sampling will be conducted in accordance with ASTM Specification D-1586-84 for standard penetration test and split barrel sampling, unless otherwise authorized by the field geologist.
- After collecting each split-spoon sample, the borehole will be drilled to a depth equal to the top of the next sampling interval, unless the geologist authorizes otherwise.
- Soil samples retrieved from the borehole will be visually described for: 1) percent recovery, 2) soil type, 3) color, 4) moisture content, 5) texture, 6) grain size and shape, 7) consistency, 8) visible evidence of staining, and 9) any other observations. The descriptions will be in accordance with the Unified Soil Classification System (USCS).
- Soil samples will be immediately screened for the evolution of organic vapors with a photoionization detector (PID). A representative portion of the split-spoon sample will be placed in a plastic "ziplok" bag or an eight-ounce sample jar filled approximately half full. The sample jar will be covered with aluminum foil, the cap will then be screwed on tightly. Sample jars and/or ziplok bags will be labeled with the boring number and interval sampled. After a minimum of 10 minutes, the lid will be unscrewed and the tip of the PID will be inserted through the aluminum foil or into the bag to measure the headspace for organic vapors.
- Drill cuttings will be disposed of in accordance with methods specified in Section 5 of the Investigation Work Plan.
- All drilling equipment will be decontaminated between each boring in accordance with methods specified in Section 6.3.
- The designated field geologist will log borehole geology and headspace measurements in the field book and the Drilling Record shown in Figure 4. 1, or similar form.

6.1.3 Soil Sampling

- The number and frequency of samples to be collected from each boring and the associated analytical parameters are summarized on Table 3 below.
- Samples for PCB and TPH analyses will be placed into a stainless steel bowl, homogenized, and placed in appropriate containers.
- The sample containers will be labeled, placed in a laboratory supplied cooler and packed on ice (to maintain a temperature of 40 C). The coolers will be shipped overnight to the laboratory for analysis.
- Chain-of-custody procedures will be followed as outlined in Section 7.
- The sampling equipment will be decontaminated between samples in accordance with procedures described in Section 6.3.
- Excess soil remaining after sampling will be contained in accordance with methods specified in Section 5 of the Investigation Work Plan.
- The sample locations, descriptions, and depths will be recorded in the field book.

6.1.2 Monitoring Well Installation

- Wear the appropriate personal protective clothing and perform ambient air monitoring of the work areas, as dictated by the EHASP.
- Prepare the sampling Site by laying out clean plastic sheeting on level ground near the sampling area and place equipment and materials to be used on the plastic.
- Advance borehole via hollow stem augers to a design depth of approximately 25 feet bgs. Record all measurement details in the field logbook.
- Install a 2-inch diameter polyvinyl chloride (PVC) well consisting of approximately 10 feet of riser and a 15-foot length of PVC 20-slot well screen straddling the water table.
- Install a filter pack (Morie #1 or equivalent) in the annular space from the bottom of the hole to a depth of two feet above the top of the screen.
- Place a 1- to 2-foot thick bentonite pellet/chip seal immediately above the filter pack and add water and allow the bentonite to hydrate for approximately 30 minutes.
- Backfill the remaining annular space with a cement/bentonite grout to within 1-foot of the surface.
- Finish the monitoring well at grade with a flush-mount curb box set in cement that is sloped away from the well to prevent water collection at the well.

6.1.3 Well Development

Following installation, all new monitoring wells will be developed as described below.

- Wear the appropriate personal protective clothing and perform ambient air monitoring of the work areas, as dictated by the EHASP.
- Prepare the wellhead by laying out clean plastic sheeting on level ground near the wellhead area and place equipment and materials to be used on the plastic.
- Measure the depth water and depth to the bottom of the well using an electronic oil/water interface probe prior to developing.
- Install dedicated polyethylene tubing with Waterra^{TM} check valve and surge-block in each well. Position the bottom of the tubing so that it is at the approximate center of the water column or well screen. A sufficient length of tubing will remain above ground to allow connection to a peristaltic or bladder pump.
- Utilize traditional Waterra pumping oscillations to remove water and sediments from the well and the formation outside the screen.
- Periodically attach a peristaltic pump or bladder pump to the dedicated polyethylene tubing to pump the well at periodic rates of one to two liters per minute to clear the well.
- Place all discharge water in five-gallon buckets for appropriate disposal (see below).
- Repeat this process several times to maximize sediment movement.
- After several surge and pump sequences, purge the well using low-flow development/sampling technique, (i.e. via a bladder pump or a peristaltic pump through a closed flow-through cell (for field parameter monitoring)).
- Collect the development water in five-gallon buckets.
- Every well volume, collect pH, specific conductivity, temperature, and turbidity measurements during development and record the results in the field logbook.

- Continue monitoring well development until the purge water is 50 NTUs, or a maximum of two hours.
- Upon completing the development, transfer the development water from the five-gallon buckets to NYSDOT-approved closed-top 55-gallon steel drums. Drums should not be filled more than half full and properly labeled.
- The drums will be labeled as waste fluids pending analysis and temporarily stored on-site in an area designated by Con Edison prior to same-day disposal by Con Edison.

6.1.4 Groundwater Sampling

As noted above, up to three newly installed monitoring wells will be gauged for the presence or absence of product and depth to water and subsequently sampled. Following water level measurements, each of the new temporary wells will be purged and low-flow sampled as outlined below. Sampling will be performed approximately two weeks after completing well development.

- Wear the appropriate personal protective clothing and perform ambient air monitoring of the work areas, as dictated by the EHASP.
- Prepare the sampling Site by laying out clean plastic sheeting on level ground near the sampling area and place equipment and materials to be used on the plastic;
- Collect the samples from the non-contaminated or known or suspected least contaminated wells first and then to wells of increasing contamination to avoid potential cross-contamination.
- Prior to sampling use a decontaminated electronic oil/water interface probe to gauge the depth to product (if any) and depth to groundwater.
- Record all measurements and any observations in the bound field logbook.
- Connect a positive displacement pump to the dedicated polyethylene tubing and position the pump at the approximate center of the water column or well screen. Sufficient length of tubing will remain above ground to allow connection to a closed flow-through cell for field parameter monitoring.
- Turn on the positive displacement and purge groundwater at a rate of 200-500 ml/minute from the well. If the well goes dry, allow the well to recover and collect a sample.
- Measure flow rate using a container calibrated for volume and a stopwatch.
- During well purging, pump groundwater through a flow-through cell or collect periodic samples into a clean container and measure and record the following parameters using a water quality multi-meter: pH, conductivity, temperature, and turbidity.
- Perform measurements each well volume until the well parameters have stabilized (described below). Every effort should be made to lower the turbidity to < 50 NTU before sampling. If the turbidity cannot be reduced below 50 NTU's, samples may be collected if all other parameters are stable. Measurements will be recorded in the field logbook.
- Parameter stabilization is considered to be achieved when three consecutive readings collected at each well volume, are within the following limits:

    - Turbidity (+/-10% for values greater than 1 NTU);
    - Dissolved Oxygen (+/-10%);
    - Specific conductance (+/-3%);

- Temperature (+/-0.1 degree Celsius);
- pH (± 0.1 unit); and
- Eh (redox potential ((+/-10%)).

- During well purging, record pump tubing intake depth, the water level, the water level drawdown, and flow rate in the field logbook.
- After purging has been completed, stabilization has been achieved, or the well has been allowed to recover, collect a groundwater sample through the tubing at a flow rate of 100-250 ml/minute.
- After all samples have been collected at each well, the positive displacement pump shall be disconnected from the polyethylene sampling tubing.
- During the purging process, collect the purge water in five-gallon buckets.
- Upon completing the purging or as necessary, transfer the purge water from the five-gallon buckets to NYSDOT-approved closed-top 55-gallon steel drums. Drums should not be filled more than half full and properly labeled.
- The drums will be labeled as waste fluids pending analysis and temporarily stored off-site prior to same-day disposal by Con Edison.
- The probe and pump shall be decontaminated following the procedures outlined in Section 6.4 of this QA/QCP.

6.2 Air Monitoring for VOCs and Airborne Dust

Specific details on action levels are described in the Community Air Monitoring Plan (CAMP) developed for the proposed work. The CAMP is provided in Appendix B of the Investigation Work Plan.

Photo-ionization detectors (PID) and respirable dust meters will be used for air monitoring at the Site. The PID will provide data regarding the presence or absence of VOCs in ambient air. Monitoring for VOCs in air will be performed with a Photovac Micro-tip or equivalent. Monitoring for airborne dust will be performed with a respirable dust monitor (MIE Brand, pDR-1000AN Modelor or equivalent).

The following procedure details use of the PID. Isobutylene span gas at a concentration of 100 ppm will be used to calibrate the PID.

- Calibration shall be performed on the frequencies specified in Section 8.2 of this QA/QCP. However, the PID should be checked periodically using calibration gas and re-calibrated as appropriate. The PID calibration should be checked more frequently should atmospheric conditions at the Site change noticeably during the day as indicated by changes from fair to rainy weather, cold front, sudden gusty winds, etc.
- Allow the PID lamp to warm up and confirm that the PID is responsive by using a solvent-based marker (e.g., Sharpie™) or calibration gas.
- Record both the maximum and steady PID readings in the field logbook.
- The PID readings should be allowed to return to zero prior to the next screening.
- PID readings that climb steadily or are anomalously high should be considered suspect. Check the PID for sensitivity to moisture by placing a saturated paper towel inside a clean empty sample bag, and using the PID to measure the headspace. If readings above the background for the bag are measured check the PID (filter, sample tube, detector window) and re-calibrate. If the apparent

moisture effects are not corrected then obtain another PID for subsequent samples.

- PID readings that are anomalously low should be considered suspect and should be checked. Check the PID to confirm that the battery is charged, the pump is working, the probe tube and or filter are not clogged, lamp is on, and window is not fogged. Consult the manufacturer's instruction manual for additional trouble shooting procedures.
- Document all PID measurements, any anomalous PID readings, corrective/ maintenance measures, re-calibrations, changes in atmospheric conditions, etc. in the field notebook.

The following procedure details use of the dust meter. Ambient air at an upwind location will be used to calibrate each meter.

- Calibration will be performed each morning prior to beginning the days work activities and checked periodically and re-calibrated as appropriate. Dust meter calibration should be checked more frequently should atmospheric conditions at the Site change noticeably during the day as indicated by changes such as sudden gusty winds, etc.
- Program the dust meter to record airborne dust in both real-time concentrations (continuously) and in time averaged concentrations (fifteen-minute averages).
- Allow the dust meter to sample the air passively (i.e. without a pump);
- The dust meter readings should be allowed to return to zero prior to the next screening. Zeroing is accomplished by means of a hand-inflatable "zero air" pouch provided with each meter.
- Review the dust meter readings every 15 minutes and compare the readings with the action levels of 100 and 150 $\mu g/m^3$ (micrograms per cubic meter) above background or upwind as specified in the NYSDOH's community air monitoring action levels.
- Consult the manufacturer's instruction manual for any trouble shooting procedures.
- Document all dust meter readings, any corrective/ maintenance measures, re-calibrations, changes in atmospheric conditions, etc. in the field notebook.

6.3 Decontamination

Between soil and groundwater sampling events, the sampling equipment, and non-disposable field equipment will be decontaminated. Decontamination will be performed as follows:

Drilling Equipment

- All drilling equipment including the drilling rig, augers, bits, rods, tools, and tremie pipe will be cleaned with a high-pressure steam cleaning unit before beginning work.
- Tools, drill rods, and augers will be placed on sawhorses or polyethylene plastic sheets following steam cleaning. Direct contact with the ground will be avoided.
- All augers, rods, and tools will be decontaminated between each drilling location according to the above procedures.

Split-Spoon Equipment

- Rinse with potable water;
- Use a bristle brush and potable-water/AlconoxTM (or an equivalent non-phosphate soap) solution to remove residual soil;
- Rinse with potable water;
- Rinse with isopropanol; and
- Perform a final rinse with deionized water.

Groundwater Sampling Equipment

- Rinse with potable water;
- Use a bristle brush and potable-water/AlconoxTM (or an equivalent non-phosphate soap) solution to remove residual soil;
- Rinse with potable water;
- Rinse with isopropanol; and
- Perform a final rinse with deionized water.

The water generated through the decontamination procedures will be stored in an on-site drum for daily disposal.

6.4 Field Documentation

Documentation of field observations and measurements will be primarily recorded in a field logbook. The field logbook will contain all field observations, notes, measurements, etc. Field logbooks utilized on this project will consist of a bound, water-resistant notebook. All pages of the logbook will be numbered sequentially and observations will be recorded in indelible ink. Field log sheets may also be used to record field measurement, observations, data, etc., but will be considered secondary records.

The field logbook for this project will be project-specific and will be maintained in the project files following completion of the Sidewalk Investigation.

For sampling and field activities, the following types of information may be recorded:

- Project name;
- Date;
- Time of notebook entry;
- Personnel;
- Specific activities being conducted;
- Weather conditions;
- Subcontractor information;
- Site observations;
- Site sketches; and
- Photograph log.

The following sections outline the information that will be documented in the field according to the media to be sampled and the activities to be performed:

Soil Sampling

- Personnel;
- Location diagram;
- Date and time of sampling (start and end);
- Sample location ID;
- Depth interval of sample collection;
- Parameters to be analyzed;
- Description of sampling procedures;
- PID readings;
- Description of visual observations of soil properties (soil type, color, odors, etc.);
- General observations;
- Weather conditions;
- Identification and description of any field duplicate samples; and
- Photograph logs.

Groundwater Sampling

- Personnel;
- Location diagram;
- Date and time of sampling (start and end);
- Sample location ID;
- Depth to water/depth to free-phase product;
- Recorded purging parameters (Temp, ph, Specific conductance, turbidity);
- Parameters to be analyzed;
- Description of low-flow sampling procedures;
- PID readings;
- Description of visual observations of groundwater (LNAPL, sheen, color, odors, etc.);
- General observations;
- Weather conditions;
- Identification and description of any field duplicate samples; and
- Photograph logs.

Each soil and groundwater sample will be identified using an alphanumeric code in all field notes, chain-of-custody forms, and laboratory reports. The sample identification system will consist of the letters MA- for Site identification, followed by sample type and number, and depth, if appropriate.

Site Identification : MA – Maspeth
Sample Type: GW – Groundwater Sample

The monitoring well locations will be referenced by their Maspeth-specific location in an X, Y grid pattern. The point of origin (or 0, 0) will be the southeast corner of the H-pile and lagging system employed during the 2004 to 2008 remedial excavation activities at the Site. The X-axis will be from east to west and the Y-axis will be from south to north. Because the sidewalk is east of the 0, 0 point, all x-coordinates will be negative.

Sample Interval: (a-b) representing the sample interval in feet below ground surface, if necessary.

Example: MA-GW -5, 25

Where: GW = Groundwater
-5, 25 = Location of well beneath sidewalk, five feet east of origin in (negative) X-direction and 25 feet from origin in Y-direction.

Waterproof labels marked with indelible ink, or the equivalent, will be used on all sample containers. For QC samples the following stand alone notation, as in the case of trip blanks, or as suffix as in the case of MS for example, will be used in addition to the protocol outlined above.

Trip Blank – TB

Field Blank – FB

Field Duplicates – Instead of using the actual sample identifiers, duplicates will be designated by a letter starting with A (for the first duplicate). For these types of samples the sample interval will be the date followed by the date plus two. For example, the duplicate sample for a soil sample collected on May 23 may be labeled as MA-GP-A (5-7). Subsequent duplicates would be designated as "GP-B", "GP-C". This method has been established to ensure that the duplicates are submitted as blind samples to the analytical laboratory.

Matrix Spike – MS

Matrix Spike Duplicate – MSD

7.0 SAMPLE HANDLING AND CUSTODY

The sample handling, from collection in the field to shipment to the off-site laboratory, including tracking and custody requirements are outlined in this section.

7.1 Sample Labeling

Each sample bottle will be identified with a separate identification label. Labels may be pre-printed and/or augmented by notations made in indelible/waterproof ink. Entry errors will be crossed out with a single line, dated, and initialed. Each securely fixed label will include:

- Project identification;
- Sample identification;
- Sampler's name;
- Preservatives added;
- Type(s) of analysis(es) to be performed; and
- Date and time of collection.

7.2 Sample Handling

Samples will be stored in on-site coolers packed with ice until they are delivered to the laboratory for analysis. Bottles will be packed tightly with Styrofoam, bubble wrap, or similar soft packing materials to protect the containers from breakage. Ice will be added to the cooler along with the chain-of-custody (COC). Coolers will be stored in protected, cool areas to ensure that the samples stay as cool as possible (without freezing). Samples will be placed in coolers directly following sampling to prevent overexposure to sunlight. Field personnel will be responsible for the security of the samples prior to shipment. Coolers will be stored in a secure or monitored area prior to shipment to the laboratory.

Samples selected for laboratory analysis will be handled and maintained following chain-of-custody protocol. The Field Team Leader who is overseeing the field work will also be responsible for the security of samples prior to deliver to the lab. A chain-of-custody will be completed and maintained with the samples, prior to delivery to the laboratory.

Samples will be transported by vehicle to the laboratory for analysis. All coolers delivered to the laboratory will be sealed with mailing tape and a COC seal signed and dated by the person who signs the COC form for that particular cooler of samples. A COC seal will be taped over using clear mailing tape to prevent them from being broken during shipment. Samples will be transported to the laboratory within 24 hours of collection.

Field personnel responsible for sample collection will coordinate with the laboratory the quantity, type and delivery dates for the samples. Field personnel will update the laboratory on any changes in this information. If prompt delivery of samples cannot be guaranteed, the field personnel will be responsible for proper storage of samples until adequate transportation arrangements can be completed. The field personnel will keep the laboratory informed of all field-sampling activities. This communication will be important to allow the laboratory enough time to prepare for the sample's arrival.

7.3 Sample Custody

Sample custody will be designed to assure that each sample is accounted for at all times. The program's sample custody procedures that will be followed during the sample handling activities from the field to the laboratory are summarized below. The laboratory is responsible for sample receipt from the designated shipping agent, completion of the COC documents, verification of proper sample preservation, recording cooler temperatures, maintaining samples in secure properly designated areas, and maintaining internal chain-of-custody documents. The laboratory will notify the on-site engineering staff and/or Con Edison immediately of any sample receipt issues that impact sample integrity and data quality. The objective of the sample custody identification and control system will be to assure, to the extent practicable, that:

- The samples scheduled for collection are uniquely identified;
- The correct samples are analyzed and are traceable to their records;
- Important sample characteristics are preserved;
- Samples are protected from loss or damage;
- Any alteration of samples (e.g., filtration, preservation) is documented;
- A historic record of sample integrity is established; and
- Client confidentiality is maintained.

The COC protocol followed by field sampling personnel will include:

- Documenting procedures and amounts of reagents or supplies that become an integral part of the sample from sample preparation and preservation;
- Recording sampling locations, sample bottle identification, and specific sample acquisition measures on the appropriate forms;
- Using sample labels to document all information necessary for effective sample tracking; and
- Completing COC to establish sample custody in the field before sample shipment.

When coolers are packed and sealed for shipping, the sampling personnel responsible for relinquishing the cooler to the courier will sign the COC form.

The COC will be used to:

- Document sample handling procedures including sample location, sample number and number of containers corresponding to each sample number;
- Document the sample; and
- Document the COC process.

The COC form includes:

- The sample number and the sample bottle identification number, where applicable;
- The name(s) of the sampler(s) and the person shipping the samples;
- The purchase order number, if applicable;
- The project name and number;
- Signature of the samplers;

- The date and time the samples were delivered for shipping;
- The sample description(s);
- The matrix of the sample;
- The number of containers for a particular sample;
- Analysis, container type, and preservation information;
- Analytical data reporting requirements; and
- Category B deliverable will be requested in the notes section of the chain.

Correction or revision to a COC will be made by: drawing a single line through the original entry, writing the revision and initialing and dating the new entry.

Sample custody and control procedures are an integral part of any field operation. Sample custody is often implemented through chain-of-custody procedures.

8.0 EQUIPMENT CALIBRATION AND MAINTENANCE

A maintenance, calibration and operation program is implemented to ensure that routine calibration and maintenance is performed on all field instruments. The program provides instruments of the proper type, range, accuracy and precision to provide data compatible with the specified requirements and desired results. Calibration of measuring and testing instruments is performed internally using in-house reference standards or externally by agencies or manufacturers.

8.1 Responsibility

The Project QA/QC Officer is responsible for ensuring that the field instruments used in the investigations are calibrated and maintained according to manufacturer's specifications. Field instrument instruction manuals describing calibration, maintenance and field operating procedures for these instruments will be on file at the Site for easy reference by field personnel and other project personnel.

The Field Team Leader will be familiar with the field calibrations, operation and maintenance of the instruments, and will perform the prescribed field operating procedures outlined in the operation and field manuals accompanying the respective instruments. They will keep records of all field instrument calibrations and field checks in the field logbook.

8.2 Calibration

As specified in Table 2, field instruments, including PIDs, dust meters, water quality meters, and oil/water interface probe will be calibrated, at a minimum, at the start of each day of fieldwork. The PID and dust meters will be calibrated a minimum of twice daily. More frequent calibration may be warranted based on changes in responsiveness of the instruments or apparently anomalous readings. Refer to Section 6.3 for specific conditions and equipment performance that would indicate the need for more frequent calibration. Instruments that fail calibration or become inoperable during use will be removed from service and tagged to prevent inadvertent use. If on-site monitoring instruments fail the Project Health and Safety Officer will be contacted immediately and will either, provide replacement instruments or have the malfunction repaired immediately.

Calibration will be performed following manufacturers instruction as outlined in the instruction manuals for each field instrument including PIDs, dust, and water quality meters. The oil/water interface probe requires no calibration. The Field Team Leader shall have copies in the field of field equipment instruction manuals for all field instruments.

Records will be prepared and maintained for calibrated measuring and testing instruments to indicate that established calibration procedures have been followed (e.g. results of calibration, problems, corrective action). Records for field instruments used only for this specific project will be kept in the project files.

8.3 Preventive Maintenance

Routine maintenance is performed whenever an instrument is acquired for field use, and when returned from field use. Instrument manuals are kept on file for reference purposes should equipment need repair. Troubleshooting sections of manuals are often useful in assisting personnel performing maintenance tasks. Preventive maintenance, other than routine maintenance and calibration, is performed as needed.

Periodic preventive maintenance is required for sensitive equipment. The field instruments are maintained through periodic calibration and adjustment as required by the instrument manufacturer.

Preventive maintenance procedures and records for laboratory instruments will be maintained by the analytical laboratory and will be available to the Project Team upon request.

9.0 INTERNAL QUALITY CONTROL CHECKS

The QC samples discussed below will be collected during the field program and analyzed by the laboratory to assess laboratory and field QA/QC procedures and the data quality.

9.1 Laboratory Internal QC Checks

The Con Edison laboratory and the contractor laboratory (Spectrum Analytical) are certified by the New York State Department of Health in accordance with the Analytical Services Protocols (ASP). In general, ASP protocols or certification programs require the laboratory to specify the qualifications of personnel; list available instrumentation, analyses performance evaluation samples; and adhere to and document standard operating procedures and quality assurance plans.

It will be the responsibility of the Laboratory QA/QC Officer to document, in each data package provided, that both initial and ongoing instrument and analytical QC functions have been met. Internal quality control checks, including replicates, spiked samples, duplicate samples, laboratory control samples, reagent specifications and checks, and calibration checks, are performed in accordance with the specific methodologies used. The minimum criteria used for analysis will consist of a daily calibration, instrument blank analysis, and sample blank analysis. In addition, at least one spike, one duplicate and one control are analyzed daily for each parameter.

Matrix Spike and Matrix Spike Duplicate (MS/MSD)
Analyses will be collected and submitted to assess laboratory QA/QC. MS/MSD will be run at a frequency of one per twenty samples. The MS and MSD will be collected as separate samples and, thus two volumes of aqueous organic samples will be collected in addition to the routine sample.

9.2 Field Internal QC Checks

For field quality assurance, three types of QA/QC samples will be collected: duplicate, field and trip blank samples. The proposed numbers of QA/QC samples, by type, are discussed below and summarized in Table 3. The sections below describe the purpose of each type of sample.

Field Blanks
Field blanks will be collected throughout the remediation work. Field blanks measure incidental or accidental sample contamination occurring during the entire sample handling process of sampling, transport, sample preparation and analysis. Field blanks can also check on the laboratory water quality and potential method contamination. One field blank will be collected per twenty samples for non-dedicated sampling equipment. Field blanks will be collected by pouring demonstrated analyte-free water over decontaminated soil-sampling devices and into the appropriate sample containers. The field blank will be labeled such that the identity of the sample as a blank will be concealed (i.e., blind blank). Field blanks will be analyzed for the same parameters.

Field Duplicates

The standard frequency for obtaining duplicate samples is one for every twenty samples. Duplicate samples serve as a check on the overall precision of the sampling and analytical methods. Duplicates will be collected in identical, laboratory prepared sample bottles, and will be analyzed for the same parameters. One set of samples will be given the sample identifier indicative of the sample location and the second set of sample bottles will be given a false sample identifier to disguise the identity of the replicated sample (i.e., blind duplicate). Actual sample identifiers for duplicate samples will be noted in the field logbook.

Trip Blanks

A trip blank sample will accompany field samples at a rate of one per shipment. Trip blanks will originate at the contract laboratory, and will be labeled as a trip blank. The water used by the laboratory to prepare the trip blank must be the same as the water used to prepare the method-blank. The trip blanks will accompany the sample containers throughout transport and sampling activities, and will be returned to the laboratory with the field samples. As such, trip blanks will accompany each daily sample shipment containing samples that will be analyzed for VOCs.

10.0 ASSESSMENT AND OVERSIGHT

10.1 Laboratory Performance and System Audits

The analytical laboratory will conduct internal quality control checks and audits in accordance with their internal operating procedures, method specific criteria and governing laboratory or certification programs. Procedures for laboratory performance and system audits will be outlined in the Laboratory Quality Assurance Plan (LQAP). The Laboratory QA Officer will be primarily responsible for conducting these audits. The LQAP will be available to the project team during the project.

The systems audit consists of evaluation of all components of the measurement systems to determine their proper selection and use. Systems audits are normally conducted prior to or shortly after systems are operational, and are then performed on a regularly scheduled basis. Performance audits are conducted periodically, and include the analysis of performance evaluation samples.

10.2 Field Performance Audits

The Project QA/QC Officer or designee will be responsible for auditing project personnel. An audit will be conducted initially during the program to ensure that proper procedures are followed and that subsequent data will be valid. The audit will focus on the details of the QA Program, and will evaluate the following:

- Project Responsibilities;
- Sample Custody Procedures;
- Document Control;
- Sample Identification System;
- QC Corrective Action Procedures;
- Sampling Techniques;
- Adherence to the Approved QA/QC Plan;
- Instrument Calibration;
- Decontamination Procedures; and
- Sample Packing and Shipping Procedures.

The audit will evaluate the implementation of the project QA Program.

The Project QA/QC Officer will also be responsible for conducting one evidence audit. The purpose of the evidence audit is to ensure that proper project documentation is maintained and has been distributed to project personnel.

11.0 DATA REDUCTION, VERIFICATION, USABILITY AND REPORTING

This section of the QA/QCP describes the process that will be followed to verify and validate the project data and field activities. Data verification activities will be performed to ensure that data collected as part of this Sidewalk Investigation are consistent with project quality objectives and measurement performance criteria.

11.1 Data Reduction

All data transformation and data reduction procedures will be clearly documented and placed in the project files. All data transformation and data reduction activities performed on the project data will be carefully monitored by both the Project Manager / Project QA/QC Officer, to ensure that data integrity is maintained.

11.2 Data Verification

Data verification and validation activities will be performed to ensure that data collected as part of the investigation work consistent with project quality objectives and measurement performance criteria.

Upon receipt of both electronic and hard copy analytical data, internal checks will be performed to detect possible errors. The data check will be performed by the Project QA/QC Officer. General checks will include the following:

- Verification of all data requested versus received (check of data against COCs);
- Verification of completeness of data packages;
- Verification of cross references between primary and duplicate samples; and
- A minimum of 10% verification of consistency between laboratory data reports and electronic data.

Rigorous quality control checks will be performed on tabular data and through visual checks. All quality control and quality assurance process documentation will be signed off for accountability reasons.

Data checks that will be completed manually for the following:

- Unknown exploration or sampling point ID;
- Misspelled chemical name;
- Unknown chemical synonym;
- New parameter;
- Inappropriate sample type;
- Invalid sample date/time;
- Sample depth outside starting and ending depths;
- Unknown target constituent list ID;
- Non-matching data for primary and duplicate samples;
- Duplicate record;
- Inappropriate test date/time;
- Holding time violation;
- Dilution factor less than or equal to zero;
- New (undefined) query codes;

- Missing fields; and
- Relationships between custody and equipment blanks to primary samples.

For data that are generated in the field, the Project QA/QC Officer will work closely with field personnel to evaluate accuracy and integrity of data collection activities. The Project QA/QC Officer will review field sheets and field notes to verify consistency with field observations and activities.

Prior to release by the off-site laboratories, the data will be reviewed internally by the Laboratory QA/QC Officer against all specific QA/QC parameters. The laboratory will use a system of sign-offs in which each analyst will acknowledge that their part of the analysis is complete. Any deviations will be documented and explained in the final laboratory analytical report. The laboratory is responsible for the final results and overall quality of the laboratory data.

11.3 Data Evaluation and Usability

Acceptance criteria for all field and laboratory internal QA samples (field blanks, duplicates, MS/MSD) will be those specified in the corresponding SW-846 and ASP methodologies.

Critical functions for determining the usability of generated data are:

- Strict adherence to the analytical methods;
- Assurance that the instrumentation employed was operated in accordance with defined operating procedures;
- Assurance that quality parameters built into the analytical procedures have been adhered to; and
- Confirmation that the DQOs have been satisfied.

The procedures for assessing the precision, accuracy and completeness of data have been presented in Section 4.0 of the QA/QCP. It will be the responsibility of the Project QA/QC Officer and the Laboratory QA/QC Officer to ensure that these procedures are followed. The DQIs for each data set will be evaluated by comparison of the actual measurement performance criteria against the acceptable limits of these criteria.

11.4 Reconciliation with User Requirements

A Data Usability Summary Report (DUSR) will be prepared by a third-party data validator, Alpha Geoscience of Clifton Park, NY. A resume of the validator, Mr. Donald Anne, is included for NYSDEC approval (see Appendix B). Based on a comparison of the field and laboratory QC data, the Project QA/QC Officer will evaluate how well the analytical data satisfy the DQI and will develop statements regarding the usability of the data relative to the project objectives, project-specific DQOs, and end use of the data.

12.0 CORRECTIVE ACTION

If unacceptable conditions are identified as a result of audits or are observed during field sampling and analysis, the Project QA/QC Officer and the Project Manager will document the condition and initiate corrective procedures. The specific condition or problem will be identified, its cause will be determined, and appropriate action will be implemented.

A corrective action memorandum will be prepared, documenting the problem and detailing the corrective action to be initiated.

Corrective actions may include, but are not limited to, the corrective action matrix presented below.

CORRECTIVE ACTION MATRIX	
Problem	Corrective Action
Sample exceeded holding time criteria.	Re-sample and re-analyze.
Field instruments are not within calibration limits.	Calibrate instrument and retest once an acceptable calibration has been obtained.
Procedures are observed that are not in accordance with the QA/QCP.	QA/QC officer is notified and involved personnel are retrained.

The efficacy of any corrective action will be assessed by project management to ensure that the deficiency or problem has been adequately addressed.

13.0 CORRECTIVE ACTION REPORTS TO MANAGEMENT

Weekly written reports will be issued to the Con Edison Project Manager. The reports will include an assessment of the project status in relation to the agreed upon timetable.

The reports will also include, as appropriate, a summary of the most recent analytical results, CAMP data, audit findings, and any necessary corrective action procedures. A data quality assessment, which summarizes the measurement data accuracy, precision, completeness, and data qualifications, will be prepared using all available data. The reports will also include a statement addressing the continuing adequacy and relevance of the methodologies. The data quality assessment will be prepared by the Project QA/QC Officer.

14.0 REFERENCES

U.S. Environmental Protection Agency, *EPA Requirements for Quality Assurance Project Plans*, Development Press, Office of Solid Waste and Emergency Response Directive 9355, 0-7B, March 1987.

U.S. Environmental Protection Agency, *Data Quality Objectives for Remedial Response Activities*, Development Press, Office of Solid Waste and Emergency Response Directive 9355, 0-7B, March 1987.

U.S. Environmental Protection Agency. 1986, Revision 1990. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*, Third Edition. Office of Solid Waste and Emergency Response, Washington, D.C.

TABLES

TABLE 1
PROPOSED ANALYTES/CONTAINERS/PRESERVATION/HOLDING TIMES

Parameter	Matrix	Analytical Method	Sample Container	Sample Preservation	Holding Times
PCBs	Soil	EPA Method 8082	(1) 4 oz clear glass	4° C	5 days to extraction then 40 days for analysis*
PCBs	Groundwater	EPA Method 8082	(1) 1L clear glass	4° C	5 days to extraction then 40 days for analysis*
VOCs	Groundwater	SW846 8260	(2) 40 ml clear glass VOA	4° C	7 days*
Total Petroleum Hydrocarbon	Soil	EPA Method 8100 – Modified	(1) 4 oz Amber Glass	4° C	14 days

* calculated from the verified time of sampling receipt (VTSR)

TABLE 2

INSTRUMENT CALIBRATION FREQUENCY

Equipment[1]	Minimum Calibration Frequency[2]
Photovac Micro-tip	Twice Daily
MIE Brand, pDR-1000AN Modelor	Twice Daily
Solinst Oil/Water Interface Probe and Water Quality Meter	Daily
NOTES: (1) Approved, equivalent field instrumentation may be used. (2) Complete calibration and maintenance instructions for all field equipment are provided in the attached instruction manuals.	

TABLE 3

SUMMARY OF INVESTIGATION SAMPLES

			Field Samples				QC Blanks		
Matrix	Parameter	Analytical Method (A)	Field Samples (B)	Field Duplicate	MS/MSD (Total) (C)	Subtotal	Trip Blank	Field Bland	Total
Hand Cleared Monitoring Well Locations: Soils	PCBs	EPA SW8082	3	1	1	5	0	1	6
Monitoring Well Samples: Soils	PCBs TPH	EPA SW8082 EPA 8100 Modified	15 15	1 1	1 1	17 17	0 0	1 1	18 18
Monitoring Well Samples: Groundwater	PCBs VOCs	EPA SW8082 EPA 8260	3 3	1 1	1 1	5 5	0 0	1 1	6 6

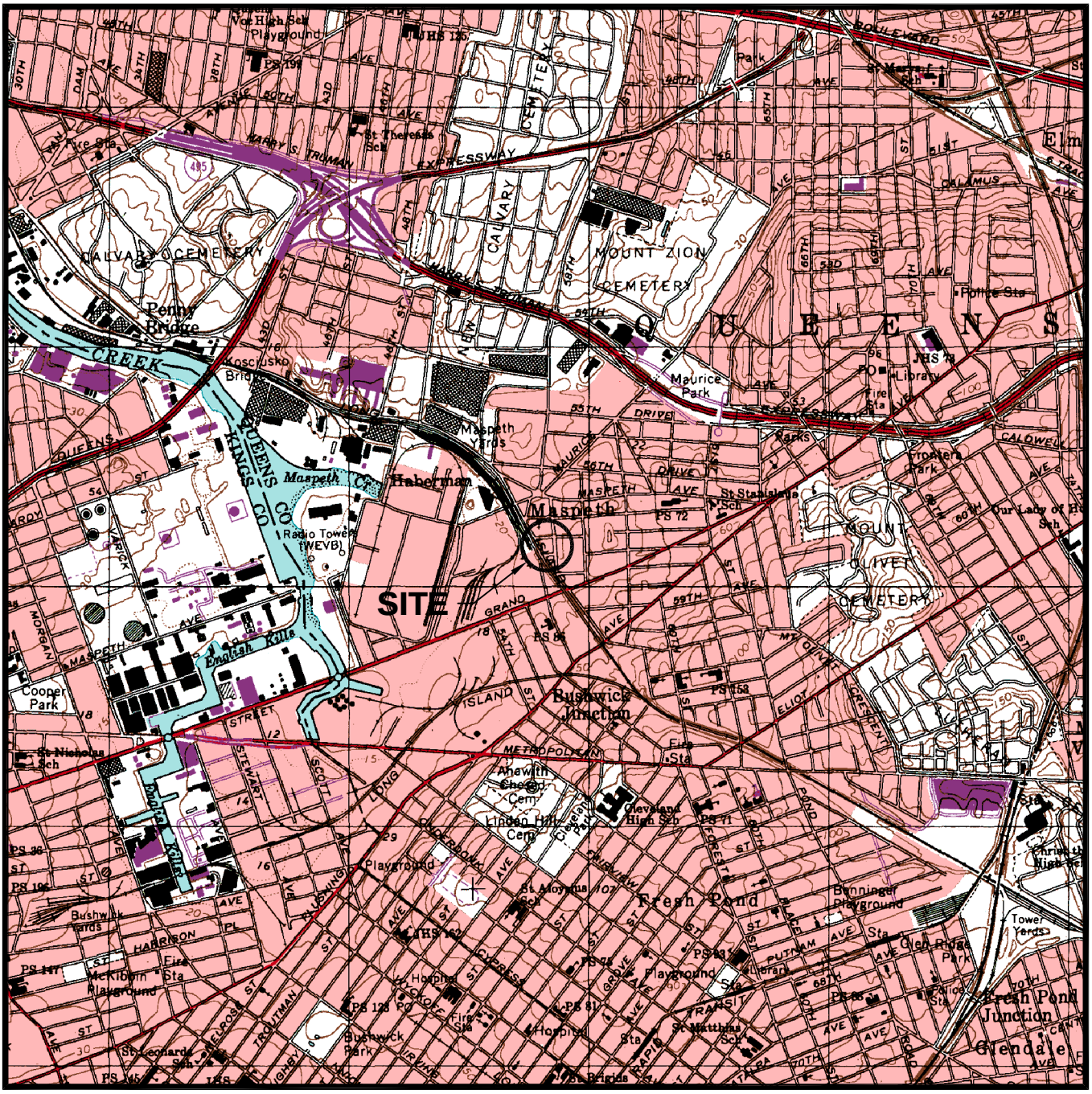
Notes:

(A) Results reported using NYSDEC ASP Category B deliverables.

(B) The number of field samples assumes that all of the hand cleared locations and soil borings will proceed as proposed: The number of groundwater samples includes three newly installed wells.

(C) Matrix spike/matrix spike duplicate for organic analyses; matrix spike and laboratory duplicate for inorganic analysis.

FIGURES



MAP SOURCE:

TOPOZONE.COM

USGS BROOKLYN [NY] QUAD
1995

NORTH

2000 0 2000

Scale in feet

Jacques Whitford Company, Inc.

JACQUES WHITFORD LOCATION: PORTSMOUTH, NEW HAMPSHIRE				
DATE PREPARED: 7-16-04	DESIGNED BY: DFM	DRAWN BY: TS	CHECKED BY: BSB	REVIEWED BY: DFM
REVISION DATE: 4-17-07	REVISION NO:	DRAWN BY: ADK	CHECKED BY: DFM	REVIEWED BY: DBH
PROJECT NAME/FILE NAME: CON EDISON MASPETH/SITE		PROJECT NUMBER/PHASE: 1012163.	SCALE: 1:24000	

DRAWING TITLE:

SITE LOCATION PLAN

FORMER MASPETH SUBSTATION
57-77 RUST STREET
MASPETH, QUEENS, NEW YORK

PREPARED FOR: CON EDISON

FIGURE NO. 1

ROWHOUSES

FORMER MASPETH SUBSTATION

MW-301	
SAMPLE DEPTH (ft bgs)	CONCENTRATION (ppm)
(9–11)	0.653
(15–17)	1.35

MW-302	
SAMPLE DEPTH (ft bgs)	CONCENTRATION (ppm)
(13–14)	0.414
(17–19)	0.087

MA-SW-0,57
(0–2) 0.82
(2–6) <0.0067
(6–10) <0.0069
(12) 0.015

MW-301

MA-SW-(-2,40)
(5) 0.095

MA-SW-(-2,38)
(17) 2.1

MA-SW-(-2,24)
(7) 7.14

MA-SW-(-2,23)
(16) 1.43

MW-302

MA-SW-0,15
(17) 0.2

MA-SW-0,9
(13) 0.33

58th STREET
ONE-WAY

Legend

- EXISTING MONITORING WELL
- SOIL TESTING LOCATION WITH NO PCB EXCEEDANCES
- SOIL TESTING LOCATION WITH PCB EXCEEDANCES
- PROPOSED MONITORING WELL

NOTES:

1. ALL CONCENTRATIONS IN PARTS PER MILLION (ppm)
2. LOCATIONS OF PROPOSED EXPLORATIONS ARE APPROXIMATE AND MAY CHANGE BASED ON SUBSURFACE CONDITIONS.

NORTH

SCALE IN FEET
5 0 5

Jacques Whitford Engineering Group, Inc., P.C.

JACQUES WHITFORD LOCATION: PORTSMOUTH, NEW HAMPSHIRE				DRAWING TITLE: SIDEWALK SAMPLE LOCATIONS
DATE PREPARED: 12-30-08	DESIGNED BY: GD	DRAWN BY: ADK	CHECKED BY: GD	REVIEWED BY: GD
REVISION DATE:	REVISION NO:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
PROJECT NAME/FILE NAME: MASPETH/SITE		PROJECT NUMBER/PHASE: 1012163.	SCALE: AS SHOWN	PREPARED FOR: CON EDISON

FORMER CON EDISON MASPETH SUBSTATION
57-77 RUST STREET
MASPETH, NEW YORK

FIGURE NO. 2

APPENDIX A
Instruction Manual:

personalDataRAM

*personal*DataRAM

models *p*DR-1000AN
and *p*DR-1200

INSTRUCTION MANUAL

April 2000
(Revised-jwj May 8, 2002)

Thermo Andersen Inc.
500 Technology Court
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CONTENTS

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ONE YEAR LIMITED WARRANTY

THERMO ANDERSEN warrants to the original Purchaser that the apparatus to be delivered hereunder will be of the kind designated or specified and free of defects in workmanship or material (excluding rechargeable batteries and rechargeable battery packs). THERMO ANDERSEN makes no other express warranty, and disclaims any implied warranty of merchantability or fitness for purpose.

If the apparatus fails to conform to the above warranty, and notice is received by THERMO ANDERSEN from Purchaser within one year from the date of shipment, THERMO ANDERSEN will, at its option, either repair the defective part or parts or make available a repaired or replacement part. This warranty extends to all parts and labor involved in the required repair to the extent that said repair was not caused by negligence in operation of the apparatus by the Purchaser. THERMO ANDERSEN will perform the repair at its plant with all shipping and insurance costs paid by the Purchaser or, upon mutual consent of the parties, at a site designated by the Purchaser except, in the latter circumstances, the Purchaser will be responsible to reimburse THERMO ANDERSEN for all costs associated with travel, per diem and travel time of those THERMO ANDERSEN individual(s) deemed appropriate to effectuate the repair.

Repair or replacement of the apparatus in the manner and for the time period specified above, is the Purchaser's exclusive remedy and will satisfy all liabilities of THERMO ANDERSEN to Purchaser arising out of the supply or use of the apparatus, whether based on contract, warranty, negligence or otherwise. In no event will THERMO ANDERSEN be liable for any incidental or consequential loss or damage resulting from any failure of the apparatus to conform to the contract of sale.

Rechargeable batteries and rechargeable battery packs shall be warranted for 30 days to be free of defects in workmanship or material. During this 30 days rechargeable batteries and rechargeable battery packs that fail shall be returned to THERMO ANDERSEN for evaluation before warranty replacements are sent.

1.0 GENERAL DESCRIPTION

The MIE *personal*DataRAM™ (for Personal Data-logging Real-time Aerosol Monitor) is a technologically advanced instrument designed to measure the concentration of airborne particulate matter (liquid or solid), providing direct and continuous readout as well as electronic recording of the information.

The *personal*DataRAM is available in two versions: model *p*DR-1000AN and model *p*DR-1200. The model *p*DR-1000AN operates as a passive air sampler whereas the model *p*DR-1200 uses active air sampling. The user can convert from one to the other of these two versions by means of optional conversion kits offered by MIE, Inc. (see Sections 4.2 and 15.0 of this manual).

The model *p*DR-1000AN samples passively (i.e., without a pump) the air surrounding the monitor; air accesses freely the sensing chamber of the instrument by means of convection, diffusion, and adventitious air motion. The model *p*DR-1200, on the other hand, requires a separate air driver (not included) such as a personal-type pump for its operation.

In addition, the model *p*DR-1200 includes a particle size-selective inlet cyclone which permits size segregated measurements (i.e., PM_{10}, $PM_{2.5}$, respirable, etc.) as well as enables the user to perform aerodynamic particle sizing by varying the sampling flow rate. The model *p*DR-1200 incorporates, downstream of its photometric sensing stage, a standard 37-mm filter holder on which all sampled particles are collected for subsequent analysis or gravimetric referencing/calibration, if so desired.

The *personal*DataRAM is the result of many years of field experience acquired with thousands of units of its well known predecessor, the MIE MINIRAM, and embodies many technological advances made possible by the latest electronic hardware and software. The *personal*DataRAM is also a worthy miniaturized companion to the MIE DataRAM, a recognized paragon of portable aerosol monitors.

The *personal*DataRAM is a high sensitivity nephelometric (i.e. photometric) monitor whose light scattering sensing configuration has been optimized for the measurement of the respirable fraction of airborne dust, smoke, fumes and mists in industrial and other indoor environments.

The *personal*DataRAM is an ultra-compact, rugged and totally self-contained instrument designed for hand-held, belt-worn, as well as unattended operation. It is powered either by its internal replaceable battery, or by an optional attachable rechargeable battery pack, or by an AC supply (included as standard accessory). For the model *p*DR-1200, power to an adjunct pump must be provided separately.

Zeroing is accomplished by means of a hand-inflatable "zero air" pouch included with the model *p*DR-1000AN, and by an inlet filter cartridge provided with the model *p*DR-1200. In addition, the instrument automatically checks agreement with its original factory calibration by checking its optical background during the zeroing sequence.

The *personal*DataRAM covers a wide measurement range: from 0.001 mg/m^3 (1 µg/m^3) to 400 mg/m^3, a 400,000-fold span, corresponding to very clean air up to extremely high particle levels.

In addition to the auto-ranging real-time concentration readout, the *personal*DataRAM offers the user a wide range of information by scrolling its two-line LCD screen, such as run start time and date, time averaged concentration, elapsed run time, maximum and STEL values with times of occurrence, etc.

Operating parameters selected and diagnostic information displays are also available. Furthermore, the *personal*DataRAM features complete, large capacity internal data logging capabilities with retrieval through an externally connected computer. The stored information (up to 13,000 data points) includes average concentration values, maximum and STEL values with time information as well as tag numbers.

Selectable alarm levels with built-in audible signal and switched output, a RS-232 communications port, and a programmable analog concentration output (voltage and current) are all part of this versatile instrument.

A custom software package is provided with the *personal*DataRAM to program operating/logging parameters (e.g. logging period, alarm level, concentration display averaging time, etc.) as well as to download stored or real-time data to a PC or laptop for tabular and/or graphic presentation. If required, the data can also be imported to standard spreadsheet packages (e.g. Microsoft Excel™, Lotus 1-2-3™, etc.).

2.0 SPECIFICATIONS

- Concentration measurement range (auto-ranging)[1]: 0.001 to 400 mg/m^3
- Scattering coefficient range: 1.5 x 10^{-6} to 0.6 m^{-1} (approx.) @ λ =880 nm
- Precision/repeatability over 30 days (2-sigma)[2]:
  ± 2% of reading or ±0.005 mg/m^3, whichever is larger, for 1-sec. averaging time
  ±0.5% of reading or ±0.0015 mg/m^3, whichever is larger, for 10-sec. averaging time
  ±0.2% of reading or ±0.0005 mg/m^3, whichever is larger, for 60-sec. averaging time
- Accuracy[1]: ±5% of reading ±precision
- Resolution: 0.1% of reading or 0.001 mg/m^3, whichever is larger
- Particle size range of maximum response: 0.1 to 10 μm
- Flow rate range (model *p*DR-1200 only): 1 to 10 liters/minute (external pump required)
- Aerodynamic particle sizing range (model*p*DR-1200 only): 1.0 to 10 μm
- Concentration display updating interval: 1 second
- Concentration display averaging time[3]: 1 to 60 seconds
- Alarm level adjustment range[3]: selectable over entire measurement range
- Alarm averaging time[3]: real-time (1 to 60 seconds), or STEL (15 minutes)
- Datalogging averaging periods[3]: 1 second to 4 hours
- Total number of data points that can be logged in memory: 13,391
- Number of data tags (data sets): 99 (maximum)
- Logged data:
    - Each data point: average concentration, time/date, and data point number
    - Run summary: overall average and maximum concentrations, time/date of maximum, total number of logged points, start

time/date, total elapsed time (run duration), STEL concentration and time/date of occurrence, averaging (logging) period, calibration factor, and tag number.

- Elapsed time range: 0 to 100 hours (resets to 0 after 100 hours)
- Time keeping and data retention: › 10 years
- Readout display: LCD 16 characters (4 mm height) x 2 lines
- Serial interface: RS-232, 4,800 baud
- Computer requirements: IBM-PC compatible, 486 or higher, Windows™ '95 or higher, ≥ 8 MB memory, hard disk drive, 3.5" floppy, VGA or higher resolution monitor
- Outputs:
  - Real-time digital signal (1 sec^{-1}): concentration, 16-character code
  - Real-time analog signal: 0 to 5 V and 4 to 20 mA. Selectable full scale ranges of^3: 0 - 0.1, 0 - 0.4, 0 - 1.0, 0 - 4.0, 0 - 10, 0 - 40, 0 - 100, and 0 - 400 mg/m^3.
    Minimum load impedance for voltage output: 200 kΩ.
    Maximum load impedance for current output: 300 Ω (when powered by AC power supply)
  - Alarm output: 1 Hz square wave, 5 V peak-to-peak amplitude. Load impedance > 100 kΩ
- Internal battery: 9V alkaline, 20-hour run time (typ.)
- Current consumption: 15 to 25 mA (in Run Mode); 10 to 20 mA (in Ready Mode)
- AC source: universal voltage adapter (included) 100-250 V~, 50-60 Hz (CE marked)
- Optional battery pack: model *p*DR-BP, rechargeable NiMH, 72-hour run time (typ.)
- Operating environment: -10° to 50° C (14° to 122° F), 10 to 95% RH, non condensing
- Storage environment: -20° to 70° C (-4° to 158° F)
- Dimensions (max. external):
  - Model *p*DR-1000AN: 153 mm (6.0 in) H x 92 mm (3.6 in) W x 63 mm (2.5 in) D

    - Model *p*DR-1200 (including cyclone and filter holder): 160 mm (6.3 in) H x 205 mm (8.1in) W x 60 mm (2.4 in) D

- Weight:
    - Model *p*DR-1000AN: 0.5 kg (18 oz)
    - Model *p*DR-1200: 0.68 kg (24 oz)

- Cyclone (included in model *p*DR-1200 only): BGI model GK 2.05

- Filter holder (included in model *p*DR-1200 only): Millipore type MAWP 037 AO (with 0.8 μm pore size filter)

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[1]Referred to gravimetric calibration with SAE Fine (ISO Fine) test dust (mmd = 2 to 3 μm, σ_g = 2.5, as aerosolized)

[2]At constant temperature and full battery voltage

[3]User selectable

3.0 USER GUIDELINES

3.1 Handling Instructions

The *personal*DataRAM is a sophisticated optical/electronic instrument and should be handled accordingly. Although the *personal*DataRAM is very rugged, it should not be subjected to excessive shock, vibration, temperature or humidity. As a practical guideline, the *personal*DataRAM should be handled with the same care as a portable CD player.

If the *personal*DataRAM has been exposed to low temperatures (e.g. in the trunk of a car during winter) for more than a few minutes, care should be taken to allow the instrument to return near room temperature before operating it indoors. This is advisable because water vapor may condense on the interior surfaces of the *personal*DataRAM causing temporary malfunction or erroneous readings. Once the instrument warms up to near room temperature, such condensation will have evaporated. If the *personal*DataRAM becomes wet (e.g. due to exposure to water sprays, rain, etc.), allow the unit to dry thoroughly before operating.

Whenever the *personal*DataRAM is shipped care should be taken in placing it in its carrying case and repackaging it with the original cardboard box with the factory provided padding.

3.2 Safety Instructions

- Read and understand all instructions in this manual.
- Do not attempt to disassemble the instrument. If maintenance is required, return unit to the factory for qualified service.
- The *personal*DataRAM should be operated only from the type of power sources described in this manual.
- When replacing the internal 9-V battery, follow the instructions provided on the back panel of the unit.
- Shut off *personal*DataRAM and any external devices (e.g. PC) before connecting or disconnecting them.
- Shut off *personal*DataRAM before replacing the internal battery, or when plugging in or disconnecting the AC power supply or the optional rechargeable battery pack.

3.3 Handling and Operation

3.3.1 Model *p*DR-1000AN

The model *p*DR-1000AN can be operated in any position or orientation. Exposure to high intensity fluctuating light of the interior of the sensing chamber, through the

front and back slotted air openings (see Section 5.5), should be avoided. Such large intensity transients may cause erroneous readings. Direct access of sunlight to the sensing chamber should be prevented.

Typical modes of instrument support/handling include:

- Hand-held. Do not obstruct or cover the sensing chamber opening slots on front and back of unit.
- Belt attached. Use belt clip provided as standard accessory. The unit can be worn on a waist belt, or with optional shoulder belt (model *p*DR-SS) for breathing zone monitoring.
- Table top operation. The *p*DR-1000AN can be placed on a table either in an upright position (i.e., resting on its lower protective bumper), or on its back (i.e., resting on the rear edges of its two protective bumpers).
- Tripod mounted. The unit can be attached to any standard tripod using the threaded bushing on the bottom of the monitor (see Figure 3).
- Fixed point operation. The model *p*DR-1000AN can be mounted at a fixed location (e.g., wall or post) using the optional wall mounting bracket, model *p*DR-WB.

3.3.2 Model *p*DR-1200

The *p*DR-1200 requires an external air suction device, such as a small diaphragm pump (e.g., model *p*DR-PU) for its sampling operation. The inlet of the pump must be connected by means of tubing to the hose fitting on the *p*DR-1200 filter holder attached to sensing chamber (see Figure 2).

The inlet metal tube of the cyclone can be oriented in any desired direction (i.e., upward, forward, downward or backward) by rotating the cyclone body within its holder cup on the right side of the sensing chamber (see Figure 2).

Always ensure unobstructed access to the cyclone inlet when sampling directly the air in the instrument's vicinity. Alternatively, tubing can be connected to the cyclone inlet in order to extract a sample stream from a duct, chamber or other enclosed volume.

Typical modes of instrument support/handling include:

- Hand-held. For example, using a personal type pump, clipped to the belt and using a tubing connection to the *p*DR-1200.
- Belt attached. Use belt clip kit provided as standard accessory. The unit can be worn on a waist belt, or with the optional shoulder belt (model *p*DR-SS) for breathing zone monitoring. A personal pump can then be belt-worn as well.
- Table top operation. The *p*DR-1200 can be placed on a table either in an upright position (i.e. resting on its lower protective bumper), or on its back (i.e. resting on its backside).
- Tripod mounted. The unit can be attached to any standard tripod using the

threaded opening on the bottom base (see accessory attachment fitting on Fig. 4).
- Wall mounted for fixed point monitoring. Use optional wall mounting bracket, model *p*DR-WB, either in combination with model *p*DR-PU pump module and model *p*DR-AC power supply (powering both the *p*DR-1200 and the *p*DR-PU), or with a separate pump.

3.4 Air Sampling Guidelines

Although the *personal*DataRAM is designed primarily for intramural use, i.e. for indoor air quality, in-plant, or mining environment monitoring, its active sampling version (model *p*DR-1200) also makes it compatible with extramural use (i.e. ambient monitoring). General ambient monitoring applications, however, are performed preferentially using an appropriate inlet configuration, in order to ensure representative particle sampling under conditions of variable wind speed and direction. Consult with MIE for such outdoor applications.

For typical area monitoring applications, the *personal*DataRAM should be placed and operated centrally within the area to be monitored, away from localized air currents due to fans, blowers, ventilation intakes/exhausts, etc. This is to ensure representative sampling within the area to be assessed.

3.5 Environmental Constraints and Certifications

The *personal*DataRAM is designed to be reasonably dust and splash resistant, however, it is not weatherproof. To operate the unit outdoors provisions should be made to protect it from environmental extremes outside its specified range, and from any exposure to precipitation.

The *personal*DataRAM is certified for compliance with the electromagnetic radiation limits for a Class A digital device, pursuant to part 15 of the FCC Rules. The unit also complies and is marked with the CE (European Community) approval for both immunity to electromagnetic radiation and absence of excessive emission interference.

4.0 ACCESSORIES

4.1 Standard Accessories

The *personal*DataRAM is provided to the user with the following standard accessories:

- Soft-shell carrying case (MIE model *p*DR-CC-1)
- Digital communications cable (MIE model *p*DR-DCC)
- Analog signal/alarm output cable (MIE model *p*DR-ANC)
- Communications software disk (MIE model *p*DR-COM)
- Z-Pouch zeroing kit (MIE model *p*DR-ZP)(for use with *p*DR-1000AN only)

- Zeroing filter cartridge and tubing (MIE model *p*DR-ZF)(for use with *p*DR-1200 only)
- Belt clip kit (MIE model *p*DR-CA)
- AC power supply (and charger for optional MIE model *p*DR-BP) (MIE model *p*DR-AC)
- Metal cyclone (MIE model *p*DR-GK2.05)(for use with *p*DR-1200 only)
- 37-mm filter holder and hose fitting (MIE model *p*DR-FH)(for use with *p*DR-1200 only)
- Instruction manual

4.2 Optional Accessories

The following optional accessories are available from MIE for use with the *personal*DataRAM:

- Rechargeable battery module (MIE model *p*DR-BP)
- Shoulder strap (MIE model *p*DR-SS)
- Remote alarm unit (MIE model *p*DR-RA)
- Wall mounting bracket (MIE model *p*DR-WB)
- Active sampling kit to convert model *p*DR-1000AN to model *p*DR-1200 (MIE model *p*DR-ASC)
- Upper bumper kit to convert model *p*DR-1200 to model *p*DR-1000AN (MIE model *p*DR-UB)
- Attachable pump unit (MIE model *p*DR-PU)(for use with *p*DR-1200 only)

5.0 INSTRUMENT LAYOUT

The user should become familiar with the location and function of all externally accessible controls, connectors and other features of the *personal*DataRAM. Refer to Figures 1 through 6.

All user related functions are externally accessible. All repair and maintenance should be performed by qualified MIE personnel. Please contact the factory if any problem should arise. Do not attempt to disassemble the *personal*DataRAM, except as described in Section 12.0 (Maintenance), **otherwise voiding of instrument warranty will result**.

5.1 Front Panel

Refer to Figures 1 (for model *p*DR-1000AN) or 2 (for model *p*DR-1200) for location of controls and display.

The front panel contains the four touch switches (keys) and the LCD screen required for the operation of the *personal*DataRAM.

The four touch switches provide tactile ("popping") feedback when properly actuated.

The ON/OFF key serves only to turn on the unit (while it is in the off state), and to turn it off (when it is operating).

The EXIT and ENTER keys serve to execute specific commands that may be indicated on the screen, and the NEXT key generally serves to scroll the displayed information, e.g. to review the operating parameters that have been programmed, display maximum/STEL values, diagnostic values, etc.

If an incorrect command is keyed (e.g. ENTER when the *personal*DataRAM displays real-time concentration) a beep is heard to alert the user.

The two-line, 16-character per line LCD indicates either measured values of concentration (instantaneous and time averaged on the same screen), elapsed run time, maximum and STEL (short term excursion limit) values, operating and logging parameters, diagnostics, or other messages.

The acoustic alarm transducer is located directly behind the center of the MIE arrow logo on the front panel.

5.2 Bottom Base

Refer to Figures 3 (for model *p*DR-1000AN) or 4 (for model *p*DR-1200). The base of the *personal*DataRAM contains the following: a) internal battery compartment cover, b) external DC power input receptacle, and c) threaded bushing for the attachment of optional battery pack, tripod, or other mounting/support hardware.

Only the internal battery compartment cover should be opened by the user, for removal and replacement of the on-board 9-V battery. Removal of the base plate could result in voiding of instrument warranty.

5.3 Right Side Panel

Refer to Figures 5 (for model *p*DR-1000AN) or 6 (for model *p*DR-1200) which shows the manner of attachment of the belt clip assembly (belt clip should be attached only if required by the user). The right side panel (as viewed from front panel) contains the 6-contact modular jack connector receptacle for digital (RS-232) communications and analog signal output. This connector also provides the alarm output control for a remote/auxiliary alarm signal. The contacts (from top to bottom) are:

1: 4 – 20 mA analog output (positive)
2: Alarm output
3: Digital data transmission
4: Digital input

5: Common ground (signal returns)
6: 0 to 5 V analog output (positive)

The digital communications cable provided as a standard accessory is to be inserted into this receptacle for interconnection to a computer (for data downloading or to reprogram parameters). The analog output cable is provided with flying leads for interconnection with other data processing and/or control systems.

WARNING: The modular jack receptacle on the side of the *personal*DataRAM should be used only for communications with computers and alarm circuitry. **Do not, under any circumstance, connect any communications equipment (e.g., telephone) to this receptacle.**

5.4 Back Panel and Belt Clip

The back panel consists of a label with important user information on safety procedures and certifications, model and serial numbers, etc.

The back panel is provided with mounting hardware for the attachment of the belt clip kit (see Figures 5 or 6 for mounting configuration of the belt clip).

5.5 Sensing Chamber

Referring to Figure 1 or 2, the upper mid-section of the *personal*DataRAM contains the optical sensing chamber. This chamber is the only internal section that the user should access for maintenance purposes (see Section 12.2).

On the model *p*DR-1000AN, air enters the sensing chamber through the two slot shaped inlets (one on the front and other on the back) under the protective bumper. During instrument operation those two openings should remain unobstructed in order to ensure free access of the surrounding air. When the model *p*DR-1000AN is used as personal monitor, i.e., clipped to a person's belt, the rear air inlet opening may be partially obstructed, but care should be exercised in ensuring that the front air inlet remains free of any obstructions.

On the model *p*DR-1200, air enters the sensing chamber through the opening in the cyclone receptacle cup (black cup on right side of sensing chamber), passes through the photometric stage, and exits through the opening in the filter holder receptacle cup (black cup on left side of sensing chamber), after which the air passes through the filter.

6.0 PREPARATION FOR OPERATION

6.1 Battery Installation

When shipped from the factory, the *personal*DataRAM will arrive without its replaceable 9V battery installed. Two fresh alkaline batteries are factory packed

separately in the carrying case, one of which should be installed in the *personal*DataRAM when preparing it for operation.

NOTE: Whenever the *personal*DataRAM is to be left unused for an extended time (i.e. longer than a month), the 9V battery should be removed from the unit.

Removing the battery will lose neither the program, time/date keeping, nor stored data.

To install the battery proceed as follows:
- Hold the *personal*DataRAM upside down.
- Loosen thumbscrew that secures the battery compartment cover (see Figure 3 or 4), and remove that cover.
- Observe battery polarity and the back panel battery orientation pattern (the negative battery terminal is the one closer to the side of the instrument).
- Insert the battery by sliding it in until it bottoms out. It should protrude slightly above the bottom surface of the instrument.
- Place battery compartment cover over battery and, while pushing down the cover firmly (taking care that the cover seats flush on the bottom surface of the *personal*DataRAM), tighten thumbscrew securely.

6.2 Battery Replacement

Normally, only alkaline type 9V batteries (type 1604A, or equivalent) should be used with the *personal*DataRAM.

Only fresh batteries should be used in order to ensure the maximum operating time. The *personal*DataRAM shuts itself off whenever the battery voltage falls below 6 volts (while retaining all programming and data). A fresh 9V alkaline battery, at room temperature, should provide typically 20 hours of continuous operation (please note that not all manufacturers produce batteries of equal capacity). Intermittent operation should extend the total running time because of partial battery recovery effects.

The approximate remaining battery capacity is indicated by the *personal*DataRAM (see Section 8.2) in increments of 1%, starting from 99%. If the remaining battery capacity is 40% or less, immediate restarting after shut off is automatically inhibited to prevent incomplete runs. If, nevertheless, a new run is to be initiated with low remaining battery capacity, do not shut off the *personal*DataRAM at the end of the previous run (i.e., remain in the Ready Mode, see section 7.0).

When significantly extended operating times are required (beyond the typical 20 hours), the use of either lithium or zinc-air batteries can be considered. The use of such alternative battery types can provide about 2 to 3 times longer operation than alkaline batteries.

6.3 AC Power Supply

A universal line voltage AC to DC power supply (MIE model *p*DR-AC) is provided as standard accessory with the *personal*DataRAM. This power supply can be used with any line with a voltage between 100 and 240 VAC (50 to 60 Hz). When using that power supply, its output plug should be inserted into the external DC receptacle at the base of the *personal*DataRAM (see Figure 3 or 4). Insertion of that connector automatically disables the internal 9V battery of the instrument. Removal of the *p*DR-AC plug from the instrument automatically re-connects the internal 9V battery.

NOTE: Before plugging in or unplugging the external power supply, the *personal*DataRAM must be shut off.

6.4 Rechargeable Battery Module

A rechargeable battery pack (MIE model *p*DR-BP) is available as an optional accessory. This unit attaches directly to the base of the *personal*DataRAM.

The *p*DR-BP contains a sealed nickel-metal-hydride battery, which provides typically 72 hours of continuous operation between successive charges (for 3-hour charging).

The use of the *personal*DataRAM, in combination with the *p*DR-BP connected to the a.c. power line ensures totally uninterruptible operation over indefinitely long time. In this operating mode, line power interruptions lasting up to 72 hours have no effect on measurement run continuity.

To attach the *p*DR-BP to the *personal*DataRAM, the instrument should be shut off. Carefully plug the *p*DR-BP into the external DC RECEPTACLE on the *personal*DataRAM. Rotate the large thumbscrew at the opposite end of the *p*DR-BP tightening it firmly. The *p*DR-BP can be recharged by means of the AC power supply of the *personal*DataRAM.

Detailed instructions for the use of the rechargeable battery module are furnished with that accessory.

6.5 Zeroing the *personal*DataRAM

One of the most important steps to be performed by the user before initiating a measurement run with the *personal*DataRAM is to zero the instrument. This is required to ensure maximum accuracy of concentration measurements, especially at low levels, i.e. below about 0.1 mg/m^3.

During the 2-minute pre-run automatic zeroing sequence (see Section 8.1), the *personal*DataRAM registers its own optical background, stores that level in its

memory, and then subtracts that background from all measured concentration values, until the zero is updated again by the user.

Although zeroing can be performed as often as desired (e.g., before every run), in practice it should not be necessary to do so more than once-a-month or even less frequently, except if average particulate concentrations should exceed about 0.5 mg/m^3.

6.5.1 Zeroing the model *p*DR-1000AN

Zeroing of the model *p*DR-1000AN requires a particle-free environment such as a clean room, clean bench, duct or area directly downstream of a HEPA filter, or the *p*DR-1000AN Z-Pouch (standard accessory). In some cases, a very clean, well air conditioned office may offer a sufficiently low particle concentration environment (i.e., ≤ 5 μg/m^3) for zeroing, as determined by another monitor (e.g., MIE DataRAM).

To zero the model *p*DR-1000AN by means of its Z-Pouch, proceed as follows:

- Wipe the outside surfaces of the *p*DR-1000AN to remove as much dust from those surfaces as possible before placing the instrument inside the Z-Pouch.
- In a reasonably clean environment, open the zipper of the Z-Pouch and place the *p*DR-1000AN inside it. Close the zipper shut.
- Open the small nipple on the Z-Pouch, and insert the fitting of the hand pump/in-line filter unit into the nipple.
- Start pumping the hand-pump until the Z-Pouch begins to bulge, and proceed with the steps in Section 8.1, pressing the keys of the instrument through the wall of the Z-Pouch. Then continue pumping.
- After completing the zeroing (step 2. of Section 8.1) procedure, open the Z-Pouch zipper and remove the *p*DR-1000AN. Close the zipper and flatten the Z-Pouch while plugging its nipple, in order to prevent dust contamination of the interior of the Z-Pouch.
- The *p*DR-1000AN is now zeroed and ready for a measurement run.

6.5.2 Zeroing the model *p*DR-1200

To provide the particle-free air required to zero the *p*DR-1200, either of two methods can be used: a) place the instrument on a clean-air bench or in a clean room, or b) connect to the cyclone inlet the green zeroing filter cartridge supplied with the *p*DR-1200. In either case, proceed as follows:

- After implementing either of the two methods, above, run the attached pump for at least one minute (e.g., at 4 liters/minute), and then proceed as described in Section 8.1 of this instruction manual, while continuing to run the pump (or leaving the unit in the clean air environment).

- Once the CALIBRATION: OK message appears on the *p*DR-1200 display, stop the pump and disconnect the zeroing filter cartridge from the cyclone inlet (or remove *p*DR-1200 from clean bench/room).
- The *p*DR-1200 is now zeroed and ready for a measurement run.

Note: While the *p*DR-1200 is used to monitor high dust concentrations (≥ 0.5 mg/m³), the flow through its sensing chamber should not be stopped before purging it, which can be done by connecting the green zeroing filter to the cyclone inlet and continuing to run the pump for about 2 minutes before shutting it off. This is to prevent dust contamination of the sensing chamber.

6.6 *p*DR-1200 Filter Holder Installation

The 37-mm filter holder provided with the *p*DR-1200 must be installed before operation of the instrument, in order to connect a sampling pump. To install the filter holder, remove protective cover, and insert the open collar over the black attachment cup with the external o-ring, on the left side of the *p*DR-1200 sensing chamber. Ensure complete insertion.

To replace the membrane filter separate the two sections of the plastic holder prying them apart with screwdriver or a coin. Make sure to place backing under the membrane filter before rejoining the two plastic rings.

7.0 OPERATING MODES

The *personal*DataRAM has several different operating modes which will be described in what follows. The specific commands and displays within each of these operating modes will be explained in detail in Section 8.0. A complete flow chart of keystrokes and screens is provided in Section 16.0.

7.1 Start-Up Mode

The *personal*DataRAM enters the Start-Up Mode as soon as the instrument is switched on. The user then has the choice to:
a) Wait before proceeding;
b) Zero the instrument and check its readiness; or
c) Proceed directly to the Ready Mode.

7.2 Ready Mode

Once the *personal*DataRAM is in the Ready Mode, the user is presented with the following alternatives:
a) Start a run immediately, or after any of the subsequent steps;
b) Review (by scrolling the display) all operating parameters, status and diagnostic data;

c) Activate or deactivate the logging function; activate, select (instantaneous or STEL), or deactivate alarm;
d) Program parameters or output logged data through a computer.

7.3 Run and Logging Mode

The Run Mode is the measurement/logging mode. The user can operate the *personal*DataRAM in this mode either with or without data logging. For example, the instrument may be used first as a survey monitor without logging, for walk-through assessment of an industrial plant, before deciding where to set up the unit for continuous monitoring and logging.

7.3.1 Data Logging

In order to activate the logging function, the unit must be in (or returned to) the Ready Mode (see Section 8.2).

If data logging has been enabled, the data will be logged in the next free (unrecorded) tag or data set. For example, if data had been recorded previously in tags # 1, 2 and 3 then, when a new run is initiated, the new data will be stored in tag #4. The data can be separated into number of sets (tags) up to a total of 99.

Any number of individual data points can be stored in a given tag, i.e. up to a maximum of 13,000 points (i.e. the total memory capacity of the *personal*DataRAM) assuming that no other data had been logged in other tags. This means that the total memory capacity of 13,000 data points can be grouped into any number of the available 99 data sets (tags).

7.3.2 Clearing of Memory

Data recorded in the *personal*DataRAM memory can be erased either through an external PC command using the MIE *p*DR-COM Custom Communications software provided as a standard accessory, or resetting the instrument (see Section 8.5). The PC method permits to erase the data in any number of selected tags, whereas the resetting method results in the deletion of all data stored in the *personal*DataRAM.

7.3.3 Run Mode Display and Commands

When a measurement run has been initiated (see Section 8.3), the user has the following display choices:
a) Instantaneous and time-averaged concentrations (both on the same screen);
b) Elapsed run time, and run start time and date (both on the same screen);
c) Maximum displayed concentration from run start, and time/date at which current maximum occurred;
d) Short term excursion limit (STEL) from run start, and time/date at which current STEL occurred;
e) Remaining battery charge, and (if logging function is enabled) remaining free memory.
f) Analog output concentration range (if enabled)

The user can command the termination of the run at any time returning it to the Ready Mode. To download logged data into a PC, the *personal*DataRAM must be in the Ready Mode. No changes in the program parameters or operating conditions can be made while in the Run Mode.

The *personal*DataRAM can be shut off from any of the three operating modes. Even if shut off while in the Run Mode, the instrument will save all stored data.

8.0 OPERATION

8.1 Start-Up

	KEY	DISPLAY	NOTES
1.	**ON/OFF**	START ZERO:ENTER GO TO RUN: NEXT	Before starting a run with the *personal*DataRAM, zero it (see Section 6.5) and key **ENTER** while the unit is exposed to particle-free air. Alternatively, key **NEXT** to go to RUN/READY mode. If **ENTER** is keyed:
2.	**ENTER**	ZEROING V2.00	Keep clean air flowing while ZEROING is displayed* for 1.1 min., followed by one of these screens:
		CALIBRATION: OK	or,
		BACKGROUND HIGH	or,
		MALFUNCTION	If CALIBRATION: OK, then go to step 3. If one of the other two screens is displayed, consult Section 12.0.
3.	**NEXT**	START RUN: ENTER READY: NEXT	To start a measurement run key **ENTER** (Section 8.3, step 1). To set up for a run and scroll logging/ operating parameters, key **NEXT** (see Section 8.2).
4.	**ON/OFF**	TURN OFF PDR? Y:ENTER N:NEXT	Keying **ON/OFF** while the unit is operating will elicit this message to prevent accidental shut off. To confirm shut down, key **ENTER**. To continue operation, key **NEXT**.

*The number following the V on the screen refers to the installed firmware version.

8.2 Setting Up For A Run (Ready Mode)

	KEY	DISPLAY	NOTES
1.	**NEXT**	LOGGING DISABLED	This screen indicates the logging status. **To enable the logging function**, key **ENTER**. Toggling of the on/off logging status can be done by keying **ENTER**.
2.	**ENTER**	LOG INTRVL 600s TAG#: 4	This message indicates that logging is enabled. Example is for 10-min log period, selected through the PC (see Section 9.0), and next free tag is #4.
3.	**NEXT**	ALARM: OFF	This screen indicates the alarm status. Keying **ENTER** repeatedly toggles through the 3 alarm modes:
4.	**ENTER**	ALARM: INSTANT LEVEL:1.50 mg/m3	This enables the alarm based on the real-time concentration. The level (e.g. 1.50 mg/m3) must be set on the PC.
5.	**ENTER**	ALARM: STEL LEVEL:0.50 mg/m3	This enables the alarm based on the 15-min STEL value. The level (e.g. 0.50 mg/m3) must be set on the PC.
6.	**NEXT**	ANALOG OUTPUT: DISABLED	This screen indicates the analog signal output status. Keying **ENTER** will enable the analog output. Toggling the analog output on/off can be done by keying **ENTER**:
7.	**ENTER**	ANALOG OUTPUT: 0 – 0.400 mg/m3	This enables the analog output. The concentration range (e.g., 0 – 0.400 mg/m^3) must be set on the PC.
8.	**NEXT**	CAL FACTOR: 1.00 DIS AVG TIME 10s	This screen displays the calibration factor and the display averaging time. Both values can be edited via PC.

9.	**NEXT**	BATTERY LEFT 83% MEMORY LEFT 96%	This screen displays the remaining battery charge, and the remaining percentage of free memory.
10.	**NEXT**	CONNECT TO PC	When this screen has been selected, the operating parameters can be edited and/or the logged data can be downloaded via the PC (see Section 9.0). If **NEXT** is keyed again, the screen returns to RUN/READY:
11.	**NEXT**	START RUN: ENTER READY: NEXT	The instrument is now ready to run following the procedure in section 8.3.

8.3 Measurement Run Procedure

	KEY	DISPLAY	NOTES
1.	**ENTER**	LOGGING DISABLED	or, if logging was enabled:
		LOG INTRVL 600s TAG #: 4	Logging status will be displayed for 3 seconds.
		CONC*0.047 mg/m3 TWA 0.039 mg/m3	After a 3-second delay, the concentration screen appears (values shown here are examples). CONC is the real-time and TWA is the time-averaged concentration**. The * appears only if logging has been enabled.**
2.	**EXIT**	TERMINATE RUN? Y:ENTER N:EXIT	To terminate the current run and return to the Ready Mode, key **ENTER**. To continue the run, key **EXIT**.
3.	**EXIT**	CONC*0.047 mg/m3 TWA 0.039 mg/m3	Keying **NEXT** successively scrolls the display to show various run values (elapsed run time, maximum, STEL, etc.). Keying **EXIT** from any of those screens returns to the concentration display.

4.	**NEXT**	ET 06:12:49 ST 08:18:26MAY15	This screen shows the elapsed run time (ET) and the run start time/date (ST).
5.	**NEXT**	MAX: 0.113 mg/m3 T 10:08:44 MAY15	This screen shows the maximum concentration of current run and time/date of occurrence.
6.	**NEXT**	STEL:0.058 mg/m3 T 09:59:22 MAY15	This screen shows the 15-min STEL value of the current run and the time/date of occurrence.
7.	**NEXT**	BATTERY LEFT 83%	or, if logging was enabled:
		BATTERY LEFT 83% MEMORY LEFT 96%	This screen shows the amount of usable charge left in the battery and, if logging has been enabled, the overall amount of free memory left.
8.	**NEXT**	ANALOG OUTPUT: 0 – 0.400 mg/m3	This screen shows the status of the analog signal output, and the range, if this output has been enabled.
9.	**NEXT**	CONC*0.047 mg/m3 TWA 0.039 mg/m3	The last **NEXT** command returns the display to the concentration screen.
10.	**EXIT**	TERMINATE RUN? Y:ENTER N:NEXT	As indicated in step 2, to end current run, key **ENTER**, to return to the Ready Mode:
11.	**ENTER**	START RUN: ENTER READY: NEXT	This keystroke terminates the current run and returns the unit to the Ready Mode.

If during a run the instrument memory is filled completely, or if all 99 tags have been used, the run is automatically terminated and the display will indicate:

RUN TERMINATED
FULL MEMORY

If a new run is initiated after the memory has been filled, the *personal*DataRAM can be operated only as a monitor without logging. The memory must then be cleared (see Section 7.3.2) first before logging can be enabled again.

8.4 Abbreviated Run Start/Stop Instructions

To power-up and start a measurement run without zeroing and without logging, proceed as follows:

- Key sequentially **ON/OFF**, **NEXT** and **ENTER**.

To terminate run and shut down, proceed as follows starting from the concentration screen (otherwise key **EXIT** first):

- Key sequentially **EXIT**, **ENTER, ON/OFF** and **ENTER**.

8.5 Resetting Procedure

The *personal*DataRAM memory can be reset through commands entered on its own keypad (i.e. without requiring a PC).

Resetting accomplishes the following:

- Erases all stored data from memory;

- Resets all parameters and operating conditions to their default values and conditions; and

- Cancels the zero correction offset.

The procedure to reset the instrument is as follows:

Starting with the unit shut off, press the EXIT and ENTER keys at the same time, and while holding down those two keys, press ON. The screen will then indicate: PDR SELF-TEST... and several diagnostic screens will appear in rapid sequence (see Section 16.0, Resetting/Electronics Checking Mode), ending in the message TESTING COMPLETE. Shut off unit. When turned on again, the *personal*DataRAM memory will have been reset, as described above.

The **default** values and operating conditions of the *personal*DataRAM are:

- Logging period (LOG INTRVL): 60 seconds
- Logging status: disabled (LOGGING DISABLED)
- Alarm level: 1 mg/m^3
- Alarm status: disabled (ALARM: OFF)
- Analog output: 0 to 4 mg/m^3
- Analog output status: disabled (ANALOG OUTPUT :DISABLED)
- Real-time display averaging time (DIS AVG TIME): 10 seconds
- Calibration factor (CAL FACTOR): 1.00

When turning on the *personal*DataRAM after resetting the instrument, it should be zeroed (see steps 1. and 2. of Section 8.1) before a run is initiated. Otherwise, its internal optical background level will not be subtracted from the indicated concentration readings. Alternatively, if the instrument is not zeroed after resetting, it will indicate its unsubtracted optical background when run under particle free conditions.

9.0 COMMUNICATIONS WITH COMPUTER

9.1 Hardware and Software Requirements

The computer requirements to install the software provided with the *personal*DataRAM (MIE *p*DR-COM) are the following:

- IBM-PC compatible
- 486 or better processor
- Minimum operating system: Windows 95™ or better
- ≥ 8 MB of RAM
- 2 MB hard disk drive
- 3.5" floppy drive
- VGA or higher resolution monitor

NOTE: When large files are logged in the *personal*DataRAM in one single tag, a faster computer speed is required to handle the data. For example, if all 13,000 data points are logged in one tag, a Pentium I or II processor with a minimum speed of 166 MHz will be required. If, however, the maximum number of data points per tag is 1,000 or below, a 33 MHz, 486 DX processor will suffice.

MIE custom hardware and software (provided as standard accessories):

- Digital communications cable (MIE model *p*DR-DCC)
- Software floppy disk (3.5", MIE model *p*DR-COM)

9.2 Software Installation Procedure

To install the MIE provided software in the computer, proceed as follows:

1. Insert the 3.5" disk labeled "*p*DR-COM" into computer.

2. For Windows 95™ users, select **Start** and then **Run**. For Windows 3.1 and 3.11 users, from Program Manager select **File** and then **Run**.

3. Type in on the **Command Line**: **a: install** (or **b: install**, as required).

4. The message "**Do you wish to install *p*DR-COM?**" will appear. Click **OK** to continue, or **Cancel**.

5. A message appears allowing the option to change the default directory: "**C:\PDRCOM**". It is advisable to leave the default directory (unless you address the hard drive by a different letter), and select **OK**.

6. After a successful installation, the message "**Installation Complete!**" will appear.

9.3 Communication Between *personal*DataRAM and Computer

To effect the communication between the *personal*DataRAM (via the *p*DR-COM software installed in the computer as described in the preceding section) and the PC proceed as follows:

1. Connect the *personal*DataRAM to one of the computer's serial ports using the *p*DR-DCC cable provided by MIE. This cable has a 9-pin female connector for the computer port.

2. Key **ON** the *personal*DataRAM and then key **NEXT** repeatedly until CONNECT TO PC is displayed on the *personal*DataRAM.

3. On the computer, double click on the ***p*DR-COM** icon. A four-tabbed notebook display should appear. Click on the **Com Port Select** and select the port to which the *p*DR-DCC cable has been connected.

4. From the four-tabbed notebook displayed on the computer screen select the tab with the desired option. The options are:

- **Main**: This page allows the user to input the *personal*DataRAM serial number (or any other desired label), and select the Serial Com Port.

- **Logged data**: This page allows the user to download, tabulate, print data, or transfer to a CSV file the data stored in the *personal*DataRAM. This page also serves to display real-time numerical data when the computer is connected to the *personal*DataRAM in the Run Mode.

- **Graph data**: This page enables the downloading and graphing of stored data to the computer screen and to a printer. In the Run Mode, this page displays the real-time data in graphic format.

- **Configure pDR**: This screen allows the user to edit the operating/logging parameters. Click on the item to be edited and select or type in the new value. To review the parameter values currently programmed into the *personal*DataRAM, click on **Get configuration**. After editing the parameters, click on **Set configuration** to input the new values into the *personal*DataRAM program.

Most operations within *p*DR-COM are self-evidently labeled, including fly-over dialog boxes. In addition, instructions may be found in the On-line Help files by selecting **Help** and then **Contents**.

The following operating/logging parameters of the *personal*DataRAM are selected (edited) via the computer:

- Current date (month and day of the month)
- Current time (hour, minute and second)
- Display averaging time (1 to 60 seconds, in 1-second increments)
- Calibration factor (0.01 to 9.99, in 0.01 increments)
- Logging interval (1 to 14,400 seconds, in 1-second increments)
- Analog output full scale concentration (0.1, 0.4, 1, 4, 10, 40, 100, or 400 mg/m^3)
- Analog output status (enabled, or disabled) (can also be selected directly through *personal*DataRAM keyboard, see Section 8.2)
- Alarm level (0.001 to 409.599 mg/m^3, in 1-µg/m^3 increments)
- Alarm mode (Off, Instantaneous, or STEL) (can also be selected directly through *personal*DataRAM keyboard, see Section 8.2)

The serial number of the *personal*DataRAM is transferred automatically to the PC and displayed on its screen.

In addition, the user can input any other identification for the instrument (up to 20 characters).

Note: The year is entered as a two-digit number; year 2000 is treated correctly as a leap year (*personal*DataRAM version 1.70 or higher).

9.4 Real-Time RS-232 Output

During the RUN mode, the *personal*DataRAM can communicate real-time concentration data through its serial port via the *p*DR-COM software package. This software application decodes the data and displays it on the computer screen in both graphical and tabulated form.

In order to use this output with some other application, the following information will enable the user to decipher the encoded output signal.

The communication settings for the digital output of the *personal*DataRAM are:
- Baud rate: 4800 bps
- Data bits: 8
- Stop bits: 1
- Parity: none
- Flow control: Xon/Xoff

Every second during a run, the *personal*DataRAM serial port will output a sixteen-character code. It consists of two brackets with 14 hexadecimal digits between them,

representing sum check (2 digits), sensed concentration (8 digits), and calibration factor (%, 4 digits). The concentration in $\mu g/m^3$ is obtained by multiplying the sensed concentration times the calibration factor and dividing by 100.

10.0 ANALOG SIGNAL OUTPUT

10.1 Analog Output Description

The *personal*DataRAM incorporates the capability to provide both a voltage and a current signal output directly proportional to the sensed concentration of airborne particulates. Both these analog signal outputs are concurrently available. These outputs are provided, principally, for fixed point applications with hard-wired installations, such as for continuous HVAC monitoring and control.

The particulate concentration range corresponding to the output voltage and current ranges (0 to 5 V and 4 to 20 mA) can be user selected (via a PC). The most sensitive range available is 0 to 0.100 mg/m^3, and the least sensitive range is 0 to 400 mg/m^3. For example, if the user selects the analog output range of 0 to 0.400 mg/m^3 then the analog output signal levels, at a concentration of 0.200 mg/m^3, would be 2.5 V and 12 mA.

Selection of the concentration range of the analog output must be performed on the PC. This range is independent of the digital display, data logging and real-time digital output range which are controlled automatically (auto-ranging).

Enabling the analog output increases the current consumption from the power source (battery or power supply) of the *personal*DataRAM by typically 5 mA when no load is connected to the analog signal current output. If such a load is connected then the current consumption of the *personal*DataRAM further increases by the magnitude of the output signal current (up to a maximum increment of 20 mA). Therefore, when not using the analog output, it is advisable to disable that output (see Section 8.2) in order to minimize power consumption (this is important only when powering the *personal*DataRAM from a battery source).

10.2 Analog Output Connection

The *personal*DataRAM is provided with a cable (model *p*DR-ANC) which has a 6-contact plug at one end and flying leads at the other. There are 4 leads for the analog and alarm outputs. The additional two contacts of the connector are used only for digital communication with a PC, for which a separate cable (model *p*DR-DCC) is provided.

Counting from top to bottom on the *personal*DataRAM connector receptacle, contact #1 is the positive 4 – 20 mA analog output, contact #2 is the alarm output, contact #5 is the common ground (return for all signals), and contact #6 is the positive 0 – 5 V analog output.

For the 0 – 5 V output signal, the externally connected load must have an impedance of more than 200 kilo-ohms. For the 4 – 20 mA output signal, the externally connected load must have an impedance of less than 200 ohms when powering the *personal*DataRAM with a battery, or less than 300 ohms when using the its AC supply.

Since both voltage and current outputs are present at the same time, both can be used concurrently, if so required.

The accuracy of the analog output signals is better than 1% of the reading with respect to the digital reading.

11.0 ALARM

11.1 Alarm Description and Operation

The *personal*DataRAM alarm function is provided both as an audible signal as well as an electrical output. The audible alarm consists of a series of beeps generated by an on-board piezo-transducer. The electrical output, available at the digital communications port, consists of a 1 Hz square wave signal which can be used to trigger/activate other equipment through an appropriate interface (consult with the factory).

The alarm function can be enabled/disabled by the user through the *personal*DataRAM keyboard (see Section 8.2). Setting of the alarm level must be performed on the PC (see Section 9.0).

The alarm is triggered whenever the preset alarm level is exceeded based either on : a) the displayed real-time concentration, if ALARM: INSTANT was selected (see Section 8.2), or b) a 15-minute running average concentration, if ALARM: STEL was selected. When the concentration falls below that level the alarm condition stops. While the alarm is on the user can stop it (i.e. silence the alarm) by pressing any key of the *personal*DataRAM. If the concentration continues to exceed the set alarm level after 10 seconds, however, the alarm restarts.

11.2 Alarm Output

A pulsed voltage output is available on the *personal*DataRAM in synchronism with the audible signal. This signal consists of a 1 Hz square wave with an amplitude of 5 V pp. An externally connected load should have an impedance of no less than 100 kilo-ohms. This alarm output signal is available at pins 2 and 5 (counting from top to bottom) of the 6-contact output/communications port on the side of the *personal*DataRAM (see Figure 5 or 6).

11.3 Remote Alarm Unit

An alarm relay unit (MIE model *p*DR-RA) is available as an optional accessory for the *personal*DataRAM. The *p*DR-RA, when connected to the alarm output of the

*personal*DataRAM, provides a switched output triggered by the alarm signal of the monitor. This switched output (up to 8 amperes, 250 volts) can be used to activate or deactivate other equipment (e.g. ventilation systems, machinery, etc.), or to control remotely located (by wire connection) alarm indicators (e.g. buzzers, lights, etc.).

12.0 MAINTENANCE

12.1 General Guidelines

The *personal*DataRAM is designed to be repaired at the factory. Access to the internal components of the unit by others than authorized MIE personnel voids warranty. The exception to this rule is the occasional cleaning of the optical sensing chamber.

Unless a MALFUNCTION message is displayed, or other operational problems occur, the *personal*DataRAM should be returned to the factory once every two years for routine check out, test, cleaning and calibration check.

12.2 Cleaning of Optical Sensing Chamber

Continued sampling of airborne particles may result in gradual build-up of contamination on the interior surfaces of the sensing chamber components. This may cause an excessive rate of increase in the optical background. If this background level becomes excessive, the *personal*DataRAM will alert the user at the completion of the zeroing sequence, as indicated in Section 8.1, by the display of a BACKGROUND HIGH message. If this message is presented, the *personal*DataRAM can continue to be operated providing accurate measurements. However, it is then advisable to clean the interior of the sensing chamber at the first convenient opportunity, proceeding as indicated below.

12.2.1 Model *p*DR-1000AN

- Remove the two screws on the top of the large protective bumper that covers the sensing chamber (see Figure 1);
- Remove the large protective bumper by lifting it firmly upwards and away from the sensing chamber;
- Remove the socket-head screws on the front and back black covers that were exposed by removal of the large top bumper. Lift away the freed front and back covers of the sensing chamber; set them aside carefully and such that they can be reattached in the same position as they were previously; avoid touching the dull black side of these plates;
- Using filtered (particle-free) pressurized air, blow the inside of the sensing chamber taking great care in not marring or scratching any of the exposed surfaces;
- Reposition the two sensing chamber cover plates in the same location (front and back) as they had been originally. Insert and tighten socket head screws firmly

making sure that the two plates are aligned perfectly with the top of the sensing chamber;
- Reposition large protective bumper over sensing chamber pushing down until properly seated. Insert the two top screws holding down the bumper and tighten gently (do not over-tighten);
- Check optical background by zeroing the *p*DR-1000AN as indicated in Section 8.1. If the sensing chamber cleaning was performed correctly, the message CALIBRATION: OK should be displayed at the end of the zeroing period.

12.2.2 Model *p*DR-1200

- Remove the two screws (one in the front and one in the back) holding the front and back gasketed covering plates of the sensing chamber, and set these plates aside, such that they may be reattached in the same location as they were previously.
- Using filtered (particle-free) pressurized air, blow the inside of sensing chamber taking great care in not marring or scratching any of the exposed surfaces.
- Reposition the two sensing chamber cover plates in the same location (front and back) as they had been originally. Insert and tighten socket head screws firmly making sure that the two plates are aligned perfectly with the top of the sensing chamber.
- Check optical background by zeroing the *p*DR-1200 as indicated in Section 8.1. If the sensing chamber cleaning was performed correctly, the message CALIBRATION: OK should be displayed at the end of the zeroing period.

12.3 Cyclone Cleaning (Model *p*DR-1200 only)

The cyclone will require occasional cleaning. It is advisable to do so whenever the sensing chamber of the *p*DR-1200 is cleaned (see above). To clean the cyclone, remove it from its black attachment cup on the sensing chamber , and unscrew the grit pot (narrower knurled end). Use clean pressurized air to blow out the grit pot and through all openings of cyclone body. Reattach grit pot to cyclone body and insert cyclone body into attachment cup making sure it is fully inserted.

13.0 CALIBRATION

13.1 Factory Calibration

Each *personal*DataRAM is factory calibrated against a set of reference monitors that, in turn, are periodically calibrated against a gravimetric standard traceable to the National Institute of Standards and Testing (NIST).

The primary factory reference method consists of generating a dust aerosol by means of a fluidized bed generator, and injecting continuously the dust into a mixing chamber from which samples are extracted concurrently by two reference filter collectors and by two master real-time monitors (MIE DataRAMs) that are used for the routine calibration of every *personal*DataRAM.

The primary dust concentration reference value is obtained from the weight increase of the two filters due to the dust collected over a measured period of time, at a constant and known flow rate. The two master real-time monitors are then adjusted to agree with the reference mass concentration value (obtained from averaging the measurements of the two gravimetric filters) to within ±1%.

Three primary, NIST traceable, measurements are involved in the determination of the reference mass concentration: the weight increment from the dust collected on the filter, the sampling flowrate, and the sampling time. Additional conditions that must be met are: a) suspended dust concentration uniformity at all sampling inlets of the mixing chamber; b) identical sample transport configurations leading to reference and instrument under calibration; and c) essentially 100% collection efficiency of filters used for gravimetric reference for the particle size range of the test dust.

The test dust used for the MIE factory calibration of the *personal*DataRAM is SAE Fine (ISO Fine) supplied by Powder Technology, Inc. It has the following physical characteristics (as dispersed into the mixing chamber):

- Mass median aerodynamic particle diameter: 2 to 3 μm
- Geometric standard deviation of lognormal size distribution: 2.5
- Bulk density: 2.60 to 2.65 g/cm^3
- Refractive index: 1.54

13.2 Field Gravimetric Calibration

If desired, the *personal*DataRAM can be calibrated gravimetrically for a particular aerosol (dust, smoke, mist, etc.) under field conditions (actual conditions of use). To effect such calibration in the particle environment of interest, proceed as indicated below.

For field calibration of the model *p*DR-1000AN, a personal type filter sampler is placed side-by-side (collocated) to the *p*DR-1000AN to be calibrated, and the two units should be started simultaneously. For the model *p*DR-1200, its own filter and attached pump can be conveniently used for the same purpose.

- Weigh and load into filter holder a fresh membrane filter.
- Start pump.
- Immediately turn on *personal*DataRAM and start a run such that the pump and the *personal*DataRAM are started nearly simultaneously.

The duration of this comparison run should be sufficient to collect a mass of at least 1 mg on the reference filter (in order to permit accurate weighing of the collected mass by means of an analytical balance). The time-weighted average (TWA) reading of the *personal*DataRAM can be used to estimate the required sampling time to collect the above-mentioned mass on the filter. To estimate the required sampling time (ET as measured on the *personal*DataRAM) in minutes, read the TWA value

(see Section 8.3) after an elapsed time (ET) of one minute or more, and apply the following relationship:

$$ET \geq 500/TWA$$

For example, if TWA = 2.5 mg/m^3, then ET ≥ 200 minutes (approximately 3 hours). If the TWA value changes significantly as the run proceeds, recalculate the required ET accordingly.

At the end of the run (after time ET has elapsed), record TWA, ET and the flow rate Q used to sample the air. Weigh the filter on an analytical balance and obtain Δm, the mass increment due to the collected particles.

Calculate the average gravimetric concentration C, as follows:

$$C = 1000\ \Delta m/ETxQ$$

Compare the recorded value of TWA and the calculated value C, and calculate the calibration factor to be programmed into the *personal*DataRAM (see Section 9.0) as follows:

$$CAL\ FACTOR = C/TWA$$

For example, if C was found to be 3.2 mg/m^3, and TWA had been determined to be 2.5 mg/m^3, the CAL FACTOR equals 1.28. Select this value on the PC, as described in Section 9.0. This completes the gravimetric calibration of the *personal*DataRAM for a specific aerosol.

13.3 Scattering Coefficient Calibration

Users interested in using the *personal*DataRAM for scattering coefficient measurements (e.g., for atmospheric visibility monitoring) should contact the factory. A special primary Rayleigh scattering calibration for such purpose can be performed by MIE.

13.4 Internal Span Check

The zeroing procedure (see Section 8.1) and the resulting normal diagnostic display of "CALIBRATION: OK" (step 2) informs the user that the instrument's calibration agrees with the original factory setting. This is an internal span check that consists of an automatic comparison between the initial (factory) optical background of the *personal*DataRAM (registered in its non-volatile memory), and the current optical background sensed during the zeroing sequence.

14.0 PARTICLE SIZE CLASSIFICATION (model *p*DR-1200 only)

The particle size selective cyclone of the *p*DR-1200 provides the user with two important capabilities: a) to measure the particulate matter concentration of a specific aerodynamic size fraction, and b) to determine the mass median size of a particle population. These two applications will be discussed in what follows. For both these applications, a variable measured flow rate pump is required, such as the MIE model *p*DR-PU (for which a separate instruction manual is provided).

14.1 Size Fractionated Monitoring

The *p*DR-1200 can be used to monitor a specific particle size fraction below a selectable cut off equivalent aerodynamic diameter. The particle size cut point can be selected by adjustment of the sampling flow rate. The higher this flow rate through the cyclone the smaller the cut off particle diameter. Figure 7 is a graph showing the dependence of the particle cut off size in micrometers as a function of the sampling flow rate in liters per minute. The cut off size is the particle aerodynamic diameter at which the collection efficiency of the cyclone is 50%, or conversely, the size at which the cyclone transmission is 50%. For example, to obtain a particle size cut off of 2.5 μm (i.e., $PM_{2.5}$), the required sampling flow rate is 4 liters/minute. A that flow rate only particles smaller than (approximately) 2.5 μm are allowed to pass into the *p*DR-1200 sensing stage, to be monitored and then to be collected on the filter.

As can be seen on Fig. 7, the lowest particle size cut for the GK 2.05 cyclone included with the *p*DR-1200 is about 1 μm, and the largest is about 12 μm. For particle size classification outside this range, consult with MIE.

14.2 Particle Sizing

The selectable particle size capability of the cyclone, in combination with the concentration measuring capability of the photometric system of the *p*DR-1200 permits the user to determine the mass median aerodynamic particle diameter of an aerosol, i.e., of the airborne particle population being sampled.

One simple procedure to determine the median particle size is as follows (please refer to the graph of Fig. 7):

- Remove cyclone from its black attachment cup and set cyclone aside
- Start pump and sample aerosol at a flow rate between 2 and 4 liters/minute
- Press **ON** key on *p*DR-1200 panel and after about one minute key **NEXT** and then **ENTER**
- After an elapsed time (ET) of about one minute, read and note TWA concentration
- Shut off pump

- Plug in cyclone into its attachment cup

- Start pump and run at about 1 liter/minute. Observe real-time concentration (CONC) reading

- Increase flow rate very slowly and gradually until CONC reading is one-half of the initial concentration measured without the cyclone. Continue sampling at this
  flow rate for about one minute and confirm that TWA reading is about one-half of the initial one. Otherwise readjust flow rate. Note final flow rate at which the TWA value has decreased to one-half the value noted without the cyclone.

- Enter the final flow rate for which the TWA value is one-half of the initial value into the graph of Fig. 7 and read the corresponding d_{50} particle size in micrometers. This represents the mass median particle diameter of the aerosol.

For example, if the TWA value without the cyclone was 0.8 mg/m^3, and the flow rate (with the cyclone attached) required to reduce the TWA to 0.4 mg/m^3 is 2 liters/minute, the mass median particle size (as obtained from the curve of Fig. 7) is approximately 5.5 μm.

15.0 CONVERSION BETWEEN *personal*DataRAM VERSIONS

The *personal*DataRAM user has the option to convert from a model *p*DR-1000AN to a model*p*DR-1200 or vice versa using the appropriate conversion kit. To convert from a *p*DR-1000AN to a *p*DR-1200 (i.e., from a passive air sampling configuration to an active one), the user requires the model *p*DR-ASC conversion kit. To convert from a *p*DR-1200 to a *p*DR-1000AN (i.e., from an active air sampling configuration to a passive one), the user requires the model *p*DR-UB conversion kit.

15.1 Conversion Procedure From *p*DR-1000AN to *p*DR-1200

To effect this conversion use model *p*DR-ASC conversion kit. As you remove parts from the *p*DR-1000AN, in order to attach the conversion kit components, store these parts carefully for possible future re-conversion. Proceed as follows:

- Remove the two screws on the top of the large protective bumper that covers the sensing chamber (see Figure 1). This bumper is not used on the *p*DR-1200;
- Remove the large protective bumper by lifting it firmly upwards and away from the sensing chamber;
- Reinsert in the upper two threaded holes and tighten the two screws that had held the protective bumper;
- Remove the socket-head screws on the front and back black covers that were exposed by removal of the large top bumper. Lift away the freed front and back covers of the sensing chamber; store them carefully for future use, ensuring that their surfaces are not scratched or marred;

- Position one of the two gasketed (soft rubber) sensing chamber cover plates provided in the conversion kit on the front side of the sensing chamber. Insert and tighten the included socket head screw firmly making sure that the plate is aligned perfectly with the top of the sensing chamber. Similarly, attach the other cover plate on the back side of the sensing chamber;
- Identify the two black cups of the *p*DR-ASC conversion kit. One of them has an external o-ring (filter holder cup), and the other has no o-ring (cyclone cup); refer to Figures 2 and 4 for the location of these cups on the *p*DR-1200 sensing chamber. These cups can be installed on either side of the sensing chamber, i.e., the cyclone can be either on the left or the right side of the sensing chamber (Figure 2 shows the case where the cyclone is on the right side);
- Attach one cup to the left side of the sensing chamber using the two black socket head screws. Tighten screws firmly. Similarly, attach the other cup to the right side of the sensing chamber;
- Take the cyclone/filter holder unit provided as part of the conversion kit, and separate the 37-mm plastic filter holder from the metal cyclone by firmly pulling the two units apart;
- Carefully slide the large open end of the plastic filter holder over the cup with the external o-ring, previously attached to the sensing chamber. Ensure that the cup is fully inserted into the filter holder;
- Carefully insert the large diameter open end of the metal cyclone into the other cup on the opposite side of the sensing chamber. The cyclone inlet (small short metal tube on side of cyclone) can be oriented as desired (upwards, as shown in Figure 2, sideways, downwards, etc.). Ensure that the cyclone is fully inserted into the cup;
- When ready to operate, connect a length of tubing between the barbed fitting at the downstream end of the plastic filter holder and the pump to be used in combination with the *p*DR-1200.
- Perform a zeroing sequence (see Sections 6.5.2 and 8.1) before starting a run. This completes the conversion of the *p*DR-1000AN to the *p*DR-1200.

15.2 Conversion Procedure from *p*DR-1200 to *p*DR-1000AN

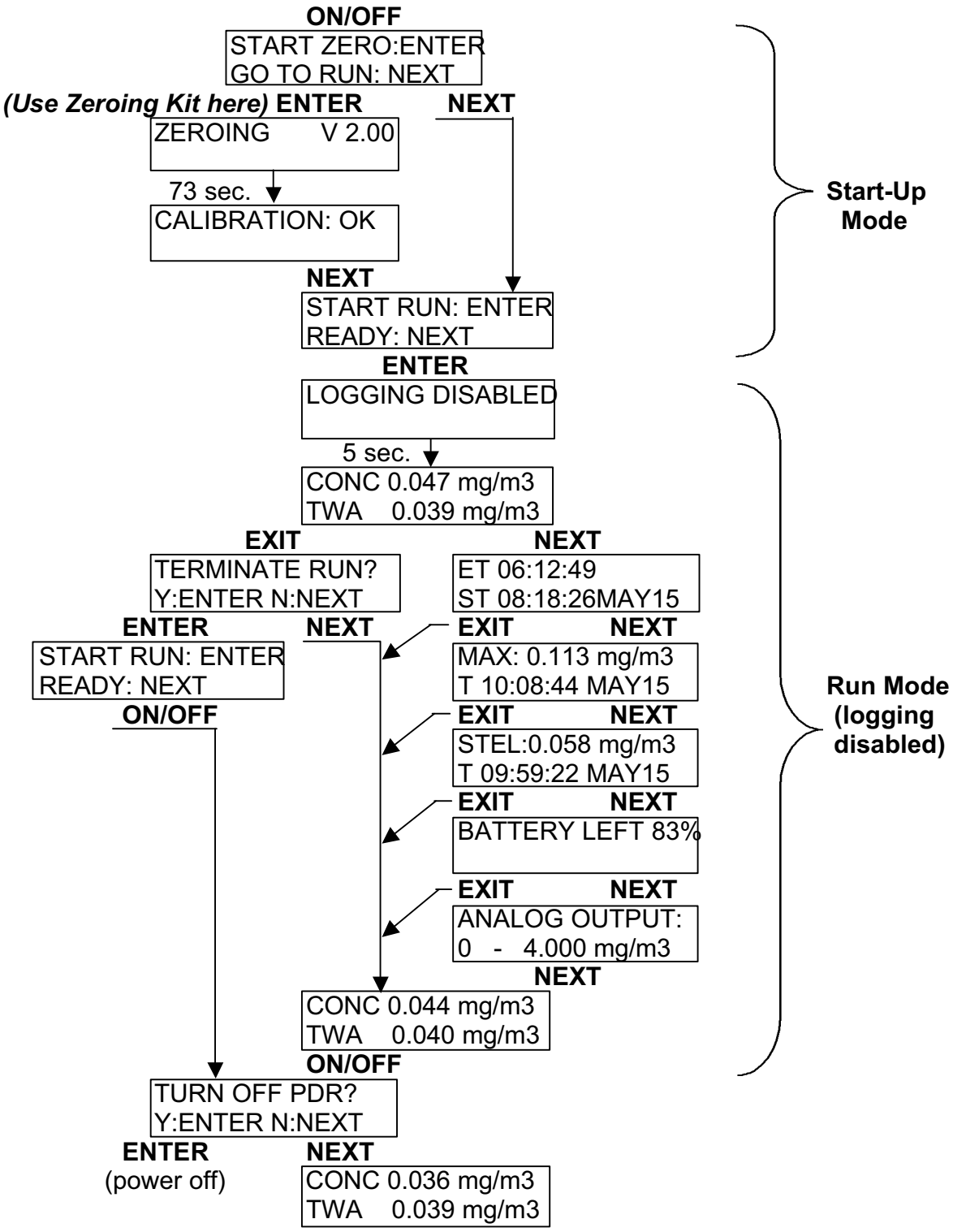
To effect this conversion use model *p*DR-UB conversion kit. As you remove parts from the *p*DR-1200, in order to attach the conversion kit components, store these parts carefully for possible future re-conversion. Proceed as follows:

- Pull off both the cyclone and the filter holder from their respective cups on the two sides of the sensing chamber;
- Loosen the two screws that hold each of the two cups on the sides of the sensing chamber (total of 4 screws), and remove the two side cups;
- Loosen the single screw on each of the two (front and back) gasketed sealing covers enclosing the sensing chamber, and remove the two covers;
- Identify the two flat sensing chamber cover plates provided in the conversion kit; one face of each of each of these two plates has a dull black finish (antireflective); avoid touching those surfaces;

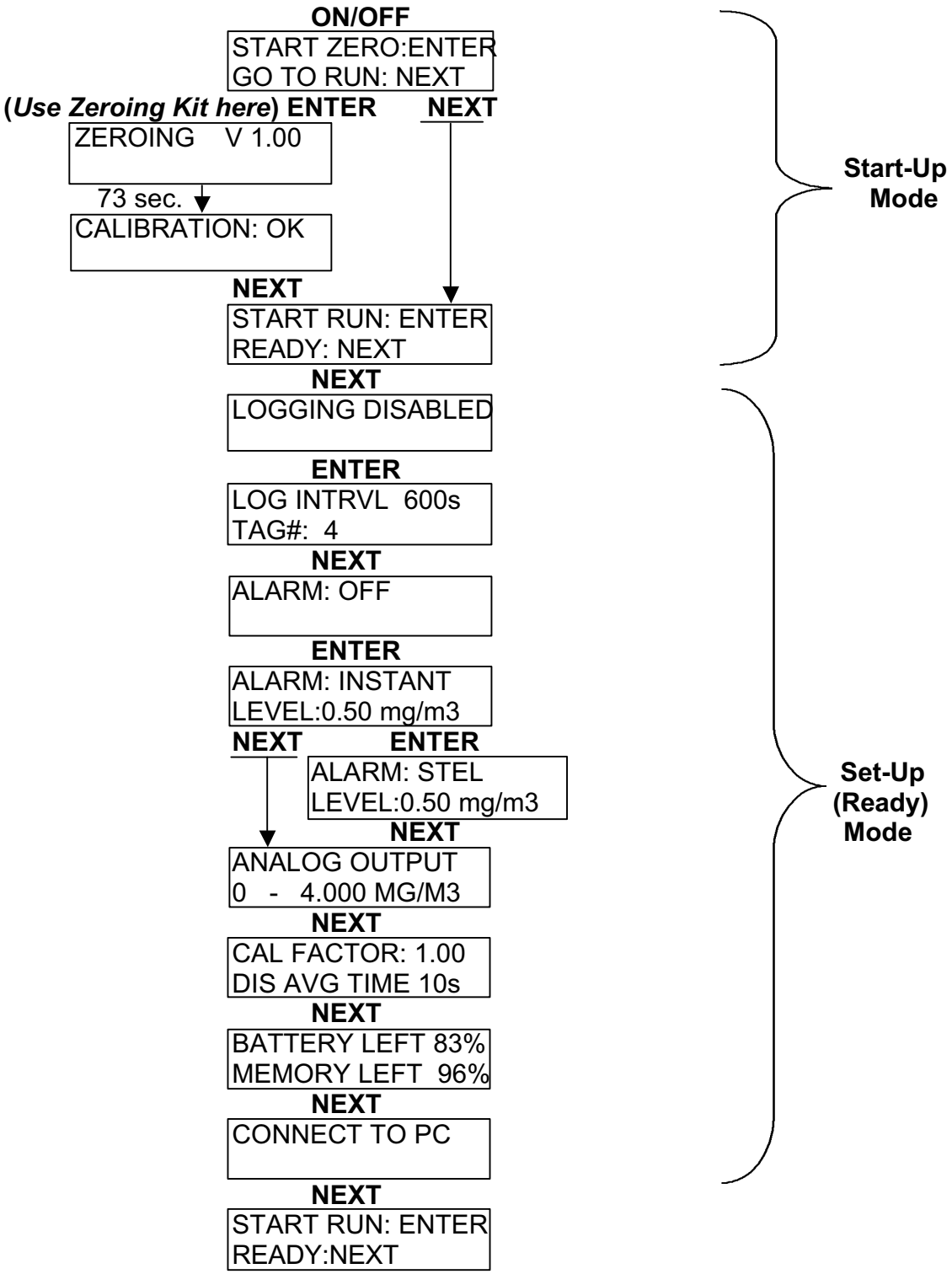
- Position one of the two sensing chamber cover plates over the open front of the sensing chamber with the dull surface on the inside, and such that the hole in the plate is aligned with the corresponding threaded mounting hole on the upper wall of the sensing chamber. Insert and tighten firmly black socket head screw provided with the conversion kit, making sure that the plate is aligned perfectly with the top of the sensing chamber. Similarly, attach the other cover plate to the rear of the sensing chamber, with the dull surface facing inward;
- Loosen and remove the two small screws on the top surface of the sensing chamber;
- Position large protective bumper (provided in the conversion kit) over sensing chamber pushing down until properly seated. Insert the two top screws (two shiny Phillips-head screws provided in the conversion kit) Into the two holes In the bumper while holding down the bumper, and tighten gently (do not over-tighten) making sure that the heads of these screws are well Inside their cavities In the bumper;
- Perform a zeroing sequence (see Sections 6.5.1 and 8.1) before starting a run. This completes the conversion from a *p*DR-1200 to a *p*DR-1000AN.

16.0 SEQUENCE OF KEYSTROKES AND SCREENS (*p*DR-1000 AN, -1200, HPM-1000)

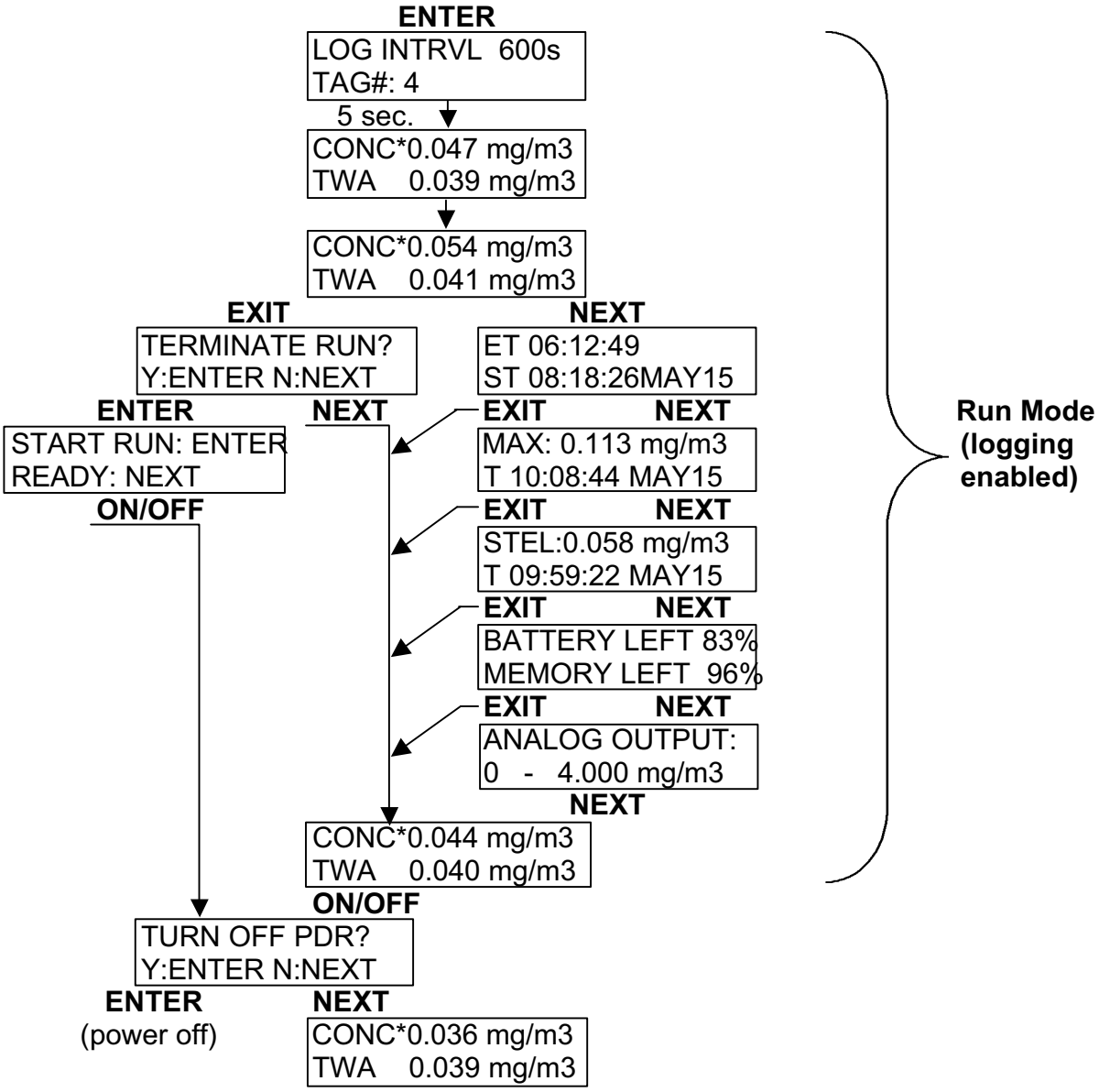
Start-Up and Survey Run Mode (***Without*** Data Logging)



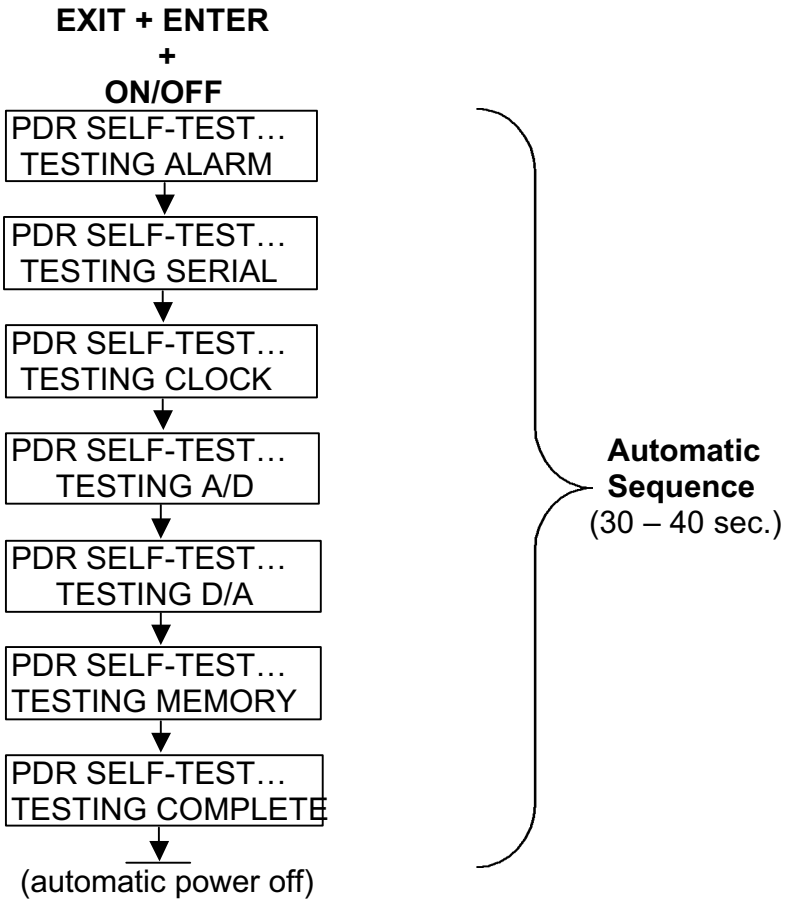
Start-Up, Set-Up and Run Mode (*With* Data Logging)



(Continues on next page)



Resetting/Electronic Checking Mode



NOTE: After the preceding resetting sequence, the instrument should be zeroed, otherwise its optical background will remain unsubtracted.

APPENDIX B

Resume of Data Validator

DONALD C. ANNÉ
SENIOR CHEMIST

EDUCATION: M.S., Chemical Oceanography, Florida Institute of Technology, 1981
B.A., Earth Sciences, Millersville University of Pennsylvania, 1975

SPECIAL TRAINING: Certified 40-Hour OSHA Health and Safety
Certified 8-Hour OSHA Supervisory Course
Ground Water Geochemistry (NWWA)
Ground Water Pollution and Hydrology (Princeton Associates)
Quality Assurance Programs for Environmental Monitoring Data (Stat-A-Matrix)

PROFESSIONAL AFFILIATIONS: American Chemical Society (AFS), 1979-Present

EXPERIENCE SUMMARY:

Mr. Anné has more than 27 years of environmental chemistry experience specializing in data validation, environmental sampling, analytical methodologies, petroleum fingerprinting, laboratory audits, field sampling audits, and preparing Quality Assurance Project Plans and Quality Assurance Manuals. Mr. Anné's experience includes analytical laboratory work with gas chromatography, atomic absorption, infrared spectrometry and wet chemistry methods.

PROJECT EXPERIENCE:

Quality Assurance/Quality Control of Chemical Data

Mr. Anné has more than 20 years experience as a data validator and quality assurance officer. Mr. Anné has validated data for most EPA Regions and under several independent state programs, including the NYSDEC. He has performed laboratory and field audits as well as written Quality Assurance Project Plans. Mr. Anné has written, reviewed, and initiated laboratory Quality Assurance Manuals for laboratories to maintain their regulatory compliance. Typical project experience includes:

- Senior Chemist responsible for data validation. Reviewed chemical data for several projects under the New Jersey ISRA regulations. The clients included industry and utilities.

- Supervising Environmental Scientist responsible for data validation. Reviewed chemical laboratory data for adherence to QA/QC protocols for several key projects, including National Priorities List sites and RCRA Corrective Actions located in EPA Regions I, II, III, IV, V, and IX. Validated analytical data, outlined problems and actions to be taken, and qualified all affected data. Consulted with project managers on data usability, and recommended corrective actions to support project goals. Responded to comments made by regulators regarding data quality.

- Supervising Environmental Scientist recognized by the New York State Department of Environmental Conservation (NYSDEC) to perform third party data validation. Attended NYSDEC workshop on data validation as part of the requirements set forth by NYSDEC. Performed data validation in support of NYSDEC STARS and ASP programs as well as data in support of the NYSDEC Part 360 Regulations for landfills. Validated data for an Albany area municipal landfill.

- Supervising Environmental Scientist responsible for developing and preparing Quality Assurance Project Plans (QAPPs) for several state and federal Superfund sites and federal RCRA corrective action sites. Negotiated with regulators for the acceptance of the QAPPs. The sites were located throughout the eastern United States.

- Environmental Chemist responsible for developing a laboratory QA/QC program which fulfilled requirements of the EPA and agencies from the States of Texas and Louisiana. Implemented and managed the program throughout DOE's SPR Environmental laboratories. Received verbal commendations from EPA and the Texas Water commission on the QA/QC Program.

Environmental Chemistry

Mr. Anné is experienced in sampling soil, water, air, and wastes in accordance with federal and state guidelines. He has performed field sampling audits and prepared sampling plans for numerous projects in accordance with applicable programmatic requirements. Mr. Anné is familiar with the geochemical aspects of fate and transport of contaminants. Mr. Anné's typical project experience includes:

- Data manager for the Pennwalt Corporation's RCRA Corrective Action RFI Phase I program. The project included quantifying and characterizing soil contamination and hydrogeologic flow systems of 12 SWMUs at a flourochemicals plant in Thorofare, New Jersey. Validated and prepared QA/QC reports for data generated during the project. Qualified all data in preparation of the final report. Work was performed under the direction of NJDEP.

- Project Chemist in charge of field sampling activities, including coordinating and scheduling all subcontracted laboratory work for more than 25 sites in Connecticut. Trained field teams in sampling techniques for soil, groundwater, and surface water; chain of custody requirements; sampling QA/QC protocols; and analytical requirements. Work was performed under the scrutiny of ConnDEP.

- Field Team Leader for a major hazardous waste drum excavation project. Supervised all field activities including site safety; excavation; removal, sampling, and over packing of drums; staging and sampling of contaminated soil; and preparation of samples. Coordinated excavation and laboratory subcontractors. Work was performed under the scrutiny of ConnDEP.

- Created an environmental monitoring program for the Bryan Mound site of DOE's Strategic Petroleum Reserve for testing ground water and surface water. Developed sampling protocols, frequency of sampling, and lists of target analytes. This program was designed to provide baseline data for pre-spill conditions in the event of a release. The site was under scrutiny by EPA Region V and the Texas Water commission.

- Project Chemist responsible for developing analytical QA/QC program that included sampling and chemical analyses of surface water, groundwater, soil, and sediment matrices as part of a Remedial Investigation/Feasibility Study (RI/FS). The RI/FS involved more than 25 sites throughout the State of Connecticut. Work was under the guidance of ConnDEP.

Analytical Chemistry

Mr. Anné has experience working in both fixed-base and mobile laboratories. His experience includes the use of gas chromatography, atomic absorption spectrometers, infrared spectrometers, and numerous wet chemistry and preparation equipment methods. He has served in the laboratory as an analyst, laboratory advisor, and QA officer. He has interfaced with regulators in the area of analytical chemistry and has experience in petroleum fingerprinting techniques and methods. Typical projects include:

- Performed bench scale experiments for St. Lawrence Zinc in order to obtain the optimum level of Phlotec necessary to treat discharged water to resolve an N.O.V. for the SPDES outfall. The optimum level of Phlotec would precipitate enough dissolved zinc for the water to meet the discharge requirement. Also performed routine analyses of samples after implementing the treatment, to insure that the proper concentration was being used.

- Environmental Chemist in charge of project to design updates for the DOE's laboratories at its SPR facilities. Evaluated IR and FT-IR instrumentation and personal computers to link with existing and future instrumentation. Wrote procedures for the acceptance of an alternative oil & grease method for NPDES permit

monitoring by EPA Region V. Coordinated all site activities necessary for implementing upgrades.

- Environmental Chemist in charge of replacing obsolete total organic carbon (TOC) analyzers for the SPR laboratories. Evaluated state-of-the-art TOC analyzers and recommended replacement TOC analyzer. Negotiated with supplier and wrote technical specification for the bid process required by DOE. Supervised installation and set-up of all new TOC analyzers.

- Analytical Chemist for Berkley Products Company responsible for product development. Analyzed competitor's products and formulated new coatings with equal or better quality. Responsible for solvent operations which included managing the waste solvent recovery operations, solvent formulation, and manufacturing QA/QC. Worked with sales and manufacturing staff to address and resolve client complaints. Received two cash bonuses for suggestions on the manufacture of products which saved the company money.

- Analytical Chemist for the mobile laboratory responsible for sample preparation in support of several projects for a range of clients located in three EPA regions and in conjunction with several state agencies. Extracted, concentrated, and prepared water and soil samples for analyses by GC/FIND, GC/ECD, GC/PID, and GC/MS. Samples were prepared for PCB, pesticide, polynuclear aromatic hydrocarbon, and petroleum hydrocarbon analyses.

EMPLOYMENT:

2005- present, Alpha Geoscience
1998-2005, Alpha Environmental Consultants, Inc.
1990-1998, McLaren/Hart
1986-1990, Fred C. Hart Associates
1985-1986, Boeing Petroleum Services
1982-1985, Petroleum Operations and Support Services
1981-1982, Dravo Utility Constructors
1979-1981, Florida Institute of Technology
1975-1979, Berkley Products Company

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