

From: Robert Stewart
To: Arnesen, Eric
Subject: Low Flow Methodology, Coral Graphics, 327 New South Road

Eric,

If you propose to use low flow protocol to sample the wells (as stated in the monthly report), you must keep the flow rate between 200 ml/minute to 500 ml/minute with a maximum drawdown of 0.3 feet. (You need a water meter to measure the drawdown.) To get this low flow, you need a Grundfos Redi Flo-II or a bladder pump. Since the pumping rate on the Whale pump is not adjustable, you can't use this pump unless the flow rate falls within the limits.

You can't sample until the following parameters have stabilized for 3 consecutive readings as follows:

- pH within 0.1
- specific conductance within 3%
- redox potential within 10 mv
- DO and turbidity within 10% (turbidity must be below 50 NTUs)

You have this covered in the work plan, but I wanted to remind you so that you will have the appropriate equipment at the site. You need a lot of equipment to do low flow sampling.

Bob

CC: Parish, Walter

From: Robert Stewart
To: Arnesen, Eric
Subject: Phase II Groundwater Sampling, 327 New South Road, #V00416-1

Eric,

This e-mail message is to confirm our telephone conversation today regarding Phase II groundwater sampling at the Coral Graphics site located at 327 New South Road in Hicksville. The agreed scope of work for this phase of the voluntary investigation follows:

- 1) Three temporary water table monitoring wells will be installed at geoprobe groundwater sampling locations WP-1, WP-4, and WP-5 so that non turbid groundwater samples can be collected at these locations.
- 2) The temporary wells will have an appropriate sand pack. They will be developed and sampled according to the protocol in the approved work plan except for changes as noted in this message.
- 3) The temporary wells will not be grouted but will be protected from surface contamination until sampled. The wells will be surveyed and the depth to water readings will be recorded before abandonment so that the groundwater flow direction can be calculated by triangulation.
- 4) The groundwater samples will only be analyzed for TAL metals (23 metals) using SW-846 methods by Category B deliverables at a NYSDOH ELAP approved laboratory. (Samples for VOCs and SVOCs will not be necessary.)
- 5) In order to ensure that the turbidity of the samples do not affect the samples, the samples will be collected directly from the pump's discharge. A turbidity meter (nephelometer) will be used to measure the turbidity of the samples. The turbidity must be less than 50 NTUs. The samples will be unfiltered. The samples will be preserved with HNO₃. (If you cannot achieve less than 50 NTUs, please ask me for directions on collecting the samples.)
- 6) A Grundfos Redi-Flo II or a plastic Whale pump will be acceptable to collect the samples. Please contact me in advance if you intend to use another brand of sampling pump.
- 7) At your discretion, the temporary wells may be abandoned after the samples are collected. Although we do not expect to have to resample the groundwater at a later date, this will not be known with any certainty until the results have been reviewed.

By copy of this message, I am informing Ian Ushe, NYSDOH and John Lovejoy, NCDOH of this proposed sampling. They should contact me immediately if they have any objections to the proposed Phase II groundwater sampling.

I am also copying Tim LeBarron with NYSDEC's QA Unit to make sure that the above sampling procedures will be acceptable.

Please call me at (631) 444-0244 if you have any questions or if I have incorrectly stated the agreed upon sampling.

Thanks,
Bob Stewart

CC: eepsjll@health.co.nassau.ny.us; LeBarron, Tim; Parish, Walter; Scharf, Steven; ziu01@health.state.ny.us

From: Robert Stewart
To: Arnesen, Eric
Subject: Re: Coral Graphics, 327 New South Road

Eric,

The primary interest at this site is the presence of 1,1,1-TCA in the groundwater at concentrations above the groundwater standard. For this reason, we cannot possibly eliminate VOCs from the sampling parameters. Please note that we did pick up trace levels of 1,1-DCA, a breakdown product of 1,1,1-TCA, in the one soil sample near the suspected location of the primary leaching pool. We probably didn't sample inside the former pool so there could be higher concentrations inside the pool. This suggests that 1,1,1-TCA may have been discharged historically at the site. We may not have found the source area yet or the source area in the unsaturated zone may have naturally attenuated, but there could be some residual contamination remaining in the groundwater. Let's wait for the VOC results from the geoprobe groundwater sampling results before making any conclusions.

Were there any significant VOC TICs detected which could account for the elevated PID readings in some of the soil samples?

Please call me if you have any questions.

Bob Stewart
Phone: (631) 444-0244

>>> "Eric Arnesen" <earnesen@np-npv.com> 07/08/02 04:17PM >>>
Bob,

I have finished tabulating the data for 327 New South Road and have included then in this e-mail. Based on these results I think we might be able to drop VOC's from the remaining analysis to be done at the site. Call or e-mail to let me know what you think.

Thanks,

Eric

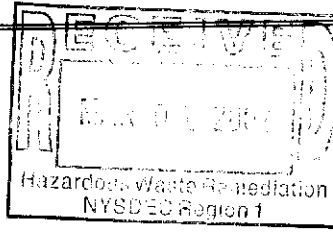
CC: Parish, Walter

Walter,

Can I send this?

OK
WA

Bob



Voluntary Investigation Work Plan

Coral Graphics, Inc.

327 New South Road
Hicksville, New York

NP&V Job No. 01075

October, 2001

Voluntary Investigation Work Plan

Coral Graphics, Inc.

**327 New South Road
Hicksville, New York**

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1.0 SITE DESCRIPTION AND BACKGROUND

1.1 Site Location

The subject property lies in the Hamlet of Hicksville, Town of Oyster Bay, County of Nassau, New York. The subject property consists of an approximately 1.0 acre developed parcel located on the east side of New South Road, north of Marvin Avenue (**Figure 1**).

1.2 Purpose

This document provides a sampling and analysis plan for a supplemental site investigation in connection with the subject property and is intended to supplement prior investigation activities completed on the site. The purpose of this voluntary cleanup investigation is to determine what impacts certain former on-site activities have had upon the environmental quality of the subject site, specifically related to previous Phase I and Phase II investigations of the former septic system and former underground storage tank (UST) facilities. The purpose of the study, is to determine if any remediation of these facilities is necessary.

1.3 Site Description

The site is currently utilized as a warehouse facility for Coral Graphic Services Inc., which is headquartered at 840 South Broadway in Hicksville approximately 0.5 miles south of the subject site. The approximately 1-acre lot houses a single story masonry building with a footprint area of approximately 15,000 SF and was constructed between 1953 and 1966. A majority of the building, approximately 13,400 SF, is used for storage space while the remaining 1,600 SF is used as office space. The building is used for the storage of paper goods, equipment and office supplies. Prior occupants of the facility include South Nassau Control Corporation, a division of Oceanside Launderers and Busada Manufacturing Corporation. South Nassau Control Corporation reportedly occupied the building for several years where they reportedly stored and blended detergents in the warehouse space. Busada Manufacturing was involved in the extrusion of plastic tubing and pipes by employing plastic resins and other compounds. The facility was formerly serviced by an on-site septic system located south of the warehouse building (for the disposal of sanitary wastes), but is now serviced by the Nassau County municipal sewer system. A 3,000 gallon UST was also formerly located south of the facility building for the storage of fuel heating oil and was abandoned in place on January 28, 1994. The UST was replaced with a 1,500 gallon aboveground storage tank (AST) located along the eastern wall of the building that is maintained within a secondary containment structure.

The site was not identified on any federal, state and local regulatory agency databases.

The site layout and structures are depicted in **Figure 2**.

FIGURE 1

LOCATION MAP



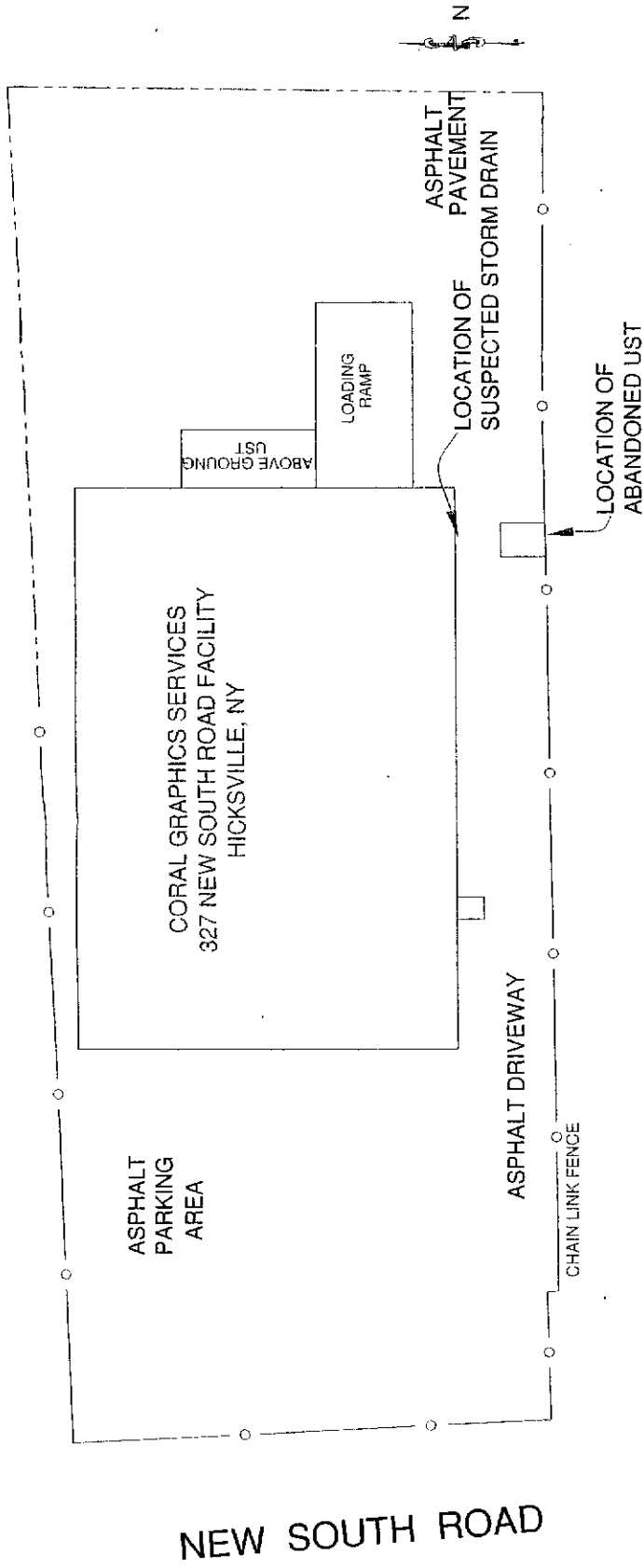
Source: USGS Topographic Maps
Scale: 1" = 1,500'

NORTH



FIGURE 2

SITE PLAN



Source: Survey prepared by Albert W. Tay, LLS, June 20, 2000
Scale: 1" = 30'

1.4 Prior Documentation and Adjacent Site Description

Prior documents involving the environmental quality of the site include a Phase I Environmental Site Assessment (ESA) conducted by Malcom Pirnie dated May 2000, and an initial Phase II ESA conducted by Malcolm Pirnie dated August 2000.

The Malcolm Pirnie Phase II ESA consisted of a soil and groundwater sampling and analysis program which also included a focused geophysical survey to locate a fuel oil underground storage tank and septic system which formerly serviced the site. Two synoptic rounds of groundwater elevation measurements were collected from the four temporary monitoring wells installed at the site. Groundwater was found to occur under unconfined conditions within the Upper Glacial aquifer at elevations ranging from 68.15 ft to 68.42 ft above the Nassau County datum or a depth of approximately 58 ft below surface grade. Based on these measurements, the general direction of groundwater flow underlying the site was determined to be towards the southwest and exhibited a hydraulic gradient of 0.003 ft/ft. However, it should be noted that prior studies conducted and the Hooker Ruco Polymer and Northrop Gruman facilities indicate that groundwater flow may be in a more southerly to south-easterly direction. At this time it is unclear whether the discrepancy is the result of undetected on-site conditions or possible calculation errors.

Results of the investigation revealed that groundwater at the site was impacted by releases to the environment consisting primarily of TCA with acetone, benzene, toluene, ethylbenzene, xylenes and several metals also being detected. Impacted groundwater was found to be primarily in the area of the subject property south of the facility building. Groundwater impacts were also detected in samples collected from the sites upgradient monitoring wells indicating potential contribution from an off-site source. Geophysical survey results revealed the presence of an underground fuel oil UST and a former on-site septic system. In addition, during the Phase II ESA three storm drains were observed east of the facility building. However no samples were collected from these potential source areas.

The laboratory analysis performed on the groundwater samples revealed the presence of several volatile organic compounds which included acetone 1,1,1-TCA, toluene, ethylbenzene, xylenes and phenanthrene. Of these compounds only 1,1,1-TCA, benzene and toluene were detected above their respective NYS Ambient Groundwater Quality Standards and Guidance Values. These exceedences were observed to occur in the area of the former UST and on-site septic system.

It is noted that three sites adjacent to the subject site, but not the subject site, are listed on several federal and State regulatory databases. These sites consist of Hooker Chemical/Ruco Polymer, Northrop/Grumman Aerospace Corporation and the Naval Weapons Industrial Reserve Plant and have been listed as either NPL CORRACTS and/or CERCLIS sites. According to Northrop/Grumman reports, the subject site is located approximately 500 feet west of (and downgradient based on site investigations) a comingled total volatile organic (TVOC) plume which originates from Hooker/Ruco, Northrop/Grumman and the Naval

Weapons Industrial Reserve Plant. The initial Phase II investigation did not identify an on -site source of groundwater contamination and has concluded that groundwater contamination most likely is originating from an off-site area of contamination along the Northrop/Grumman and Hooker Chemical site borders.

2.0 FIELD SAMPLING PLAN

The Field Sampling Plan (FSP) has been designed to delineate the source areas and extent of potential soil and groundwater contamination present at the site. Investigative activities will consist of subsurface soil and groundwater sampling in potential source areas as well as upgradient and downgradient locations. The FSP will be divided into two separate phases. Phase I will consist of the collection of soil and groundwater samples to determine potential source areas responsible for on-site subsurface contamination. Soil and/or sediment samples will be collected from each of the on-site storm drains and suspected leaching pools of the former on-site septic system. In addition, soil samples will be collected from the former UST area as well as a patched asphalt area located near the buildings southeast corner which may be a former drywell structure. Groundwater samples collected using Geoprobe temporary sampling locations will be collected from the eastern property line and south of the on-site facility building. Phase II will involve the installation of permanent groundwater wells to monitor the vertical and horizontal extent of the delineated contaminant plume (if detected) emanating from defined source areas at the site.

All field sampling procedures and protocols involved in execution of this FSP will be thoroughly outlined in Section 3.0 of this SAP. All appropriate QA/QC and sample tracking methods are provided in Sections 4.0 and 5.0.

2.1 Phase I Proposed Sampling

Phase I of the proposed on-site sampling will consist of soil and groundwater sampling to locate potential source areas of contamination which may be present on-site or originating from an off-site source. The results obtained during this phase will be used to identify the origin of contamination and determine the location of permanent monitoring wells.

2.1.1 Drainage and Leaching Structure Inventory

Inspection of the interior and exterior of the facility building will be conducted to identify the presence of any floor drains, slop sinks, drywells or other related drainage structures not previously detected at the subject site. Activities related to this inventory will be undertaken in the presence of NYSDEC and Nassau County Department of Health (NCDOH) personnel and any encountered structures will be further investigated to determine their point of discharge. Procedures utilized to identify discharge points will include interviews with facility personnel, dye testing and/or other visual inspection techniques. Should leaching structures not previously identified at the site be encountered it may be necessary to collect additional samples to determine if bottom soils have been impacted by discharges. NYSDEC and NCDOH personnel will be contacted to determine if any of the structures should be included with the sampling program proposed in subsequent sections of the Work Plan.

2.1.2 Soil Sampling – Existing On-Site Storm Drains

Two (2) samples (1 sediment and 1 soil) will be collected from each of the three (3) existing on-site storm drains located in the eastern portion of the site (SP -1 through SP-3) (Figure 3). These drainage structures have not been previously sampled and may act as potential source areas for existing on-site contamination. Samples will be collected from the bottom of each pool at an interval of 0 to 2 ft. In addition, another sample will also be collected at the 10 to 12 ft interval below the bottom of each storm drain in the event that bottom soils had been removed as part of previous storm drain cleanouts conducted by previous occupants of the on-site facility.

The sample will be collected with Geoprobe® direct push technology using a two (2) ft core barrel sampling device. Cores will be monitored in the field to optimize the depth of the second sample to secure same above virgin material.

2.1.3 Soil Sampling – Former UST

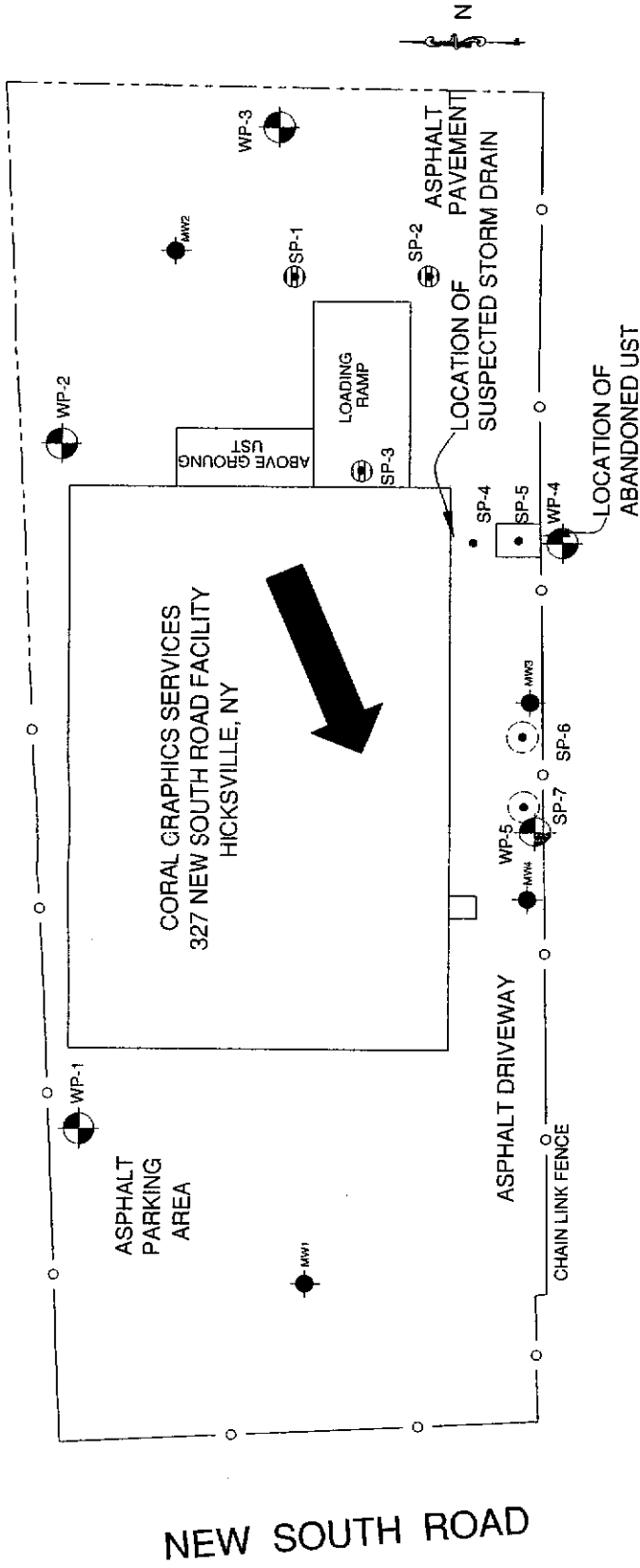
One (1) soil sample (SP-5) will be collected from soils underlying the former on-site UST located south of the existing facility building. According to the Malcom Pirnie Phase I (May, 2000) the UST was abandoned in place in January of 1994 and no information was available regarding soil or groundwater quality impacts that may have resulted from its use for the storage of fuel oil. Samples will be collected continuously to a depth of 20 ft below surface grade utilizing Geoprobe direct push technology. Each sample will be screened with a photoionization detector (PID) for the presence of volatile organic compounds. The sample exhibiting the highest PID reading will be submitted for laboratory analysis. If none of the screened samples register a PID reading the sample from the 10 to 12 ft interval will be submitted for analysis.

2.1.4 Soil Sampling – Former Leaching Pools and Suspected Storm Drain

One (1) soil sample will be collected from each of the former septic system leaching pools (SP -6 and SP-7) and the suspected storm drain (SP -4) located south of the facility building. For the purpose of this FSP it will be assumed that each of these structures were abandoned in place and backfilled. Soil samples will be collected continuously within each structure utilizing Geoprobe direct push technology to determine the extent of backfill materials and the vertical depth of potentially impacted soils. A soil sample will be collected below any backfilling at an interval of 0 to 2 ft beneath the former bottom of each structure.

FIGURE 3

SAMPLING PLAN



LEGEND

- MW1
- FORMER TEMPORARY MONITORING WELL
- SUSPECTED GROUNDWATER FLOW DIRECTION
- ABANDONED SANITARY SYSTEM LEACHING POOL
- ON SITE STORM DRAIN
- GEOPROBE WATER SAMPLE LOCATION
- GEOPROBE SOIL SAMPLE LOCATION
- SP-1

NOTE:
 GENERAL DIRECTION OF GROUNDWATER FLOW BASED ON
 SYNOPTIC ROUND OF GROUNDWATER ELEVATION
 MEASUREMENTS COLLECTED ON JUNE 20, 2000.
 FOR MALCOLM PIRREE PHASE II INVESTIGATION

Source: Survey prepared by Albert W. Tay, LLS, June 20, 2000
 Scale: 1" = 30'

2.1.5 Groundwater Probe Installation and Groundwater Sampling

A total of five (5) groundwater probes will be installed to further delineate groundwater quality at the subject site. Three (3) probes (WP-1 through WP-3) will be installed northwest, northeast and east of the facility building to provide adequate upgradient coverage of groundwater flowing onto the site. Groundwater samples from these locations will be analyzed to determine if impacts previously identified at the site may be the result of off-site contamination migrating onto the subject property. The remaining two (2) probe locations will be installed south of the facility building and will be placed in locations to characterize groundwater quality in the vicinity of potential source areas identified on the subject site. These probes may also be located downgradient of the three on-site storm drains and analytical results from these soil probe locations may help to identify if former discharges to these subsurface structures have contributed to groundwater contamination underlying the property. The first location will be installed in the area of the suspected dry well located near the buildings southeast corner (WP-4). This location is downgradient of the abandoned UST as well as MW-3 installed during the previous Phase II investigation. The second location (WP-5) will be located immediately adjacent to the former septic tank and in the vicinity of the former location of MW-4 installed during the previous Phase II investigation. Both former monitoring wells MW-3 and MW-4 were both found to contain groundwater contamination above the regulatory standards for 1,1,1-TCA. The location of each groundwater probe point is presented in Figure 3.

All sediment and soil samples collected during Phase I will be analyzed for volatile organic compounds via EPA test method 8260, Semivolatile compounds via EPA test method 8270 and TCL metals via EPA method 6010. Groundwater samples collected during this phase will only be analyzed for volatile organic compounds via EPA test method 8260. However should significant detections of SVOC's and metals be detected in soils and sediments the analysis of groundwater samples may be expanded to include these compounds. All samples will be analyzed by a NYSDOH Environmental Laboratory Approved Program (ELAP) CLP certified laboratory with Category B deliverables, using all appropriate QA/QC and sample tracking methods.

2.2 Phase II Proposed Sampling

Based on the results obtained during Phase I of the FSP and if an on-site source is identified, it is anticipated that a minimum of four (4) two (2) inch monitoring wells may be required to monitor any contaminant plume which may be identified at the site.

One (1) well (NPV-1) will be placed upgradient of the facility building to monitor groundwater quality entering the property boundaries. One well will also be installed within any potential plume identified during Phase I (NPV-2). The two (2) remaining monitoring wells, NPV-3 and NPV-4, will be placed downgradient of the identified source areas to monitor impacts to groundwater quality originating from past site activities. Each well will be installed with a fifteen (15) ft screen set to straddle the water table. Each well will be used for the collection of

groundwater samples as well as for water level measurements for groundwater flow characterization. It should be noted that based on results of Phase I it may be necessary to install additional permanent monitoring wells beyond the minimum four proposed to more fully characterize on-site contamination. The final number and exact location of monitoring wells will be determined through an analysis of the analytical data retrieved during Phase I and discussions with the NYSDEC.

Monitoring wells will be installed using a Hollow Stem Auger (HAS) drill rig in accordance with the specifications outlined in Section 3.0. Groundwater samples will be collected consistent with the analytical parameters utilized during Phase I. In addition, samples will be collected in accordance with all appropriate QA/QC procedures as well as sample tracking methods and shall require a Category B deliverables package. Analysis of monitoring well groundwater samples will be determined based on the results obtained during Phase I and NYSDEC approval.

However, if no on-site source areas are identified and it is determined that on-site contamination is the result of an off-site source then no monitoring wells will be installed.

2.3 Sampling Summary

Table 1 has been included to summarize the groundwater and soil sampling schedule.

TABLE 1
SAMPLING SCHEDULE

Phase I Soil Sampling						
Sample ID	Sample Location	Sample Interval (ft)	Probe Interval (ft)	Sample Type	Sample Analysis	# of Samples
SP-1	Storm Drain	0-2 and 10-12	NA	Soil	8260, 8270, 6010	2
SP-2	Storm Drain	0-2 and 10-12	NA	Soil	8260, 8270, 6010	2
SP-3	Storm Drain	0-2 and 10-12	NA	Soil	8260, 8270, 6010	2
SP-4	Suspected Storm Drain	Continuous	0-20	Soil	8260, 8270, 6010	1
SP-5	Abandoned UST	Continuous	Unknown	Soil	8260, 8270, 6010	1
SP-6	Former Leaching Pool	Continuous	Unknown	Soil	8260, 8270, 6010	1
SP-7	Former Leaching Pool	Continuous	Unknown	Soil	8260, 8270, 6010	1
Duplicates	Storm Drain (SP-3)	NA	0-2	Soil	8260, 8270, 6010	1
MS/MSD	Storm Drain (SP-3)	NA	0-2	Soil	8260, 8270, 6010	1
Field Blanks	NA	NA	NA	Water	8260, 8270, 6010	1
Trip Blanks	NA	NA	NA	NA	NA	1
Phase I Groundwater Sampling						
Sample ID	Sample Location	Sample Interval (ft)	Probe Interval (ft)	Sample Type	Sample Analysis	# of Samples
WP-1	Upgradient	(1)	Water Table	Groundwater	8260, (2)	1
WP-2	Upgradient	(1)	Water Table	Groundwater	8260, (2)	1
WP-3	Upgradient	(1)	Water Table	Groundwater	8260, (2)	1
WP-4	Suspected Storm Drain	(1)	Water Table	Groundwater	8260, (2)	1
WP-5	South of Building	(1)	Water Table	Groundwater	8260, (2)	1
Duplicates	Storm Drain (SP-3)	(1)	Water Table	Groundwater	8260, (2)	1
MS/MSD	Storm Drain (SP-3)	(1)	Water Table	Groundwater	8260, (2)	1
Field Blanks	NA	NA	NA	Water	8260, (2)	1
Trip Blanks	NA	NA	NA	NA	NA	1
Phase II Monitoring Well Installation and Sampling						
Sample ID	Sample Location	Sample Interval (ft)	Probe Interval (ft)	Sample Type	Sample Analysis	# of Samples
NPV-1	Upgradient	Water Table	NA	Groundwater	(2)	1
NPV-2	Plume	Water Table	NA	Groundwater	(2)	1
NPV-3	Downgradient	Water Table	NA	Groundwater	(2)	1
NPV-4	Downgradient	Water Table	NA	Groundwater	(2)	1
Duplicates	Downgradient	Water Table	NA	Groundwater	(2)	1
MS/MSD	Upgradient	Water Table	NA	Groundwater	(2)	1
Field Blanks	NA	NA	NA	Water	(2)	1
Trip Blanks	NA	NA	NA	Water	(2)	1

Notes: (1) – Top of Water Table (2) – To be determined based on results obtained from prior results and DEC approval

3.0 FIELD SAMPLING PROCEDURES AND PROTOCOLS

3.1 Monitoring Well Installation and Groundwater Sampling Protocol

Monitoring wells will be installed and constructed in compliance with applicable methods for groundwater quality monitoring well installation, as per the description and illustration provided in **Appendix A**.

Following installation each well will be developed using a submersible pump to remove sediment and allow for the free movement of groundwater between the monitoring well and the formation. To perform effective development, the pump will be surged through the entire water column and purge flow rates will be altered to allow backwashing to occur. Each monitoring well will be developed until removed water clarity achieves a turbidity of 50 nephelometric units (NTU's) or less and stabilization in pH and conductivity readings has occurred.

During sampling, groundwater samples shall be collected from all groundwater monitoring wells within the monitoring well network using "low flow" groundwater sampling techniques. Prior to sampling, a round of static water levels shall be taken from all monitoring wells. Specific sampling and measurement procedures are presented in the following sections. The groundwater elevation data shall be tabulated.

Each well shall be purged and sampled with a flow regulated submersible pump and dedicated polyethylene tubing using low flow methodology. Groundwater will be removed from each well until stabilization of selected water quality indicator parameters (pH, specific conductance, dissolved oxygen, oxidation-reduction potential and temperature) and a turbidity of at least 50 nephelometric units (NTUs) is achieved. All samples shall be sent to the laboratory for the analyses within 24-hours of sampling.

The following Standard Protocol for Groundwater Sampling has been established to conform to NYSDEC rules and regulations. The standard methods for preparation, collection, and transfer of groundwater samples, as well as record keeping, are detailed within.

After collection of an acceptable sample in accordance with this protocol, the sample will be submitted to a NYSDOH certified laboratory. The preparation, collection, preservation, transfer and record keeping of each sample will be coordinated with the analytical laboratory to ensure reliable test results. Before contracting with a certified laboratory, the appropriate analytical testing QA/QC Protocol will be verified with the laboratory and submitted to the NYSDEC for approval.

3.2 Geoprobe Groundwater Sampling

3.2.1 Definitions

The **Geoprobe** machine is a vehicle-mounted hydraulically-powered soil probing machine that utilizes static force and percussion to advance small diameter sampling tools into the subsurface. This section of the RI workplan will discuss only the groundwater sampling tools.

Screen Point Groundwater Sampler: The assembled screen point sampler is 1.0 inch O.D. by 36 inches in overall length. This sampler employs a 19 -inch screen encased in a perforated stainless steel sleeve.

3.2.2 Groundwater Sampler Placement

In this procedure, the assembled Screen Point Sampler threads onto the leading end of a Geoprobe probe rod and is driven into the subsurface using a Geoprobe machine. Additional probe rods are connected in succession to advance the sampler to depth. While the Screen Point Sampler is being driven to the desired sampling depth, it is kept sealed by O -ring connections placed at critical locations on the assembly.

When the desired sampling depth is reached, the sampler is pulled up about 2 feet which disengages the expendable drive point and creates an open borehole from which to sample. The inner core, which consists of a stainless steel wire screen inside of a perforated stainless steel sleeve, is then pushed out into the borehole and water is allowed to enter the sampler and connected probe rods.

In common practice, ground water samples are recovered by pumping or bailing of water collected in the open probe rods. Alternately, tubing from the surface may be connected directly to the sampler screen using a Geoprobe PR (post run) fitting, and samples recovered using a peristaltic pump. The pore size of the screen of this sampler is .0057 inches (0.145 mm). This sampler will allow the user to collect relatively clean water samples in a short time period due to its large surface area. See **Appendix B** for Groundwater Sampler Diagrams.

3.2.3 Basic Operation

The outer appearance of the Screen Point Groundwater Sampler, once it has been assembled properly, looks just like a normal Geoprobe 3 -foot probe rod. The bottom is fitted with an expendable drive point, while the top part of the sampler can simply be connected to Geoprobe rods and other accessories. The assembled sampler will be driven by a Geoprobe machine.

At sampling depth, the probe rods attached to the sampler are retracted two feet to allow the sampler screen to be pushed out into the formation.

3.2.4 Decontamination and Preparation of Parts

In order to assemble the water sampler properly and to take accurate and precise water samples, all parts need to be cleaned thoroughly and, if necessary, individually decontaminated prior to their use. For each test run, fresh, decontaminated sampler parts and O-rings will be used.

All parts will be washed with alcanox detergent. All soil adhering to the parts will be removed by steam cleaning. Finally, all parts will be rinsed with clean, contaminant-free water and allowed to dry before they are assembled.

3.2.5 Assembly

A diagram of the unassembled screen point sampler parts is presented in **Appendix B**. Assembly instructions are as follows:

- a) Push the screen insert and plug (P/N GW-444), equipped with an O-ring (P/N GW-444R), into the screen sleeves (P/N GW-441), which is the end of the screen sleeves with only one drain hole.
- b) Push the screen connector (P/N GW-443), which is fitted with an O-ring (P/N GW-443R), over the top of the screen sleeve and secure with the connector pin. The pin can easily fall out since it is a rather loose fit.
- c) Insert the screen connector end of the assembled screen sleeve halfway into the screen point sampler sheath (P/N GW-440) from either end. Again, the screen connector end is inserted first.
- d) Slide the drive point seat (O-ring P/N GW-440-1R) over the outstanding end of the screen sleeve and screw it tightly into the sampler sheath.
- e) Push the screen sleeve up into the sampler sheath just far enough to fit the expendable drive point (O-ring GW-445R) into the bottom end of the drive point seat.
- f) Screw the O-ring end of the water sampler drive head (P/N GW-430B) into the top of the sampler sheath. Make sure all threads are fastened tightly.

3.2.6 Probing

- a) Drive the water sampler approximately two-foot below the depth level where you want to sample by simply attaching it to Geoprobe rods.

- b) Never drive the water sampler without the O-ring (P/N GW-445R) attached to the drive point. Failure to use this O-ring may result in flowing soils clogging the screen during driving.

3.2.7 Screen Deployment

Once the Screen Point Groundwater Sampler has been driven to the base of the interval desired for sampling, the probe rods are retracted a distance of 2 feet (607 mm) and the screen is pushed out into the formation. The following procedures are employed to deploy the screen:

- a) Retract the probe rods, from the ground a distance of 24 inches.
- b) Insert Geoprobe stainless steel extension rods (P/N AT -67) down the bore of the probe rods. An extension rod coupler (P/N AT -68) must be placed at the bottom end of the lead extension rod in order to protect the threads at the end of this rod. One extension rod will be required for each probe rod in the ground, plus one extension rod for the screen point sampler itself. Place an extension rod handle (P/N AT -69) at the top of the extension rod string.
- c) When the proper number of extension rods have been coupled together and inserted down the bore of the probe rods, the last extension rod will protrude from the top of the probe rods a distance of approximately 24 inches (607 mm).
- d) Pushing down on the extension rods should now push the screen out into the formation. When the screen is completely pushed out, the extension rod handle will come to rest at a final position approximately 3 inches (76 mm) above the top of the probe rods.
- e) In extreme situations, it may be necessary to tap on the top of the extension rod handle with a hammer in order to force the screen out into the formation.

3.2.8 Sampling, General Considerations

There are two methods for obtaining a sample from the GW -440 series Screen Point Sampler. Groundwater samples can be obtained by bailing or pumping directly from the bore of the probe rods above the screen point. Alternately, a tubing system may be attached directly to the top of the deployed screen and samples pumped to the surface using a peristaltic pump.

3.2.9 Bottom Check Valve Sampling

The most common method employed is to pump directly from the bore of the probe rods immediately above the screen point using a tubing bottom check valve. This method is often

referred to as sampling from the open rods, and is essentially the same for bottom check valve sampling as it is for bailing. Note that in order for this method to be employed, the piezometric

head in the saturated formation must be above the top of the deployed screen joint; water from the formation must rise into the probe rods where it can then be pumped to the surface. Sampling is performed as described in the following steps:

- a) Either 3/8 inch (9.5 mm) O.D., teflon (P/N TB-30T) or polyethylene (P/N TB-25L) tubing will be used for groundwater sampling. Selection of tubing material will be based on the analytes of interest and the purpose of the groundwater investigation.
- b) Place a tubing check valve (P/N GW-42) at the bottom end of a roll of tubing. This bottom check valve will fit either of the tubing types listed above.
- c) Push the tubing, check valve end first, down the bore of the probe rods until it strikes the top of the screen point sampler.
- d) Lift the tubing approximately 4 inches (102 mm) off the bottom (top of the screen point sampler) and oscillate the tubing up and down in 8 to 12 inches (200 to 300 mm) strokes. In field practice, the tubing is oscillated up and down by hand at a rate of 60 to 100 strokes per minute. This pumping can yield as much as 500 milliliters of sample per minute.
- e) Air bubbles appearing in the pumped stream indicate that the pumping action is exceeding recharge from the screen point, allowing air to enter at the check valve end. For most purposes, intermixing of air with the pumped sample is undesirable. The pumping rate should be slowed and balanced with the recharged rate.
- f) If water cannot be pumped to the surface, sufficient sample may be obtained by using the tubing and check valve as a bailer. Oscillate the tubing to fill it with several feet of sample and then remove the tubing from the rods.

3.2.10 Sampling Through PRT Tubing

“PRT” (post run tubing) refers to a Geoprobe proprietary system of tubing and fittings that are used both for vapor and groundwater sampling. This tubing is inserted down the rods after the sampler has already been driven to depth and has been deployed for sampling. The top of the screen point sampler screen is equipped with a PRT adapter fitted onto the end of the sample tubing.

In practice, the tubing with PRT adapter at the lower end is inserted down the bore of the probe rods and screwed into the receptacle on the top of the sampler screen. This procedure forms a

vacuum tight sample train from the sampler screen to ground surface. Sample is normally pumped to the surface using a peristaltic pump or other vacuum source.

The advantage of this method is that the sample is only placed in contact with the stainless steel sampler screen and the sample tubing. The sample is never exposed to a free surface. The disadvantage of this method is that it is limited to maximum groundwater depths of 20 to 28 feet (6 to 8.5 mm) below ground surface.

Although this sampling method is desirable, it will probably not be possible due to the depth of the groundwater table.

The following procedures are used to obtain groundwater samples using PRT fittings and tubing:

- a) Either 3/8 inch (9.5 mm) O.D. teflon (P/N TB-30T) or polyethylene (P/N TB-25L) tubing may be used for groundwater sampling. Selection of tubing material should be based on the analytes of interest and the purpose of the groundwater investigation. Each of these tubings has a corresponding PRT adapter that will be required for this sampling. These adapters are shown in the following table.

Tubing and PRT Adapters

<u>Tubing</u>	<u>Description</u>	<u>PRT Adapter Part Number</u>
TB-30T	3/8 inch (9.5 mm) TFE	PR-30S
TB-25L	3/8 inch (9.5 mm) LDPE	PR-25S

- b) Place the barbed end of the appropriate adapter into the selected tubing.
- c) Push the adapter end of the tubing down the bore of the probe rods until it comes into contact with the PRT threads at the top of the screen point sampler.
- d) Rotate the tubing counter-clockwise at the surface to screw the adapter into the screen point threads. Rotate the tubing several revolutions until the down hole adapter is completely sealed and the tubing starts twisting. In this condition, the tubing will rotate backwards (clockwise) when released.
- e) The tubing can now be attached to a peristaltic pump or vacuum source at the surface.
- f) After sampling is complete, tubing should be removed by pulling it up at the surface. This will pull the tubing off the barbed end of the tubing adapter and will allow the

operator to examine the connection at the top end of the screen point when it is pulled from the ground.

3.2.11 Removal

- a) Remove all sampling tubing from the bore of the probe rods.
- b) Pull all probe rods from the ground using the Geoprobe machine. Care should be taken not to push down on the probe rods during removal.
- c) Care should be taken to lift the screen point sampler vertically upward at the surface. Pulling the probe rods or sampler from the ground at any direction other than vertical may result in bending of the screen point sampler.
- d) Dismantle the sampler at the surface and examine it for damage. Decontaminate all parts, replace all O-rings, and reassemble the sampler for the next sample.

3.3 Geoprobe Groundwater Sampling Protocol

During sampling, groundwater samples shall be collected from Geoprobe groundwater samplers using the technique discussed in Section 3.2.9. Prior to sampling, the groundwater elevation will be measured. The groundwater elevation data shall then be tabulated.

Three to five sampler volumes shall be purged using the bottom check valve sampling tubing. Samples shall be collected within three (3) hours of purging. All samples shall be sent to the laboratory for the analyses within 24-hours of sampling.

The following Standard Protocol for Groundwater Sampling has been established to conform to NYSDEC rules and regulations. The standard methods for preparation, collection, and transfer of groundwater samples, as well as record keeping, are detailed within. These methods should be followed to provide a representative sample of the critical stratigraphic unit for chemical analysis.

After collection of an acceptable sample in accordance with this protocol, the sample will be submitted to a NYSDOH certified laboratory. The preparation, collection, preservation, transfer and record keeping of each sample will be coordinated with the analytical laboratory to ensure reliable test results. Before contracting with a certified laboratory, the appropriate analytical testing QA/QC Protocol will be verified with the laboratory and submitted to the NYSDEC for approval.

3.4 Pre-Sampling Preparation / Equipment for Monitoring Well Sampling

- Health and safety: The health and safety protocols of the contractor shall conform to typical level D industry standards.
- Authorized personnel: All individuals involved in the sampling will have read this groundwater sampling protocol, be technically qualified, and follow the protocol whenever groundwater samples are obtained.
- Staging: Prior to any sampling event, the following steps will be taken by personnel responsible for sampling.
- Review the sampling procedures.
- Assemble and inspect field equipment necessary for sample collection, verify that equipment is clean and in proper working order.
- Calibrate equipment to manufacturer's specifications.
- Examine shuttles, bottles and preservatives. Contact laboratory immediately if any problems are found.
- Confirm sample delivery time and method of sample shipment with the laboratory.
- Establish a sampling schedule for the activities of the day. Establish a staging area consisting of plastic sheets.

3.5 Monitoring Well Groundwater Level Measurement Procedures (SOP 1)

- Clean all water-level measuring equipment using appropriate decontamination procedures.
- Remove locking well cap, note weather, time of day, and date, etc. in field notebook, or on an appropriate form.
- Remove well casing cap.
Measure the static water level in the well with a decontaminated water level indicator which shall be decontaminated with an alconox soap water wash followed by a deionized water rinse between each individual well to prevent cross-contamination. Synoptic round of water level measurements shall all be completed on the same day.
- Measure distance from water surface to reference measuring point on well casing, and record in field notebook.
NOTE: water level measurement is from either the top of protective steel casing, top of PVC riser pipe, from ground surface, or some other position on the well head.
- Measure total depth of well and record in field notebook or on log form.
- Remove all downhole equipment, replace well casing cap and locking steel caps.
- Calculate elevation of water:

$$E_w = E - D$$

where

E_w = Elevation of Water

E = Elevation at point of measurement

D = Depth to Water

- All water level measurements are to be recorded to the nearest 0.01 foot.
NOTE: The same procedure may be used to determine the elevation of DNAPL. In addition, handling of coal tar residues if present will be conducted in compliance with the Field Health and Safety Plan (HASP) prepared for this site.

3.6 Procedures for “Low Flow” Well Purging and Purge Water Disposal (SOP 2)

Well purging is necessary to obtain a sample which is representative of the hydrogeologic regime and not standing water in the well.

- Identify the well and record the well number on the field data sheet.
- Verify that the well is not damaged.
- Field personnel put on new disposable gloves.
- Carefully remove well cover to avoid entry of foreign material into well.
- Purging the well.
- Purge well at rate of 0.5 liters/minute (L/min) until stabilization of selected water quality indicator parameters (pH, specific conductance, dissolved oxygen, oxidation-reduction potential, and temperature) and a turbidity of 50 NTUs is achieved.
- All purging and sampling equipment must be stored and transported in a manner which minimizes the possibility of accidental contamination.
- Record keeping.
- The sampling team will record the following information regarding the well purging procedure:
 - Day / Date / Time
 - Weather Conditions
 - Air Temperature
 - Condition of the well (rusty, bent casing, etc.)
 - Person(s) doing the purging
 - Groundwater level prior to purging
 - Depth to the bottom of the well
 - Volume to groundwater to be purged.

Chemical properties of evacuated water:

pH, specific conductance, dissolved oxygen, oxidation-reduction potential, and temperature.

Physical properties of evacuated water.

Turbidity, color, odor, presence of non-aqueous liquids and Volume of purged water.

Procedures for collection, measurement, and disposal of purged water.

- Purged water from each well shall be placed directly into NYSDEC approved, spill proof, 55 gallon steel drums or directly to ground surface if approved by NYSDEC. Gasketed tops shall be

placed on the drums and drawn tight with a steel ring / bolt mechanism. Drums will be stored on-site for subsequent classification and disposal.

3.7 Procedures for the Measurement of Groundwater pH and Temperature (SOP 3)

- Immerse the tip of the electrode in demineralized water.
- Rinse the electrode with demineralized water.
- Immerse the electrode in pH 7 buffer solution.
- Adjust the temperature compensator to the proper temperature.
- Adjust the pH meter to read 7.0.
- Remove the electrode from the buffer and rinse with demineralized water.
- Collect a groundwater sample using either a stainless steel, Teflon or PVC / polyethylene bailer and pour a small amount of this sample into an extra sample jar which shall not be used to store chemically analyzed samples.
- Immerse the electrode into the extra sample jar. Do not immerse the electrode into a sample which shall be chemically analyzed.
- Read and record the pH of the solution, after adjusting the temperature compensator to the sample temperature.
- Rinse the electrodes with demineralized water.
- Keep the electrode immersed in demineralized water when not in use.

All results are to be recorded in the Field Notebook.

3.8 Procedure for the Measurement of Groundwater for Specific Conductance, Oxidation-Reduction Potential and Dissolved Oxygen (SOP 4)

- Immerse the electrode in water overnight. If this is not possible due to field conditions, immerse the electrode for at least an hour before use.
- Rinse the cell with one or more portions of the sample to be tested.
- Immerse the electrode in the sample and measure the conductivity.
- Adjust the temperature setting to the sample temperature.
- Record the results in the field notebook.

3.9 Procedures for Monitoring Well Groundwater Sampling (SOP 5)

The following procedure shall be used for monitoring well groundwater sampling.

- Decontaminate flow regulated submersible pump and use disposable, single use discharge line.
- Purge well at a flow rate of 0.5l/min or less.
- Obtain sample from well using flow regulated pump following stabilization of selected water quality indicator parameters (pH, specific conductance, dissolved oxygen, oxidation-reduction potential and temperature) and a turbidity of 50 NTUs is achieved.

- Collect samples by discharging directly into pre-preserved sample bottles from pump.
- Place analytical samples in cooler and chill to 4 degrees C. Samples shall be delivered to the appropriate laboratory within 24 hours.
- Re-lock well cap.
- Fill out field notebook, Well Sample Log Sheet, labels, custody seals and chain of custody forms.

3.10 Procedures for Sampling Soils/Waste

3.10.1 Objective

The objective of this procedure is to collect discrete soil/waste samples at prescribed depths and recover them for visual inspection and/or chemical analysis.

3.10.2 Definitions

Geoprobe* Soil Probing Machine: A vehicle-mounted, hydraulically-powered machine that utilizes static force and percussion to advance small diameter sampling tools into the subsurface for collecting soil core and soil/waste core samples.

*Geoprobe is a registered trademark of Kejr Engineering Inc., Salina, Kansas.

Large Bore Soil Sampler: A 24-inch long x 1-1/2 inch (610 mm x 38 mm) diameter soil sampler capable of recovering a discrete sample that measures up to 320 ml in volume in the form of a 22-inch x 1-1/16 inch (559 mm x 27 mm) core contained inside a removable liner.

Liner: A 24-inch long x 1-1/8 inch diameter (610 mm x 29 mm) removable/replaceable, thin walled tube inserted inside the Large Bore Sample Tube for the purpose of containing and storing soil samples. Liner materials include brass, stainless steel, teflon, and clear plastic (cellulose acetate butyrate).

3.10.3 Discussion

The Large Bore (LB) Soil Sampler is used primarily as a discrete interval sampler, that is, for the recovery of a sample at a prescribed depth. In certain circumstances, it is also used for continuous coring.

The assembled Large Bore Sampler is connected to the leading end of a Geoprobe brand probe rod and driven into the subsurface using a Geoprobe Soil Probing Machine. Additional probe rods are connected in succession to advance the sampler to depth. The sampler remains sealed

(closed) by a piston tip as it is being driven. The piston is held in place by a reverse-threaded stop-pin at the trailing end of the sampler. When the sampler tip has reached the top of the desired sampling interval, a series of extension rods, sufficient to reach depth, are coupled together and lowered down the inside diameter of the probe rods. The extension rods are then rotated clockwise (using a handle). The male threads on the leading end of the extension rods and stop-pin have been removed; the tool string is advanced an additional 24 inches. The piston is displaced inside the sampler body by the soil as the sample is cut. To recover the sample, the sampler is retrieved from the hole and the liner containing the soil sample is removed. The operation is illustrated in Figure 20.

3.10.4 Decontamination

Before and after each use, thoroughly clean all parts of the soil sampling system by steam cleaning, Alconox wash, pesticide grade methanol wash and deionized/distilled water rinse followed by air drying as per project requirements. A clean, new liner will be used for each use. Parts should also be inspected for wear or damage at this time.

3.10.5 Assembly

- 1) Install a new AT-63R O-Ring into the O-Ring groove on the stop-pin.
- 2) Seat the pre-flared end of the LB liner over the interior end of the cutting shoe. It should fit snugly.
- 3) Insert the liner into either end of the sample tube and screw the cutting shoe and liner into place. If excessive resistance is encountered during this task, it may be necessary to use the LB shoe wrench. Place the wrench on the ground and position the sampler assembly with the shoe end down so that the recessed notch on the cutting shoe aligns with the pin in the socket of the wrench. Push down on the sample tube while turning it until the cutting shoe is threaded tightly into place.
- 4) Screw the piston rod into the piston tip. Insert the piston tip and rod into the sample tube from the end opposite the cutting shoe. Push and rotate the rod until the tip is seated completely into the cutting shoe.
- 5) Screw the drive head onto the top end of the sample tube, aligning the piston rod through the center bore.
- 6) Screw the reverse-threaded stop-pin into the top of the drive head and turn it counterclockwise with a 3/8 inch wrench until securely tightened. Hold the drive head in place with a 1-1/4 inch or adjustable wrench while completing this task to assure that

the drive head stays completely seated. The Macro-Core Combination Wrench will also fit the drive head for 1.25 inch probe rods. The assembly is now complete.

3.10.6 Pilot Hole

A pilot hole is appropriate when the surface to be penetrated contains gravel, asphalt, hard sands, or rubble. Pre-probing will prevent unnecessary wear on the sampling tools. A Large Bore Pre-Probe may be used for this purpose. The pilot hole should be made only to a depth above the sampling interval. Where surface pavements are present, a hole may be drilled with the Geoprobe Soil Probing Machine using a drill steel (AT-3255, AT-3536 or AT-3548 depending upon the thickness of the pavement), tipped with a 1.5 inch diameter carbide drill bit (AT-36) prior to probing.

3.10.7 Driving

- 1) Attach a drive cap to a one-foot probe rod and thread the rod onto the assembled sampler. Position the assembly for driving into the subsurface.
- 2) Drive the assembly into the subsurface until the drive head on the sample tube is just above the ground surface.
- 3) Remove the drive cap and one-foot probe rod. Secure the drive head with a 1-1/4 inch open end, adjustable wrench or a Micro-Core combination wrench, and re-tighten the stop-pin with a 3/8 inch open end wrench.
- 4) Attach the drive cap to a two-foot probe rod and continue driving the sampler into the ground. Attach three or four foot probe rods in succession until the leading end of the sampler reaches the top of the desired sampling interval.

3.10.8 Preparing to Sample

- 1) When sampling depth has been reached, position the Geoprobe machine away from the top of the probe rod to allow room to work.
- 2) Insert an extension rod down the inside diameter of the probe rods. Hold onto it and place an extension rod coupler or Quick Link extension rod connectors on the top threads of the extension rod (the downhole end of the leading extension rod should remain uncovered). Attach another extension rod to the coupler and lower the jointed rods down hole. An extension rod jig may be used to help hold the rods during Steps 2 and 3.

- 3) Couple additional extension rods together in the same fashion as in Step 2. The leading extension rod must reach the stop-pin at the top of the sampler assembly. When coupling extension rods together, you may opt to use the extension rod jig hold the downhole extension rods while adding additional rods.
- 4) When the leading extension rod has reached the stop-pin down hole, attach the extension rod handle to the top extension rod.
- 5) Turn the handle clockwise until the top -pin detaches from the threads on the drive head. Pull up lightly on the extension rods during this procedure to check thread engagement.
- 6) Remove the extension rods and uncouple the sections as each joint is pulled from the hole. The extension rod jig may be used to hold the rod couplers in place as the top extension rods are removed.
- 7) The stop-pin should be attached to the bottom of the last extension rod upon removal. Inspect it for damage. Once the stop-pin has been removed, the sampler is ready to be driven to collect a sample

3.10.9 Sample Collection

- 1) Reposition the Geoprobe machine over the probe rods, adding an additional probe rod to the tool string if necessary. Make a mark on the probe rod 24 inches above the ground surface (this is the distance the tool string will be advanced).
- 2) Attach a drive cap to the probe rod and drive the tool string and sampler another 24 inches. Actuate the hammer function during sample collection to increase sample recovery. Do not over-drive the sampler.

3.10.10 Retrieval

- 1) Remove the drive cap from the top probe rod and attach a pull cap. Lower the hammer assembly and close the hammer latch over the pull cap.
- 2) With the machine foot firmly on the ground, pull the tool string out of the hole. Stop when the top (drive head) of the sampler is about 12 inches above the ground surface.
- 3) Because the piston tip and rod have been displaced inside the sample tube, the piston rod now extends into the two-foot probe rod section. In loose soils, the two-foot probe rod and sampler may be recovered as one piece by using the Foot Control on the probe machine to lift the sampler the remaining distance out of the hole.

- 4) If excessive resistance is encountered while attempting to lift the sampler and probe rod out of the hole using the Foot Control, unscrew the drive head from the sampler and remove it with the probe rod, the piston rod, and the piston tip. Replace the drive head onto the sampler and attach a pull cap to it. Lower the hammer assembly and close the hammer latch over the pull cap and pull the sampler the remaining distance out of the hole with the probe machine foot firmly on the ground.

3.10.11 Sample Recovery

- 1) Detach the two-foot probe rod if it has not been done previously.
- 2) Unscrew the cutting shoe using the LB Cutting Shoe Wrench, if necessary. Pull the cutting shoe out with the liner attached. If the liner doesn't slide out readily with the cutting shoe, take off the drive head and push down on the side wall of the liner. The liner and sample should slide out easily.

3.10.12 Core Liner Capping

- 1) The ends of the liners can be capped off using the vinyl end caps for further storage or transportation. A black end cap should be used at the bottom (down end) of the sample core and a red end cap at the top (up end) of the core.
- 2) On brass, stainless steel, and teflon liners, cover the end of the sample tube with AT-640T teflon tape before placing the end caps on the liner. The tape should be smoothed out and pressed over the end of the soil core so as to minimize headspace. However, care should be taken not to stretch and therefore thin the teflon tape.

3.10.13 Sample Removal

- 1) Large Bore clear plastic liners and teflon liners can be slit open easily with a hooked-blade utility knife for the samples to be analyzed or placed in appropriate containers.
- 2) Large Bore brass and stainless steel liners come with plastic cladding on the outside of the liner to keep four 6-inch sections aligned. Remove the cladding and cut the sections apart with a knife. The Large Bore Manual Extruder may be used to push soil cores out of the liner sections for analysis or for transfer to other containers.

3.11 Procedures for Field Screening of Volatile Organic Compounds (SOP 6)

Once the soil sample has been retrieved the following procedures will be conducted to retrieve soil gases for screening:

- Calibrate with 100 parts per million (ppm) isobutylene gas to ensure proper operation.
- Calibrate to background conditions so to eliminate interference from the surrounding ambient air. The calibration procedures are outlined in the operations manual for the instrument.
- Place sample in glass jar, heat jar slightly and insert PID probe into jar.
- Record reading from instrument digital display.

3.12 Field Procedures Documentation

Data reporting practices will be followed carefully and data entries will be validated regularly to insure that raw data are accurate and that an audit trail is developed for those data that require reduction. All the field data, such as that generated during field measurements, observations and field instrument calibrations, will be entered directly into a bound field notebook.

One or more bound books will be maintained for the site: each book will be consecutively numbered. The book(s) will remain with the main project files. Copies will be made for the Project Manager and for the person who made the entries, if requested.

All entries in the log book will be made in ink. When a mistake is made in the log, it will be crossed out with a single ink line and will be initialed and dated.

Special care will be taken in the description and documentation of sampling procedures. Sampling information to be documented in the field notebook and/or associated forms are as follows:

- Weather conditions.
- Sample number
- Date and time of sample collection
- Source of sample (monitoring well or *Geoprobe* sampling tool)
- Purged well-type of equipment, purge volume, rate of purge and decontamination procedures
- Location of sample - document with a site sketch and/or written description of the sampling location so that an accurate re-sampling can be conducted if necessary
- Sampling equipment (i.e., bailer, Teflon tube)
- Analysis and QA/QC required
- Field instrument calibration including date if calibration standards used and their source, results of calibration and any corrective action taken

- Field data (pH, temperature, conductivity, etc.)
- Field observation - all significant observation will be documented
- Sample condition (color, odor, turbidity, oil, sheen, etc.)
- Site conditions
- Sample shipping procedure, date time, destination and if legal seals were attached to transport container(s)
- Comments - any observation or event that occurred that would be relevant to the site; for example, weather changes and effect on sampling.

3.13 Corrective Action

If, during the course of sampling, it is determined that field procedures are yielding unrepresentative samples, (SAP) or field procedures modifications may be necessary. In this event, a proposal will be submitted to the DEC for approval before such modifications are made. SAP or field procedure modifications will not be implemented until approval is clearly conveyed by the DEC for such modifications.

4.0 GROUNDWATER/SOIL SAMPLING AND ANALYSIS PLAN (SAP)

4.1 Data Quality Objectives (DQO's)

The data quality objectives for the groundwater / soil SAP are to assure that the data collected and reported is of documented values and to utilize groundwater/soil quality data to ascertain and define any observed impacts of any on-site or off-site activities that may have had an impact upon groundwater quality. The objective of the SAP is to assess and document that all data collected, stored and reported is scientifically valid, defensible and within accepted standards for precision, accuracy and consistency. Additionally, the SAP will catalog that all data collection, storage and reporting was performed in accordance with all state and federal regulations. The laboratory analyses shall be performed by a laboratory currently certified by the New York State Department of Health's Environmental Laboratory Approval Program (ELAP).

The applicable regulatory programs and standards include the following:

- Technical Administrative Guidance Manual 4046 (TAGM 4046)
- Technical Operating Guidance Series TOGS 1.1.1 Groundwater Quality Standards and Limitations.

4.2 Quality Assurance Objectives

4.2.1 Overall Program Objectives

Groundwater

The monitoring, sampling and analytical program to be implemented will ensure that groundwater quality within the site has been adequately characterized and maintained. Analytical results of the groundwater monitoring program will be utilized to ascertain and monitor changes in water quality immediately up gradient, beneath and immediately down gradient of the site. The primary objectives of the ground water level measurements from existing and proposed monitoring wells will be to: 1) obtain depth to water measurements from all on-site monitoring wells; 2) calculate groundwater elevations and 3) construct groundwater table and potentiometric contour maps to monitor groundwater flow rate and direction.

Soil

The overall program objectives for soil/waste sampling are to:

- 1) Characterize residual contamination from past actions.

- 2) Evaluate possible areas which may still be acting as a continued source of groundwater contamination.
- 3) Assess the potential for future biological contact with hazardous wastes.

4.2.2 Field Sampling Objectives

The overall program objective of field sampling is to establish standard operating practices which will be consistently followed in order to minimize potential impacts to data quality over time. Sampling procedures that are consistently implemented improve the long term accuracy of data. To achieve this data quality objective, collection and handling of samples will be conducted in accordance with this document.

4.2.3 Laboratory Data Quality Objectives

The laboratory data quality objectives will focus on precision, accuracy, representativeness, comparability and completeness (PARCC). The laboratory performing analytical work will do such work in accordance with established protocols and analytic quality assurance/analytic quality control (AQA/AQC). The laboratory will be NYSDOH ELAP CLP certified and will follow the NYSDEC ASP QA/QC procedures.

Precision

The laboratory objective for precision is to equal or exceed the precision demonstrated by the respective analytical methods on similar samples. Precision measures the reproducibility of measurements under a given set of conditions; it is the agreement among a set of replicable measurements. Precision will be measured in the laboratory by the analysis of duplicate sample analysis. For the routine quarterly groundwater monitoring events, the laboratory will be required to perform these analyses at a frequency specified in USEPA SW -846 Test methods for Evaluating Solid Waste, Physical/ Chemical Methods, 3rd Edition. Typically, these analyses will be performed for every twenty (20) samples.

For baseline monitoring events, a site specific duplicate sample will be collected and submitted to the laboratory for analysis.

For organic analyses, precision will be measured by the laboratory as a function of relative percent difference (RPD).

$$\text{RPD} = \frac{|D1 - D2|}{\frac{D1 + D2}{2}} \times 100$$

D1 = The first sample value
D2 = The second sample value

A control limit for laboratory precision as a function of RPD of 20% shall be used for sample values greater than ten times the instrument detection limit.

The overall precision of measurement data is a mix of sampling and analytical factors. Analytical precision is much easier to control and quantify than sampling precision, considering that there are more historical data related to individual analytical method precision and sampling precision is unique to each site. Overall system precision will be determined by collecting field duplicate samples and will be expressed as the RPD between the first sample (original) and the second sample (duplicate). Field duplicates will be "blind" to the laboratory.

Precision for measurements performed in the field (pH, specific conductance, temperature, redox, turbidity, dissolved oxygen, water level measurements and well total depth measurements) will be performed by taking a replicate measurement every fifth sample. An RPD control limit of 20% will be used for these measurements.

Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the respective analytical method based on the analysis of samples of a similar matrix. Accuracy is a measure of the closeness of agreement between an observed value and an accepted reference value. Laboratory accuracy will be measured as a function of percent recovery.

$$\text{Percent (\%) Recovery} = (R/S)*100$$

Where:

R = Reported or detected concentration

S = Known concentration

The laboratory will evaluate the accuracy of inorganic (spike sample analysis) and inorganic (matrix spike analysis) through the analysis of matrix spike samples at a frequency of every twenty samples and laboratory control samples (LCS) for every batch. For the baseline (annual) monitoring event, a site specific matrix spike sample will be used for inorganic compound analysis.

Atomic absorption (AA) analysis and wet chemical analyses will include a laboratory batch matrix spike every twenty samples of analytical batch, whichever is more frequent, and a calibration check standard every ten samples. The control limit for the ICP and GFAA calibration check samples will be a percent recovery of $\pm 10\%$ (LCS percent recovery will be between 90 and 110). The control limit for the wet chemical calibration check samples will be a percent recovery of $\pm 20\%$ (LCS percent recovery will be between 80 and 120). The spike sample analysis control limit percent recovery will be $\pm 25\%$ (matrix spike percent recovery for all analyses will be between 75 and 125).

Matrix spike and surrogate quality control limits (if necessary) are calculated following the procedure described in the following test. The matrix spike and surrogate quality control limits will be used by the laboratory will be presented with all sample analysis reports submitted to the NYSDEC by the selected laboratory. The laboratory and its QC reports must be approved by the Department prior to performing any work for the SAP.

After the analysis of at least five spikes samples (of the same matrix type) the average percent recovery (p) and the standard deviation of the percent recovery (Sp) is calculated. The accuracy assessment is expressed as a percent recovery interval from $p - 2Sp$ to $p + 2Sp$. The accuracy assessment for each analyte is updated on a regular basis.

Accuracy is also a function of proper instrument calibration. The QA/QC criteria for the initial and continuing calibration procedures followed by the laboratory will be provided when a laboratory has been selected. The laboratory and its QA/QC procedures must be approved by the Department prior to performing any work for the SAP.

Representativeness

Representativeness refers to the degree to which the data collected accurately reflect the medium being sampled. It is a qualitative parameter which most concerned with the proper design of the sampling program in terms of location, numbers of samples and collection procedures. The field sampling procedures are presented in Section 7.0 of the SAP. The selected sampling locations and frequency of sampling are also present in the SAP. Together, they will ensure that samples are collected in a manner such that the data are representative of the groundwater, and soil, in the vicinity of the site.

Comparability

The objective of comparability is to ensure that the analytical data are of comparable quality, both between sample locations and with data from previous sampling/analytical events at the site.

The analysis of groundwater and soil samples will follow NYSDEC ASP Contract Required Quantification Limits (CRQL) methods. Standard sampling methods that will be used in the collection of environmental samples and data are presented in Section 5.0, herein.

Completeness

The goal of completeness will be to generate the maximum amount of data that is usable in evaluating environmental conditions at the site. The data validation and usability procedures detailed in Section 8.0 herein, will determine the usability of the data. If any data are determined unusable, and the data are determined critical to evaluating site conditions, resampling and analysis of the questionable data point(s) may be required.

4.3 Groundwater Data Quality Objectives

The groundwater data quality objectives will focus both on -site and off-site monitoring for Contract Required Quantification Limits for the site.

4.3.1 Data Quality Objective

CRQL Analysis

All groundwater samples which have been selected will be analyzed for contract required quantification limits (NYSDEC ASP methods for category B deliverables, inorganic (metals) parameters).

4.4 Soil Data Quality Objectives

The soil data quality objectives will focus on both on -site and off-site monitoring for Contract Required Quantification Limits.

4.4.1 Data Quality Objective

All soil samples which have been selected for analysis will be analyzed for Contract Required Quantification Limits.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

This section describes the QA/QC requirements for groundwater sampling at the site.

5.1 QA/QC Definitions

The following definitions are included for terms which are used in the SAP for laboratory procedures:

Accuracy: the degree of agreement of a measurement with an accepted reference value. Accuracy is generally reported as a percent recovery, and calculated as:

$$(\text{Measure Value} / \text{Accepted Value}) \times 100$$

Analyte: the chemical or property for which a sample is analyzed.

Comparability: the expression of information in units and terms consistent with reporting conventions the collection of data by equivalent means; or the generation of data by the same analytical method. Aqueous samples shall be reported at mg/l solid samples shall be reported in units of mg/kg, dry weight.

Completeness: the percentage of valid data obtained relative to that which would be expected to be obtained under normal conditions. Data is judged valid if it meets the stated precision and accuracy goals.

Duplicate: two separate samples taken from the same source by the same person at essentially the same time and under the same conditions which are placed into separate containers for independent analysis. Duplicate samples are intended to assess the effectiveness of equipment decontamination, the precision of sampling efforts of ambient environmental conditions on sensitive analyses (e.g. volatile organics analysis or VOA), and the potential for contaminants attributable to reagents in decontamination fluids, identifying such potential sources or error is essential to the success of the sampling program and the validity of the environmental data. Each QC sample is described below. As a minimum, each set of ten or fewer field samples should include a trip blank, a duplicate and one sample collected in a sufficient volume to allow the laboratory to perform a matrix spike.

Episode: a continuous period of time during which sampling activities are undertaken. Cessation of activities for more than 48 hours terminates the episode.

Field Blanks: field blanks are the final analyte-free water rinse from equipment decontamination in the field and are collected at least once during a sampling episode. If analytes pertinent to the project are found in the field blank, the results from the blanks will be used to qualify the levels of analytes in the samples. This qualification is made during the

validation. The field blank is analyzed for the same analytes as the sample that has been collected with that equipment.

Precision: a measure of the agreement among individual measurements of the sample property under prescribed similar conditions. Precision is generally reported as Relative Standard Deviation (RSD) or Relative Percent Difference (RPD). Relative standard deviation is used when three or more measurements are available and is calculated as:

$$\text{RSD} = (\text{Standard Deviation} / \text{Arithmetic Mean}) * 100$$

Relative Percent Difference is used for duplicate measurements and is calculated as:

$$\text{RPD} = [(\text{Value 1} - \text{Value 2}) / \text{Arithmetic Mean}] * 100$$

Quality Assurance (QA): all means taken in the field and inside the laboratory to make certain that all procedures and protocols use the same calibration and standardization procedures for reporting results; also, a program which integrates the quality of planning, quality assessment, and quality improvement activities within an organization.

Quality Control (QC): all the means taken by an analyst to ensure that the total measurement system is calibrated correctly. It is achieved by using reference standards, duplicates, replicates, and sample spikes. Also, the routine application of procedures designed to ensure that the data produced achieved known limits of precision and accuracy.

Replicate: two aliquots taken from the same sample container and analyzed separately. Where replicates are impossible, as with volatile organics, duplicates must be taken.

5.2 Field Instrument Calibration and Preventative Maintenance

The field engineer or hydrogeologist shall be responsible for keeping a master instrument calibration/maintenance form for each measuring device. Calibration procedures shall be performed in accordance with each manufacturer's recommended procedures. Each form shall include at least the following information, where applicable.

- Name of device/or instrument calibrated;
- Device/instrument serial and/or I.D. number;
- Frequency of calibration;
- Date of calibration;
- Results of calibration;
- Name of person performing the calibration;
- Identification of the calibration standards, and
- Buffer solutions (pH meter only)

5.3 QA/QC Sample Collection

General guidance and the specific requirements regarding the collection of QA/QC samples are presented separately below.

5.3.1 Field Blanks (SOP 7)

Field blanks shall be taken to evaluate the cleanliness of groundwater sampling equipment, sample bottles and the potential for cross-contamination of samples due to airborne contaminants present in the air at the site and handling of equipment and sample bottles. Field blank samples shall be performed on the groundwater sample bailers and any filtering equipment. The frequency of field blanks taken shall be three (3) for the first week of field work (one each on Monday, Wednesday and Friday) and two (2) for the second week of sampling (one each on Tuesday and Thursday), as per NYSDEC Division of Environmental Remediation Quality Assurance Group.

Where required, field blanks shall be obtained prior to the occurrence of any analytical field sampling event by pouring deionized or potable water over a particular piece of sampling equipment and into a sample container. The analytical laboratory shall provide filled blank water and sample jars with preservatives for collection of all field blanks. Glass jars shall be used for organic blanks, and polypropylene jars shall be used for inorganic blanks. The field blanks as well as the trip blanks shall accompany field personnel to the sampling location. The field blanks shall be analyzed in accordance with the parameters selected for the groundwater samples (i.e. baseline or expanded) and shall be shipped with the samples taken subsequently that day.

Field blanks shall be taken in accordance with the procedure described below:

- Decontaminate sampler using the procedures specified in this plan.
- Pour distilled/deionized water over the sampling equipment and collect the rinsate water in the appropriate sample bottles.
- The sample shall be immediately placed in a sample cooler and maintained at a temperature of 4°C until receipt by the laboratory.
- Fill out sample log, labels and chain of custody forms, and record in notebook.

5.3.2 Duplicate Samples

Duplicate samples shall be analyzed to check laboratory reproducibility of analytical data. At least 5% of the total number of collected samples shall be duplicated to evaluate the precision of the method used. Field duplicates will be “blind” to the laboratory.

5.3.3 Sample Preservation

If acidification of the volatile samples causes effervescence, the sample should be submitted without acid preservation (cooling to 4 °C only). The occurrence of the effervescence must be appropriately noted on each sample label prior to shipment.

- Immediately following collection of the samples, they shall be placed in a cooler with freezer packs in order to maintain sample integrity. Any preservatives required will be added by the analytical laboratory. It is desirable to have preservatives placed in the bottles by the laboratory prior to the sampling event. This will save time in the field and increase overall QA/QC for the event. All volatile sample bottles to be filled to capacity with no head space for volatilization. If necessary, to meet the maximum recommended holding time, the samples are to be shipped by overnight couriers to the laboratory.
- The shipping contained used will be designed to prevent breakage, spills and contamination of the samples. Tight packing material is to be provided around each sample container and any voids around the freezer packs. The container is to be securely sealed, clearly labeled and accompanied by a chain-of-custody record. Separate shipping containers should be used for "clean" samples and samples suspected of being heavily contaminated. During winter months, care should be taken to prevent samples from freezing. Sample bottles will not be placed directly on freezer packs.

5.3.4 Sample Holding Times

- Samples must be received by the laboratory within 48-hours of sampling.
- The samples must be stored at or near 4°C and analyzed within applicable holding times.
- The laboratory must conform with the NYSDEC Analytical Services Protocol (1995 Revision).

5.4 Decontamination of Sampling Equipment (SOP 8)

As presented below, all field sampling equipment shall be decontaminated prior to use and/or between sampling locations.

The submersible sample pumps that are placed in the monitoring well shall be decontaminated with an Alconox detergent rinse and by pumping approximately twenty gallons of potable water through the pump. Since dedicated new lengths of polyethylene tubing shall be used for sampling each well, the tubing shall not be decontaminated. Unless otherwise specified, the submersible pumps, the pump's electrical wire, and the pump's safety wire shall be decontaminated prior to the sampling of the first well and between each subsequent well as follows:

- Potable water rinse
- Alconox detergent and potable water scrub
- Potable water rinse
- Distilled/deionized water rinse
- Wrap pump in aluminum foil, shiny side facing out

In lieu of safety wire, a new length of polypropylene safety rope may be utilized for the submersible pump between well locations.

Unless otherwise specified, all non-detect sampling equipment utilized to obtain groundwater environmental samples for chemical analyses (either stainless steel, Teflon, or PVC/polyethylene disposable bailers) shall be decontaminated between sampling points as follows:

- Potable water rinse
- Alconox detergent and potable water scrub
- Potable water rinse
- Ultra pure grade 10% nitric acid rinse
- Distilled/deionized water rinse
- Pesticide grade methanol (diluted with distilled/deionized water) rinse
- Distilled/deionized water rinse
- Air dry
- Wrap over with aluminum foil shiny side face out

The rinse water utilized to clean and rinse the sampling equipment will be disposed of into the on-site storm drains, pursuant to approval from the SCDHS.

6.0 SAMPLE TRACKING SYSTEM

In order to provide for proper identification in the field, and proper tracking in the laboratory, all samples must be labeled clear and in a consistent fashion using the procedures and protocols described below and with the following subsections.

- Sample labels will be waterproof and have a pre-assigned, unique number that is indelible.
- Field personnel must maintain a field notebook. This notebook must be water resistant with sequentially numbered pages. Field activities shall be sequentially recorded at a later time.
- The notebook, along with the chain of custody form, must contain sufficient information to allow reconstruction of the sample collection and handling procedure at a later time.
- Each sample shall have a corresponding notebook entry which includes:
 - Sample ID number
 - Well location and number
 - Date and time
 - Analysis for which sample was collected
 - Additional comments as necessary
 - Samplers name
- Each sample must have a corresponding notebook entry on a chain of custody form.
- The manifest entry for sampling at any one well is to be completed before sampling is initiated by the same sampling team at any other well.
- In cases where the samples leave the immediate control of the sampling team the shipping must be sealed.

6.1 Sample Identification System

Each sample collected shall be designated by an alpha numeric code that shall identify the type of sampling location, the specific location, the matrix sampled, and a specific sample designation. Site specific procedures are described below.

Sample identifications shall contain a sequential code consisting of three segments. The first segment shall designate the proper number. The second segment shall identify the location type and specific sample location. Location types shall be identified by a two or three letter code, for example: NPV for monitoring well, WP for Geoprobe water sample, SP for Geoprobe soil sample, etc. The specific sampling location shall be identified using a three digit number.

The third segment shall identify the matrix type and sample designation or identifier which identifies the sample depth, the sample event number, or other designation depending on the sample type. The matrix type shall be designated by a two letter code, for example: GW for groundwater. The sample identifier shall be represented by a two digit numeric code. Sampling events or rounds, such as for groundwater sampling shall be numbered in sequence beginning with "01" which corresponds to the round of sampling.

The following shall be a general guide for sample identification:

First Segment	Second Segment	Third Segment
NNNNN	AANN	AANN
Project #	Location Type	Matrix Sample Identifier
97081	NPV01*	GW20**

<u>Symbol Definitions</u>	<u>Matrix Type</u>	<u>Location Type</u>	<u>Sample</u>
<u>Identifier</u>			
A = Alphabetic	S = Soil	NPV = Monitoring Well	Groundwater sampling event
N = Numeric		GW = Groundwater	1st round of sampling = 01
		FB = Field Blank	2nd round of sampling = 02
		TB = Trip Blank	** - Depth of sample in feet
		PW = Potable Water	
		WP = Geoprobe for Water	
		SP = Geoprobe for Soil	
		DP = Deep Probe	
		* = Location Type Number	
		(will vary 01, 02,...10, etc.)	

6.2 Sample Containers and Analytical Requirements

- As required in the NYSDEC ASP, all sample containers must be provided by the laboratory.
- If glass bottles are used, extra glass bottles will be obtained from the laboratory to allow for accidental breakage that may occur.
- Necessary preservatives will be placed in the sample bottles by the laboratory.
- The sample bottles will be handled carefully so that preservatives are not inadvertently spilled.

Further details regarding specific sample holding times and glassware are provided in **Table 2**.

6.3 Sample Packing and Shipping

Samples shall be packaged and shipped according to Section 6.2 of the *Compendium of Superfund Field Operations Methods (CSFOM)*, entitled "Packaging, Labeling and Shipping" (**Appendix C**). Chain of custody forms, sample labels, custody seals and other sample documents shall be filled out as specified in the USEPA CLP Users Guide. Sample bottles and

samples shall either be delivered/picked up at the site daily by the analytical laboratory, or delivered via overnight courier.

The proper procedures for packaging and shipping must be followed once samples have been collected.

Packaging

Prior to shipment, samples must be packaged in accordance with current US DOT regulations. All required government and commercial carrier shipping papers must be filled out. The procedure below should be followed regardless of transport method.

- As required in the NYSDEC ASP, samples will be transported in metal ice chests or sturdy plastic coolers.
- Remove previously used labels, tape and postage from cooler.
- Ship filled sample bottles in same cooler in which empty bottles were received.
- Check that all bottle labels are complete.
- Check that all sample bottles are tightly capped.
- Affix return address labels.
- Be sure that chain-of-custody forms are complete.
- Wrap sample bottles in bubble pack and place in cooler.
- Pack bottles with extra bubble pack, vermiculite, or Styrofoam. Be sure to pack trip blank, if applicable.
- Keep samples refrigerated in cooler with bagged ice or frozen cold packs. Do not use ice for packing material.
- Separate and retain the sampler's copy of chain-of-custody.
- Tape paperwork in zipper bag to inside cooler lid.
- Close cooler and apply signed and dated custody seal in such a way that the seal must be broken to open the cooler.
- Securely close cooler lid with packing or duct tape. Be sure to tape latches and drain plugs in closed position

Shipping

Samples should arrive at the lab as soon as possible following sample collection to ensure holding times are not exceeded. All samples must be hand delivered on the same day as sampling or sent via overnight courier. When using a commercial carrier, the following steps will be followed:

- Securely package samples and complete paperwork.
- Weigh coolers for air transport.
- Complete air bill for commercial carrier. If necessary, insure packages.
- Keep customer copy of air bill with field notes and chain-of-custody form.

- When coolers have been released to transporter, call receiving laboratory and give information regarding samplers names, method of arrival.
- Call lab on the day following shipment to be sure all samples arrived intact. If bottles are broken, locations can be determined from chain-of-custody form.

6.4 Sample Documentation

The sample team or individual performing a particular activity shall be required to keep a weatherproof field notebook. Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during projects and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross examination and are admissible as evidence. The field notebook entries should be factual, detailed and objective. All entries are to be signed and dated. All members of the field investigation team are to use this notebook, which shall be kept as a permanent record. The field notebook shall be filled out at the location of sample collection immediately after sampling. It shall contain sample descriptions including: sample number, sample collection time, sample location, sample description, sampling method used, daily weather conditions, field measurements, name of sampler, and other site-specific observations. The field notebook shall contain any deviations from the protocol contained herein, visitors names, or community contacts made during sampling, geologic and other site-specific information which may be noteworthy.

Chain of custody forms, sample labels, custody seals and other sample documents shall be filled out as specified in Section 4.0 of the CSFOM, entitled *Sample Control, Including Chain of Custody* (Appendix C). Additionally, a dedicated sampling master log shall be maintained as the field program progresses. The sample log book shall contain the sample number, sample date/time, sampling team, and chain-of-custody number.

6.5 Chain-of-Custody Protocol

The primary objective of the sample custody procedures is to create an accurate written record that can be used to trace the possession and handling of all samples from the moment of their collection, through analysis, until their final disposition. Sample custody for samples collected during the investigation will be maintained by the on-site hydrogeologist or the field personnel collecting the samples. Field personnel are responsible for documenting each sample transfer and maintaining custody of all samples until they are shipped to the laboratory.

Chain-of-custody forms will be completed at the time of sample collection and will accompany the samples inside the cooler for shipment to the selected laboratory.

7.0 ANALYTICAL QUALITY ASSURANCE/ANALYTICAL QUALITY CONTROL LABORATORY PROCEDURES

7.1 Analytical Laboratory Qualifications and Standard Operating Procedures

The laboratory must perform all analytical work in accordance with established protocols and analytical quality assurance/quality control (QA/QC). Any laboratory to be used for the SAP will be accredited by the NYSDOH. Laboratory analyses will be performed by a laboratory currently certified under the appropriate approval categories by the NYSDOH's Environmental Laboratory Program (ELAP), with contract laboratory protocol (CLP) certification and in accordance with protocols and analyses reporting outlined in ASP (category B deliverables). The ELAP CLP certified laboratory will be Chemtech laboratories (see **Appendix D** for qualifications). The Category B deliverables package will be sent to the NYSDEC project manager.

The analytical QA plan will include procedures for the following:

- Receipt, storage and handling of samples.
- Sample scheduling to ensure that holding time requirements are met.
- Reagent/standards preparation.
- General laboratory techniques such as glassware cleaning procedures, operation of analytical balances, pipetting techniques and use of volumetric glassware.
- Description of how analytical methods are actually to be performed including precise reference to the analytical method used.
- Standard operating procedures for equipment calibration and maintenance to ensure that laboratory equipment and instrumentation are in working order, including, but not limited to procedures and schedules for calibration and maintenance in accordance with manufacturers' specifications.
- For a correction action, procedures for identifying and correcting deficiencies in the laboratory procedures. Each corrective action measure will be documented in the sampling event report submitted to the NYSDEC with a description of the deficiency, the corrective action taken, and the person responsible for implementing the corrective action.

Any alterations to the laboratory procedures will be included as an amendment to the SAP.

7.2 Laboratory Analytical Procedures

7.2.1 Groundwater Analysis

The groundwater quality monitoring will require analysis of groundwater samples for CRQL's.

Analytical Methods

The specific analytes and the suggested methodologies for the CRQL's are set forth in the Contract Required Quantification Limits (CRQL's) for the NYSDEC ASP methods. These analytical methods should include volatile, semi-volatile organic analysis and TAL metals with Category B deliverables (see **Appendix E**).

Comparability

The CRQL's for groundwater that will be used for the SAP are presented in **Appendix E**. Standard sampling methods that will be used in the collection of environmental data are presented in Section 6.0 herein.

7.2.2 Soils Analysis

Laboratory analytical procedures with regard to soils analysis shall be consistent with NYSDEC ASP methods Category B deliverables as can be seen in **Appendix E**. This information has been obtained from the laboratory's Statement of Qualifications, which is the laboratory which will be performing the soils analysis.

7.2.3 Waste Analysis

Laboratory analytical procedures with regard to waste analysis shall be consistent with NYSDEC ASP methods Category B as can be seen in **Appendix E**. This information has been obtained from the Chemtech Laboratories Statement of Qualifications, which is the laboratory which will be performing the waste analysis.

8.0 COMMUNITY HEALTH AND SAFETY PLAN

In order to protect communities, businesses and on-site workers not directly involved with the work activities associated with the Voluntary Investigation Work Plan a community air monitoring plan will be initiated during on-site investigative activities. The Plan along with target response and action levels are provided in **Appendix F**.

9.0 PROJECT MANAGEMENT AND SCHEDULE

9.1 General

The NYSDEC Project Manager for the 327 New South Road SAP is Robert Stewart. The Nelson, Pope & Voorhis (NP&V) Project Manager is Mr. Charles Voorhis.

9.2 Quality Assurance Officers

One ELAP certified laboratory will be used for sample analysis (Chemtech, Edison, NJ). The Laboratory Quality Assurance Officer will oversee the data validation and review process. This process is accomplished by using systems including audits, reference material, analyses, quality control checks and performance evaluations. The laboratory quality assurance officer will be assigned at a later date.

The quality assurance officer representing Nelson, Pope & Voorhis, LLC in the field is Mr. Eric Arnesen, RPG, who will report directly to the NP&V project manager. One drilling company will be used for field sample acquisition, Geoprobe, etc. (Impact Environmental, Kings Park, NY). A qualified field sample quality assurance officer (FSQAO) will oversee field work and sample acquisition to ensure that representative samples are collected, stored, transported and delivered to the laboratory in accordance with the Voluntary Cleanup workplan. The FSQAO will be responsible for preparing the data usability summary report (DUSR) and communication with the laboratory. They will also visit the job site to perform an informal sampling audit. The field sample quality assurance officer will Mr. Eric Arnesen of Nelson, Pope & Voorhis. The resumes of key personnel may be found in **Appendix G**.

9.3 Schedule

It is anticipated that following NYSDEC work plan review that site investigative activities will commence the first week in October, 2001. Work will be conducted in two phases with Phase I beginning in October, 2001 and Phase II beginning in November, 2001. Following all field work a report summarizing field activities, results and conclusions will be submitted to the NYSDEC the first week in January, 2001.

Table 2 summarizes the project schedule for each phase and phase activity.

10.0 DATA QUALITY ASSESSMENT

10.1 Data Validation

Independent data validation will not be used because it is not necessary. Instead, a Data Usability Summary Report (DUSR) will be prepared by Michael Veraldi of Long Island Analytical Laboratories and will be contracted to Nelson, Pope & Voorhis LLP. The credential of Mr. Veraldi are provided in **Appendix H**. The category B deliverables package will be sent to the NYSDEC project manager.

Mr. Veraldi will review the submitted data packages to determine compliance with those portions of the work plan which pertain to the production of laboratory data. Data compliance is defined by the following criteria: the data package is complete as defined in the above paragraph, data has been produced and reported in a manner consistent with the requirements of the laboratory subcontract, all protocol required QA/QC criteria have been met, all instrument tune and calibration requirements have been met for the time frame during which the analyses were completed, all protocol required initial and continuing calibration data is present and documented, and data reporting forms are complete for all samples submitted and all problems encountered during the analytical process have been reported in the case narrative along with any and all actions taken by the laboratory to correct these problems.

10.2 Data Usability Analysis

Data usability is the determination of whether or not a data set is sufficiently complete and of sufficient quality to support a decision action, in terms of the specific objectives of the data collection activity.

A Data Usability Summary Report will be prepared and submitted with the Category B deliverables package. The raw data review must be based upon the criteria set forth in NYSDEC ASP (Reference N-20), as well as EPA CLP guidelines (Reference U-9) and validation protocols. The DUSR will be prepared by a qualified chemist or environmental professional whose credentials will be submitted to the NYSDEC for approval prior to preparation of the document and will be written in accordance with the NYSDEC's "Guidance for the Development of Data Usability Summary Reports" document.

The DUSR is developed by reviewing and evaluating the analytical data package. During the course of this review the following questions must be asked and answered:

1. Is the data package complete as defined under the requirements for the NYSDEC ASP Category B or USEPA CLP deliverables?
2. Have all holding times been met?

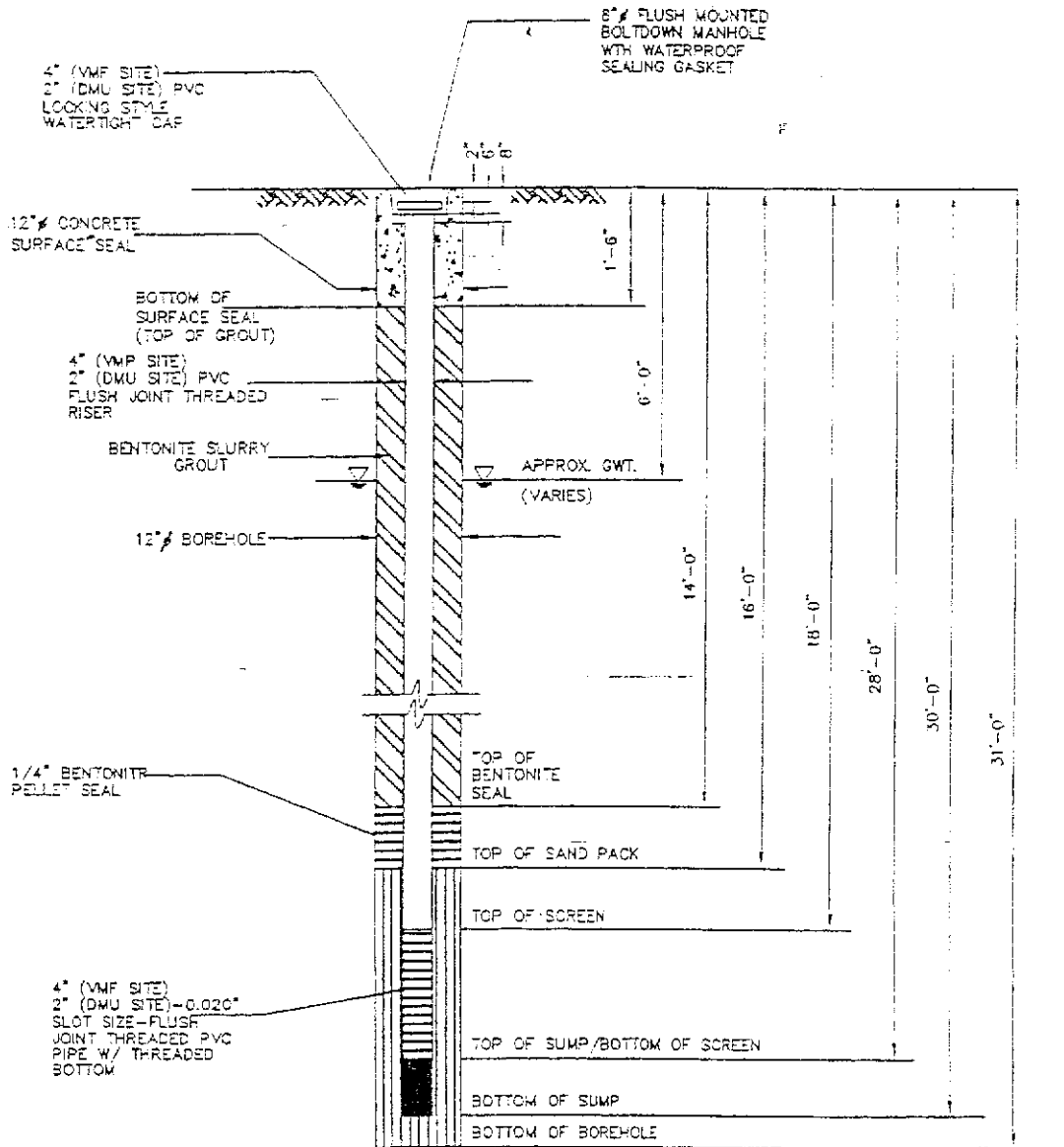
3. Do all the QC data: blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, replicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications?
4. Have all of the data been generated using established and agreed upon analytical protocols?
5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification form?
6. Have the correct data qualifiers been used?

Once the data package has been reviewed and the above questions answered the DUSR will proceed to describe the samples and analytical parameters. Any deficiencies, deviations or problems will be identified and their effect on the data discussed. The DUSR shall also include recommendations on sampling and reanalysis if required. All data qualifications will be documented following the NYSDEC ASP '95 Rev. guidelines or the EPA Region 2 data validation guidelines.

Appendix A

Monitoring Well Specifications

MONITORING WELL INSTALLATION AND CONSTRUCTION DETAIL



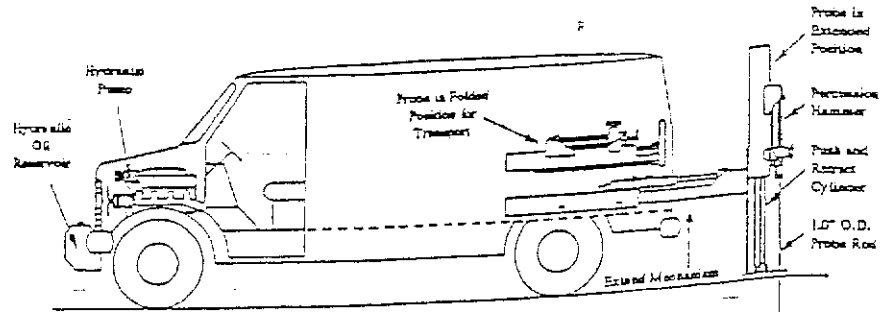
NOT TO SCALE

Groundwater monitoring wells will be installed in accordance with standard industry practices for water quality monitoring well installation. Boreholes will be constructed by use of a hollow stem auger, by a contractor experienced in monitoring well installation, and supervised by the quality assurance office in charge of field operations. Auger sections will be decontaminated prior to arrival on site and between well installations using an oxonox detergent solution and water rinse. Depth will be per Section 13.5, which specifies large equipment will be decontaminated by the contractor by steam cleaning prior to leaving the site. Wells will be installed such that the top of the screen will extend approximately 12' below the water table. The bottom of the borehole will be filled with 12" of clean granular sand packaged for monitoring well installations and used as a new product on site. Wells will consist of two (2) inch diameter PVC components at the DMU site and four (4) inch diameter pvc components at the vmf site including: a 0.20 inch slot size screen, riser, and locking style watertight cap. All joints will be threaded with no use of glues or adhesives. All well components will be new materials which will remain as packaged from the manufacturer/distributor until used on site. Wells will be constructed with a sand pack above the top of the screen, topped by a 1/4" pellet bentonite seal, topped by bentonite slurry grout to fill the borehole. The well will be finished with an 18" concrete surface seal, and an 8" diameter flush mounted bolt-down manhole with waterproof sealing gasket, labeled "monitoring well." Monitoring well construction detail is provided in the figure above.

Appendix B

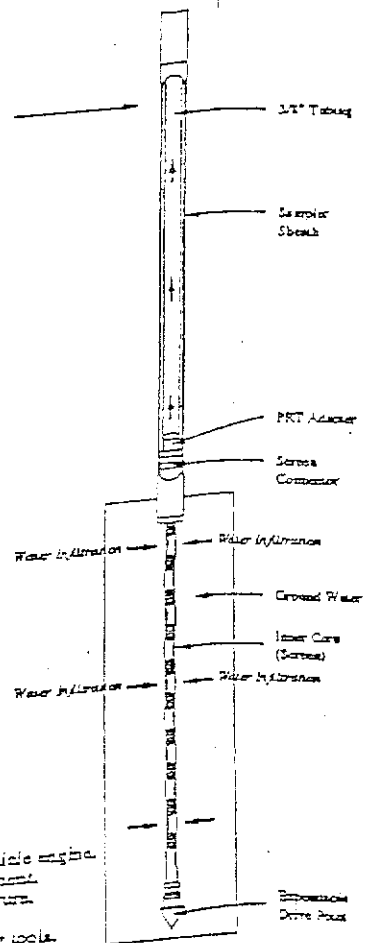
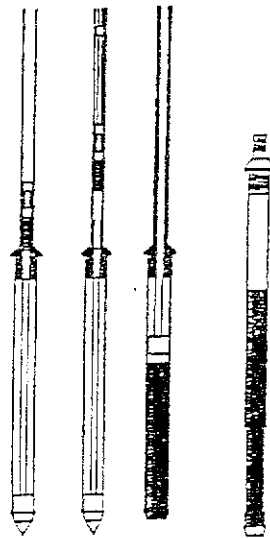
Geoprobe Specifications Diagrams

GEOPROBE SAMPLING APPARATUS



Ground Water Sample Tool
 Tool allows a stainless steel screen to be delivered to intersect groundwater. Sample transported to surface via pump system.

Soil Probing Tool
 Tool is advanced and sample is contained within a non-reactive plastic sheathing.



- Hydraulic powered probe unit operated from hydraulic system driven from the vehicle engine.
- Remote vehicle ignition allows operator to start vehicle engine from rear compartment.
- Belt driven hydraulic pump supplies 10 gpm at 2000 rpm, 2000 psi operating pressure.
- Probe unit folds for transport.
- Utilizes static force (weight of vehicle) and percussion hammer to advance probing tools.
- 8 horsepower hydraulic hammer delivers over 1800 blows per minute.
- Hammer features 0-300 rpm L/R directional rotary function for drilling surface pavements.
- Probes have greater than 12,000 pounds of pulling capacity.
- Drives small diameter (1.5" O.D.) probing tools to depths of over 80'.

SOIL GAS SAMPLING

penned by Team Geoprobe

Geoprobe Systems has had a lot of experience with soil gas. Our soil probing machines were initially designed specifically for soil gas sampling. Our first set of tools were manufactured to extract vapor samples from our backyard.

Before the Geoprobe was available, most soil gas collection was done by manually advancing NPT pipe into the ground surface using a slam bar, often followed by using a car-type jack to remove the NPT pipe. Not a pretty picture, but it got the job done.

During our early years, we developed an expendable point which was driven to the depth using an expendable point holder and probe rods. Once at depth the probe rods were retracted a set distance to aid in sampling the soil gases from the created void. A gas sampling nipple was attached to the top probe rod, and a sample was collected by applying vacuum to the entire rod string and evacuating a volume equivalent to a minimum of three times the system volume. Even though this was an improvement over former methods there were still some limitations and drawbacks.

Then we developed a simple, quick, cost effective method for conducting soil gas surveys. This active sampling method is based on the Post Run Tubing (PRT) system of sample collection. Using the post run tubing

and PRT adapter with O-rings eliminated concerns about system leaks at threaded joints. The PRT method also decreased labor costs, time requirements, and decontamination fluids generated for sample collection.

Soil gas sampling can be a powerful tool in locating and delineating contamination, and every field investigator should be familiar with its application and the basic tools available for field use. We manufacture a wide variety of soil gas sampling tools, from basic drive points to vacuum pumps. Our extensive experience and versatile probe systems have established us as a major supplier of soil gas survey systems to the environmental industry. We offer sampling systems for collection of samples through the probe rod, or through inserted tubing systems using either retractable or expendable point systems.

Soil gas sampling can do great service in determining the distribution of contaminants at a site. The advantages of soil gas sampling are that a sample can be obtained with relative ease, and that the sample is already in the gaseous phase for analysis by either GC or a gas detector. Both sampling and analysis can be done in a very short time, perhaps only 10 to 15 minutes for each operation, and the investigator is returned a valuable, if qualitative, piece of information concerning the site. The simple placement of a probe can

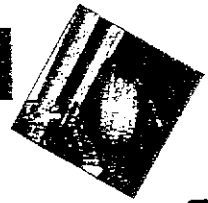
- POST-RUN TUBING
- PERMANENT IMPLANTS
- STANDARD SYSTEM
- VACUUM/VOLUME SYSTEMS

allow the investigator to determine if a problem exists, and perhaps whether problem "A" is greater than problem "B."

Soil gas surveys can reveal various information:

- Using sufficient sampling points and appropriate analyses, it can be determined whether or not a site is contaminated with gasoline, other light hydrocarbons, or with chlorinated hydrocarbons.
- Discern the areal extent of contamination.
- Locate potential sources
- Track groundwater contamination.
- If soil gas concentrations are found to equal the saturated vapor content of the analyte, then it's a reasonable assumption that free product exists at the site.
- Compare the relative level of contamination from point to point.
- Monitor and control vapor extraction and bioremediation projects.

Requests for soil gas sampling tools have remained a constant for us over the years. And although this catalog is full of soil, groundwater, and sensing tools, we wanted you to know that soil gas sampling is still alive and well.



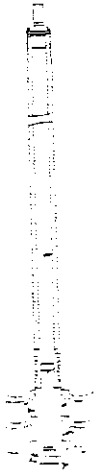
Active Sampling Options:

- Alloy Steel or Aluminum Expendable Drive Points.
- Stainless Steel Retractable Point.
- Sample through low volume Post-Run Tubing (PRT) or through alloy steel Probe Rods.
- Measure purge volume, control applied vacuum, and monitor pressure inside of the sampling train with Geoprobe's unique Vacuum/Volume System (see page 8.8).

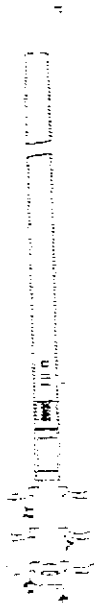
Three tip configurations for grab sampling are shown.



A
Sampling through probe rods using an expendable point.

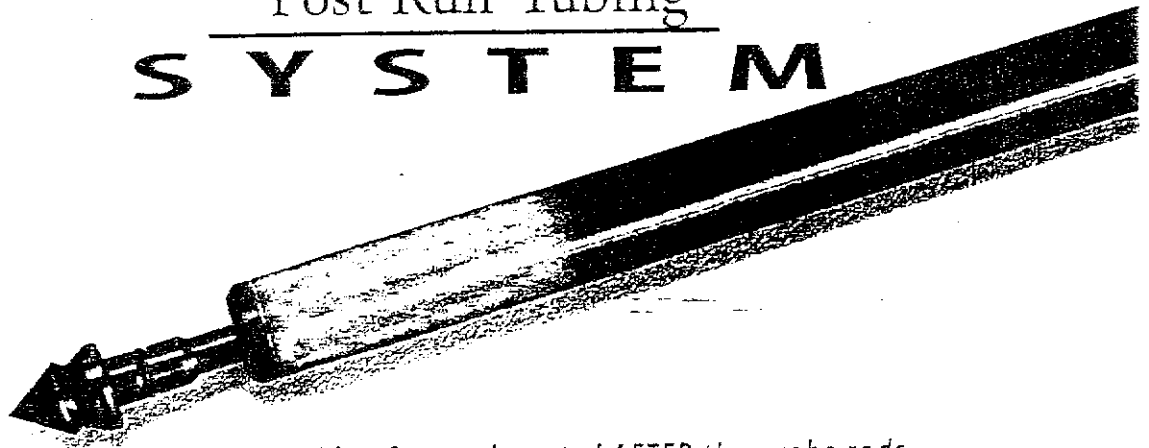


B
Sampling through probe rods using a retractable point.



C
Sampling through inner tubing using the PRT system.

Post Run Tubing SYSTEM



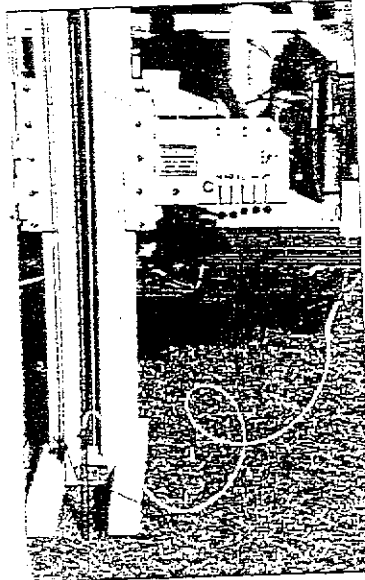
An Inner Tubing System inserted AFTER the probe rods are driven to depth ...

- Increases speed and accuracy of soil gas sampling.
- Eliminates problems associated with rod leakage and sample carryover.
- Utilizes simple design for ease of use and vacuum-tight probing.
- Sampling train and all connections can be checked to verify leak-free status.
- Requires no management of inner tubing during probing.

Soil Gas Sampling

The Post-Run Tubing System

The Post-Run Tubing System (PRT) allows the user to collect soil vapor samples quickly and easily at the desired sampling depth WITHOUT the time-consuming complications associated with rod leakage and contamination. O-ring connections enable the PRT system to deliver a vacuum-tight seal that prevents sample contamination from UP hole, and assures that the sample is taken from the desired depth at the BOTTOM of the hole. The sample is drawn through the point holder, through the adapter, and into the sample tubing. The tubing can be replaced after each sample, thus eliminating sample carryover problems and the need to decontaminate the probe rods. The resulting time-savings translates into a higher productivity rate for you and your client.

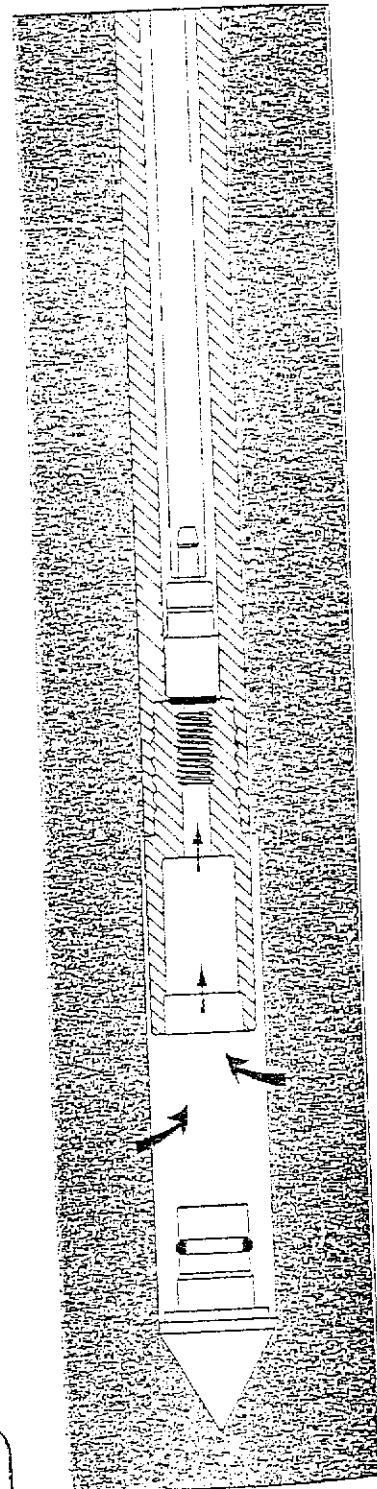


Using the Post-Run Tubing (PRT) system for soil vapor sampling.

Sampling Methods

Some of the more common methods of active soil gas sample collection include:

- Direct sampling from the PRT using a gas chromatograph-compatible syringe used when the Geoprobe van is equipped with a mobile laboratory and gas chromatograph for immediate analysis of the collected samples.
- Inline sampling using glass sampling bulbs or Teflon bags. The sampling device is placed inline, between the PRT adapter and the vacuum-volume system. As the sampling system is purged, soil gas is trapped in the bulb or bag. These samples may be stored for limited periods of time and either analyzed on site or at an off-site laboratory.
- Summa canisters, pre-evacuated steel devices that are connected to the surface end to the PRT tubing also provide another sampling option for soil gas. A valve on the canister is opened and the vacuum inside the canister pulls in soil gases from the sample interval. This system is expensive and is usually reserved for sending samples to an off-site laboratory for specialized analyses or quality control purposes.



A cross section of the PRT System showing how soil gas (arrows) is drawn through the inner tubing system.

FIELD QUESTION

1. Is it possible to use a retractable point with the PRT system?
2. Can you still use a Retractable Point (AT113) with a PRT Retractable Point Holder (RP113)? See page 5.



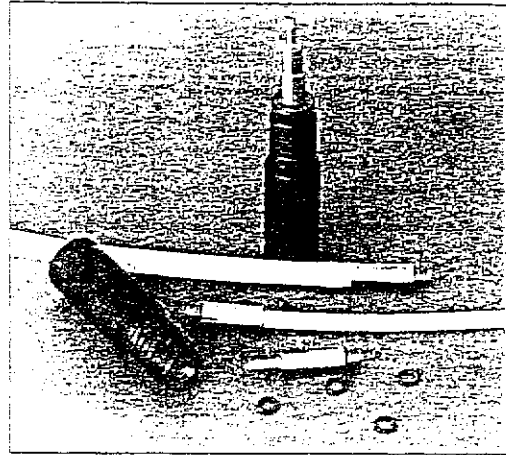
Post-Run Tubing System

A Simple Sampling System

- The downhole components of the PRT system include:
- Tubing, either polyethylene, Teflon®, or stainless steel
 - Probe rods
 - PRT adapter
 - Expandable point holder
 - Expandable point

O-ring seals are used on the PRT Adapter and the expandable point holder to provide a leak-proof system that assures sample integrity. Driving the expandable point to a sufficient depth is also a requirement to be sure that leakage from the surface ambient air is eliminated and sample integrity is assured.

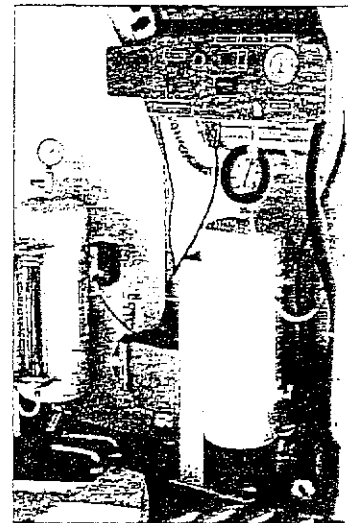
Aboveground, a Vacuum/Volume System is used to actively purge soil gas vapors from the probe cavities created when the probe rods are retracted from the expandable point. This is an eleven-liter tank with 12 volt DC diaphragm pump and gauge calibrated in both tank volume and vacuum pressure. This system includes a sampling valve, a line vacuum gauge, and a pump control switch. The vacuum tank gauge provides an accurate measurement of purge volume extracted from the probed hole. It also allows regulation of the maximum applied vacuum.



PRT SYSTEM PARTS
PRT Expandable Point Holder (PR11B), PRT Adapters, tubing, and O-rings

PRT Applications

- Rapidly define the extent of VOC contamination in the subsurface, under appropriate conditions.
- Rapidly define potential source areas of VOC contamination over large or small areas.
- Determine the types of VOC contaminants present in the subsurface at a facility.
- Rapidly define the potential extent of groundwater contamination and down gradient migration of VOCs under appropriate conditions.
- Determine presence, extent, concentration, and types of landfill gases (methane, carbon dioxide, etc.) present in the subsurface at active and abandoned landfills.
- Locate potential sources and delineate plumes of perchloroethylene (PCE) associated with active or abandoned dry cleaning facilities.
- Locate potential sources and delineate plumes of carbon tetrachloride (CCl₄) associated with active or abandoned grain storage facilities.
- Locate potential sources and delineate plumes of benzene, toluene, ethylbenzene, and xylenes (BTEX) associated with active or abandoned gasoline storage facilities (both underground storage tanks (UST) and aboveground storage tanks (AST)).
- Locate potential sources and delineate plumes of various chlorinated solvents, including compounds such as trichloroethane, trichloroethylene, dichloroethane and dichloroethylene, associated with active or abandoned facilities where degreasing or metal and plastic parts cleaning operations were conducted.



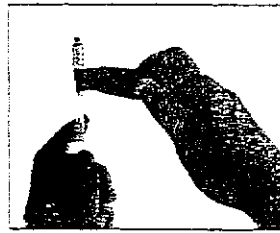
Mountable Vacuum/Volume System was designed for extraction of soil gas samples from probe cavities.

Performance Range

The PRT system has been used to collect soil gas samples from unconsolidated materials at depths ranging from near surface (1 to 2 feet) to depths in excess of 50 feet (15 m) below grade. The depth depends upon the equipment and methods used to advance the sampling point (manual, static vehicle weight, or percussion probing), the formation being penetrated, and operator experience.

Sampling Basics

Clean all parts prior to use. Install O-rings on the PRTBB and the PRT adapter. Inspect the probe rods and clear them of all obstructions. TEST FIT the adapter with the PRT fitting on the expendable point holder to assure that the threads are compatible and fit together smoothly. Remember PRT fittings are left-hand threaded! Push the adapter into the end of the selected tubing. Tape may be used on the outside of the adapter and tubing to prevent the tubing from spinning freely around the adapter during connection – especially when using Teflon tubing. The sample will not contact the outside of the tubing or adapter.



Securing adapter to tubing with tape.
NOTE: Tape does not contact soil gas sample.

Drive the PRT tip configuration into the ground (Figure 1). Connect probe rods as necessary to reach the desired depth. After depth has been reached, disengage the expendable point by pulling up on the probe rods. Remove the pull cap from the top probe rod, and position the Geoprobe unit to allow room to work. Insert the adapter end of the tubing down the inside diameter of the probe rods (Figure 2). Feed the tubing down the rod bore until it hits bottom on the expendable point holder.

Allow about 2 ft. (610 mm) of tubing to extend out of the hole before cutting it. Grasp the excess tubing and apply some downward pressure while turning it in a counterclockwise motion to engage the adapter threads with the expendable point holder (Figure 3). Pull up lightly on the tubing to test engagement of the threads. (Failure of adapter to thread could mean that intrusion of soil may have occurred during driving of probe rods or disengagement of drive point.)



Figure 2. Insert adapter end of tubing down the ID of probe rods.



Figure 3. Engage threads by rotating tubing.

Connect the outer end of the tubing to the Silicone Tubing Adapter and vacuum hose (or other sampling apparatus). Follow the appropriate sampling procedure for collecting a soil gas sample (Figure 4). After collecting a sample, disconnect the tubing from the vacuum hose or sampling system. Pull up firmly on the tubing until it releases from the adapter at the bottom of the hole. (Taped tubing requires a stronger pull.) Remove the tubing from the probe rods. Dispose of polyethylene tubing or decontaminate Teflon® tubing as protocol dictates.

Retrieve the probe rods from the ground and recover the expendable point holder with the attached PRT adapter. Inspect the O-ring at the base of the PRT adapter to verify that proper sealing was achieved during sampling. The O-ring should be compressed. This seal can be tested by capping the open end of the point holder applying vacuum to the PRT adapter. Prepare for the next sample.



Figure 4. Taking a soil gas sample for direct injection into a GC with the PRT system.

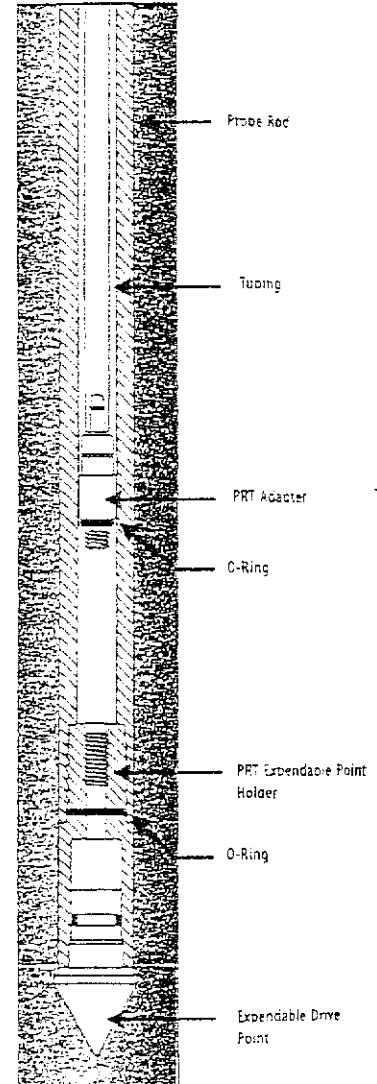
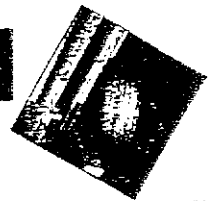


Figure 1. A cross section of probe rods that are being driven to depth and then retracted to allow for soil gas sampling. The PRT adapter and tubing are now fed through the rods and rotated to form a vacuum-tight connection at the point holder. The result is a continuous run of tubing from the sample level to the surface.





PRT Adapter Selection Guide

Post-Run Tubing System

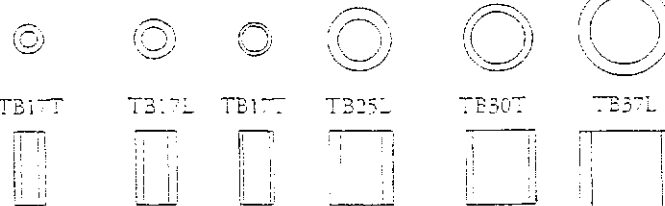
PRT ADAPTER (Actual Size)	RECOMMENDED TUBING SIZE	GEOPROBE TUBING PART NO.	TUBING INTERNAL VOLUME (mL/ft)	ADAPTER PART NUMBER
	1/8 in. I.D. (3.2 mm I.D.)	TB12T	2.41	PR12S
	0.17 in. I.D. (4.3 mm I.D.)	TB17L	4.46	PR17S
	3/16 in. I.D. (4.8 mm I.D.)	TB17T	5.43	
	1/4 in. I.D. (6.4 mm I.D.)	TB25L	9.65	PR25S
	5/16 in. I.D. (7.9 mm I.D.)	TB30T	15.08	PR30S

NOTE: The sorption characteristics of certain tubings may not permit their applications in all circumstances.



PR17D ... PRT Dummy Adapter

Tubing At A Glance ...



Tubing Sizes, Materials, and Specifics detailed on pg. 8.8.



PRT "Dummy" Adapters

PR12D ... fits 1/8 in. (3.2 mm) ID tubing

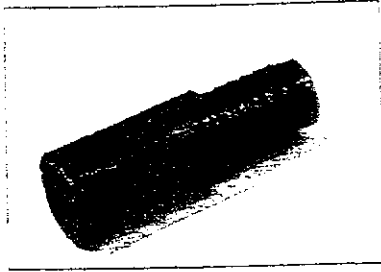
PR17D ... fits 3/16 in. (4.8 mm) ID tubing

PR25D ... fits 1/4 in. (6.4 mm) ID tubing

PR30D ... fits 5/16 in. (7.9 mm) ID tubing

Solid PRT Adapters (no bore) fit same sizes of tubing as regular PRT Adapters. Stainless steel. For use with PR-14 Implant Anchors and selected tubing. Used for anchoring tubing to the drive point while the probe rods are retracted.

Basic Parts and Components



PR13B ... PRT Expendable Point Holder

PRT Expendable Point Holder

PR13B

For use with the AT14 and AT14AL Expendable Drive Point and PRT System.

O-rings for PRT Expendable Point Holder

PR13R

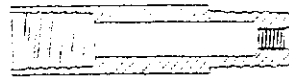
Fits at base of probe rod threads to prevent ambient air from being pulled through the joint. Pkg. of 25.

Expendable Drive Point

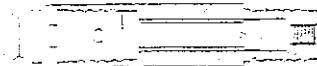
AT14 ... Steel

AT14AL ... Aluminum

1.1-inch (28 mm) maximum O.D., Drive Point. Point remains in soil upon retraction of probe rods leaving an open cavity for soil gas sampling. Improved design utilizes minimum tolerances to inhibit intrusion from soil flow. Optional O-ring fits in groove for even tighter sealing. Fits Geoprobe Expendable Point Holders. Reduced weight of AT14AL lowers shipping costs. No performance difference.



PR21B ... PRT Retractable Point Holder



PRT Retractable Point Holder (PR21B) with Retractable Point Assembly (AT21B)

PRT Retractable Point Holder

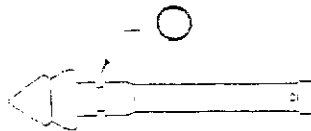
PR21B

For use with the AT21B Retractable Point. Popular with manually-driven probes. AT21B Retractable Point Assembly not included.

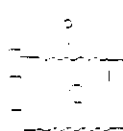
Retractable Drive Point Assembly

AT21B

Stainless steel retractable point insert with Geoprobe-threaded point holder and ball keepers. Point extends on pull-back to allow gas sampling but remains attached to holder for further probing. Point extends 2 inches (51 mm) on pull-back. Can be easily disassembled for cleaning.



AT211 ... Retractable Point Shaft and AT21R ... O-Rings



AT211B ... Retractable Point Housing and AT212 ... Ball Bearings

Sub-Assembly Parts

AT211B ... Retractable Point Housing

AT211 ... Stainless Retractable Point Shaft

AT212 ... Retractable Point Ball Bearing, Pkg. of 12.

AT21R ... O-Rings for Retractable Drive Point. Pkg. of 25.

POST RUN TUBING SYSTEM POINT HOLDERS

PR13B PRT Expendable Point Holder

PR13R O-Rings for PRT Point Holder, Pkg. of 25

PR21B PRT Retractable Point Holder*

PR25R O-Rings for PRT Adapter, Pkg. of 25

* Retractable Point Holder Only

Retractable Point (AT21B) is sold separately.

PR13K PRT Soil Gas Sampling Kit

PR13B 2 PRT Expendable Point Holders

PR13R 2 O-Rings for PRT Expendable Point Holder, Pkg. of 25

PR17S 4 PRT Adapters, 3/16 in.

PR25R 2 O-Rings for PRT Adapter, Pkg. of 25

TB17L 1 PRT Tubing, 1/4 in. x 1/70 in ID, 500 A. Roll

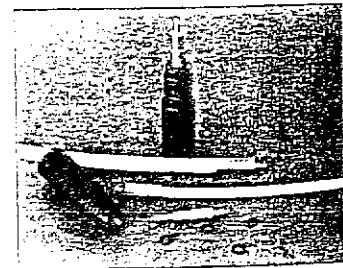
AT14 100 Steel Expendable Drive Points

O-Rings for Expendable Drive Points

AT14R

Fits groove on Expendable Drive Points (AT14 and AT14AL). Pkg. of 25.

Steel Expendable Drive Point (AT14) with O-Ring (AT14R)



PRT SYSTEM PARTS
PRT Expendable Point Holder (PR13B), PRT Adapters, Tubing, and O-rings.



Post-Run Tubing System

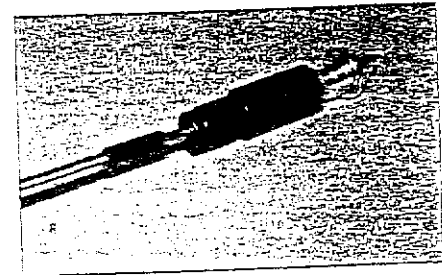
Polyethylene Tubing (low density)

17L
 3/16-in. ID x 1/4-in. OD (4.8 mm x 6.4 mm) with 0.040-in. (1 mm) wall tubing. Discard tubing after each sample.
 50 ft. (15.2 m) roll.

125L
 1/4-in. ID x 3/8-in. OD (6.4 mm x 9.5 mm) with 0.060-in. (1.5 mm) wall tubing. Discard tubing after each sample.
 50 ft. (15.2 m) roll.



Tubing (PS175 shown above) is available in polyethylene and Teflon.



The Post-Run Point Popper (PR15K) helps dislodge G-ring-sealed points down-hole.

Teflon® Tubing

TB12T
 1/8-in. ID x 1/4-in. OD (3.2 mm x 6.4 mm) with 0.030-in. (0.8 mm) wall tubing. Discard tubing after each sample.
 50 ft. (15.2 m) roll.

TB17T
 3/16-in. ID x 1/4-in. OD (4.8 mm x 6.4 mm) with 0.030-in. (0.8 mm) wall tubing. Discard tubing after each sample.
 50 ft. (15.2 m) roll.

TB30T
 5/16-in. ID x 3/8-in. OD (7.9 mm x 9.5 mm) with 0.030-in. (0.8 mm) wall tubing. Discard tubing after each sample.
 50 ft. (15.2 m) roll.

Silicone Tubing

TB45SL
 5/16-in. ID x 7/16-in. OD (4.8 mm x 11 mm) with 1/8-in. (3.2 mm) wall. Self-healing. Reseals itself when syringe is removed after drawing vapor sample.
 25 ft. (8 m) roll.

Tygon Tubing

TB50TY
 1/4-in. ID x 5/8-in. OD (6.4 mm x 11 mm) with 1/8-in. (3.2 mm) wall. Can also be used as a coupler for TB17L tubing.
 100 ft. (31 m) roll.

Post-Run Point Popper

PR15K ... Point Popper & Adapter
PR15 ... Point Popper Only

Point Popper and Adapter. Use in conjunction with extension rods to dislodge O-ring-sealed expendable and retractable points from point holder at the bottom of the hole. Fits through PRT point holder adapter threads. Threads onto extension rods.

Teflon® Tape

AT640T
 3 in. (76 mm) wide x 5 mil thick.
 100 ft. (30 m) roll.



Control panel for Geoprobe's Vacuum/Volume System (AT1901) mounted in a standard pickup. The system was designed to extract soil gas vapors from probe cavities.



Do You Need Technical Support?

Sam Kincaid is just one in our fleet of Technical Service Reps ready to assist you with any probing problems or questions you may have. His first priority is to answer your questions, offer probing or tooling suggestions, and assist you in selecting the right tool for the job. With a background in teaching science classes, Sam seems to have a knack for explaining how different Geoprobe tools work. Although based in Salina, Sam keeps tabs on the fishing in Iowa, especially in the winter. Give him a call if you have questions.

Soil Gas Sampling

Standard System

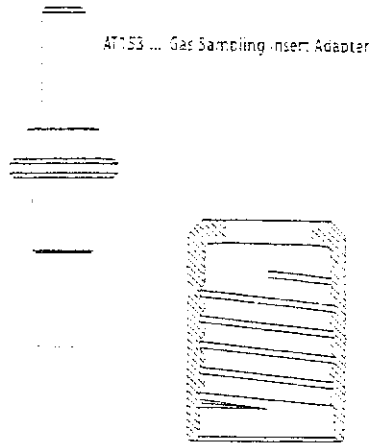
Gas Sampling Insert Adapter & Cap

AT153 ... Insert Adapter

AT155B ... Adapter Cap

For sampling directly through probe rods. An O-ring design enables a vacuum-tight seal when cap is tightened onto probe rod compressing the O-ring at the base of the sampling adapter.

NOTE: Probe rods should be decontaminated before sampling. Teflon tape is recommended for the probe rod joints to assure a sealed system.



AT153 ... Gas Sampling Insert Adapter
AT155B ... Gas Sampling Adapter Cap

O-rings for Gas Insert Adapter

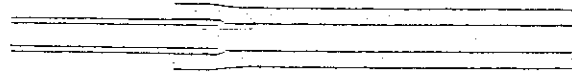
AT153R

Neoprene O-rings. Fit Gas Sampling Insert Adapter (AT153). Pkg. of 25.

Silicone Tubing Adapter

AT118

3-inch (76 mm) section of silicone tubing and 1.5-in. (38 mm) section of polyethylene tubing. Silicone tubing fits over gas sampling adapters or PRT tubing, and connects to Geoprobe Vacuum/Volume system. Syringe needle is inserted through the silicone tubing for direct injection soil gas sampling. 10 per package.



AT118 ... Silicone Tubing Adapter

Gas Sampling Cap

AT15B ... for 1.0 in. rods

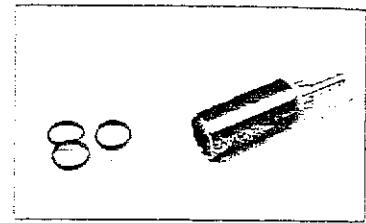
AT1265 ... for 1.25 in. rods

Geoprobe threaded top cap, supplied with a brass 0.25-in. barbed hose fitting for connection to vacuum supply.

O-rings for Gas Sampling Cap

AT15R

Neoprene O-rings. Fit inside female end of AT15B. Pkg. of 25.



AT15B ... Gas Sampling Cap and AT15R ... O-Rings

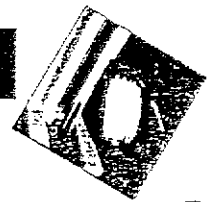


QUICK Parts REFERENCE List

Additional Tools Listing
Section 17



Using the Geoprobe R&D mobile laboratory with a Model 4200 probing machine, several soil gas sample arrays were installed during the initial stages of a long-term monitoring program at Wurtsmith Air Force Base near Oscoda, MI. The program site involves a 7.5 square mile (12 km) area, of which approximately 20 percent is contaminated with uncombusted jet fuel and chlorinated solvents. The National Center for Integrated Bioremediation Research and Development will study the natural biological processes occurring in the soil. At least five major plumes have been identified. Results of soil gas and groundwater monitoring will help define a comprehensive monitoring system for each plume.



Vacuum/Volume System, Mountable

AT1001

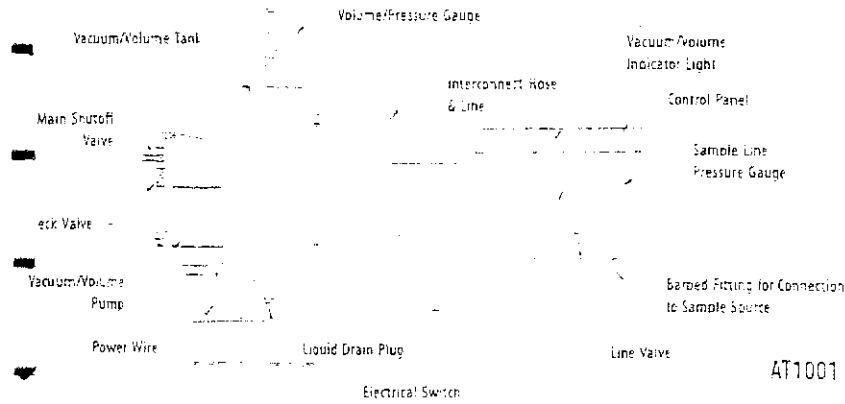
Designed for extraction of soil gas vapors from probe cavities. Eleven-liter vacuum tank with 12 VDC diaphragm pump and gauge calibrated in both tank volume and vacuum pressure. Capable of vacuum up to 21 in. Hg (76 centibars). Also includes a sampling valve, a line vacuum gauge, a pump control switch. The vacuum tank gauge provides an accurate measurement of purge volume from the probed hole and allows regulation of the maximum applied vacuum. The line vacuum gauge indicates pressure at the probe head during vapor sampling.

Weight: 35 pounds (16 Kg).

Operating instructions on page 8-12.



Vacuum/Volume System (AT1001) mounted in a Geoprobe-equipped standard cargo van.



AT1001 ... Mountable Vacuum/Volume System

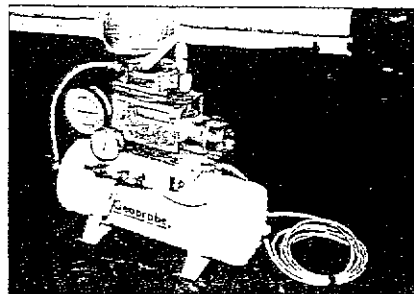
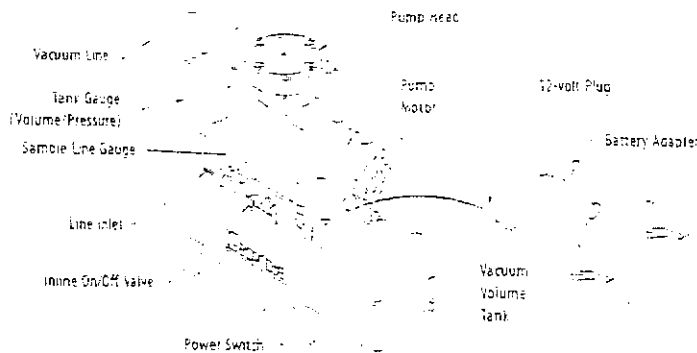
Vacuum/Volume System, Portable

AT1000

Portable version of Vacuum/Volume System. 12 VDC. Compact and portable. Same function as Mountable Vacuum/Volume System. Different configuration. Provides mobility for the operator for spot sampling monitoring wells at various locations without the need of a Geoprobe-equipped vehicle.

Equipped with vehicle accessory plug and 10 feet (3 m) vacuum line.

Weight: 40 pounds (18 Kg).



AT1000 ... Portable Vacuum/Volume System

AT1000 ... Portable Vacuum/Volume System

Operating Instructions for Vacuum/Volume System

The Vacuum/Volume system allows the operator to perform several functions necessary for the successful sampling of soil gas and thereafter the interpretation of soil gas data. These functions include:

- Measurement of the volume of gas extracted at a sampling point.
- Measurement of the initial vacuum applied to a sampling point.
- Measurement of the time for a sampling point to return to atmospheric pressure after a vacuum has been applied.

Note that the vacuum pump is not operated during the sampling process. Instead, the vacuum pump is operated between sampling points to return the vacuum tank in the system to the initial vacuum pressure. The change in pressure of the vacuum tank is then used to indicate the volume of sample gas being added to the tank. This change in gas volume is indicated on the outer scale of the tank pressure gauge.

Instructions provided in this section are for the operation of the Vacuum/Volume system and we assume that the operator is educated in the proper connection of the sampling train to a soil gas sampling point.

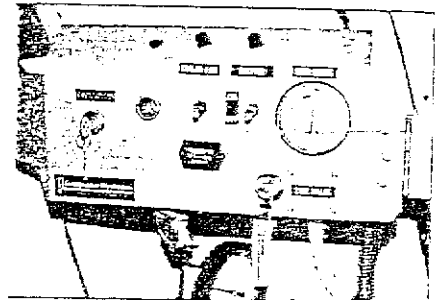
Operation

Follow these steps after probe rods have been driven to sampling depth and the extendable or retractable point has been disengaged, or after the PRT tubing has been attached.

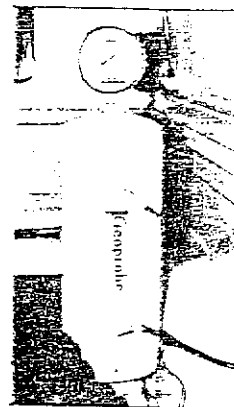
1. Turn the vacuum pump on and allow vacuum to hold in the vacuum tank. Make sure that the line valve is closed before starting the pump. The inside scale of the vacuum gauge is calibrated in kPa or in. Hg. The outside scale is calibrated for volume in liters at standard temperature and pressure. Pump the tank down to the desired vacuum and turn the switch off.
2. Attach vacuum hose to the top of the soil vapor sampling train (i.e., to sampling cup on top of probe rods or to PRT tubing).
3. Open line control valve. If sampling through probe rods, evacuate 100 mL of volume for each rod used. Some protocols may call for a minimum of 3 purge volumes to be evacuated before sampling (i.e., 3 rods x 100 mL x 3 = 900 mL). If using PRT tubing, evacuate appropriate volume to purge ambient air in the system. You may choose to purge a standard volume at each sample location.
4. After achieving sufficient purge volume, quickly close the line valve and allow sample line pressure to return to zero (0). This returns the sampling train to atmospheric pressure. The sample can be collected at this time.
5. Swinge aliquots of soil gas sample are normally obtained from a silicone tubing adapter inserted in the sampling train between the top of the probe rod and the system line valve.



Mcountable Vacuum/Volume System was designed for extraction of soil gas samples from probe cavities.



Vacuum/Volume control panel with line control valve and line pressure gauge from 3600000-equipped standard cargo van.



Vacuum/Volume System tank and gauge.



12VDC Vacuum Pump.

Soil Gas Sampling

Soil Gas Sampling Parts

SOIL GAS SAMPLING TOOLS

Post-Run Tubing System Point Holders

- PR13B PRT Expendable Point Holder
- PR13R O-Rings for PRT Point Holder, Pkg. of 25
- PR21B PRT Retractable Point Holder
- PR25R O-Rings for PRT Adapter, Pkg. of 25

Drive Points

- AT14 Expendable Drive Points, Steel
- AT14 Expendable Drive Points, Aluminum

PRT "Dummy Adapters"

- PR12D Fits 1/8-in. ID Tubing
- PR17D Fits 3/16-in. ID Tubing
- PR25D Fits 1/4-in. ID Tubing
- PR30D Fits 5/16-in. ID Tubing

PRT Adapters

- PR12S Fits 1/8-in. ID Tubing
- PR17S Fits 3/16-in. ID Tubing
- PR25S Fits 1/4-in. ID Tubing
- PR30S Fits 5/16-in. ID Tubing

PRT Accessories

- PR15 Post-Run Point Popper
- PR15K Post-Run Point Popper Kit

Standard Soil Gas Sampling System

- AT126S Gas Sampling Cap. for 1.25-in. probe rods
- AT15B Gas Sampling Cap. for 1.0-in. probe rods
- AT15R O-Rings for Gas Sampling Cap. Pkg. of 25
- AT15S Gas Sampling Insert Adapter
- AT155B Gas Sampling Insert Adapter Cap
- AT155R O-Rings for Gas Insert Adapter, Pkg. of 25

PR13K PRT Soil Gas Sampling Kits

- PR13B 2 PRT Expendable Point Holders
- PR13R 2 O-Rings for PRT Exp Point Holder, Pkg. of 25
- PR17S 4 PRT Adapters, 3/16-in.
- PR25R 2 O-Rings for PRT Adapter, Pkg. of 25
- TB17L 1 Poly Tubing, 1/4-in. x 1/16-in. ID, 50 ft. roll
- AT14 1 Steel Expendable Drive Point

Tubing

Polyethylene Tubing

- TB17L 1/4-in. ID x 1/16-in. OD, 50 ft. roll
- TB24L 1/2-in. ID x 3/8-in. OD, 50 ft. roll

Teflon Tubing

- TB12T 1/8-in. ID x 1/16-in. OD, 50 ft. roll
- TB17T 3/16-in. ID x 1/4-in. OD, 50 ft. roll
- TB25T 1/4-in. ID x 5/16-in. OD, 50 ft. roll
- TB30T 5/16-in. ID x 3/8-in. OD, 50 ft. roll

Silicone Tubing

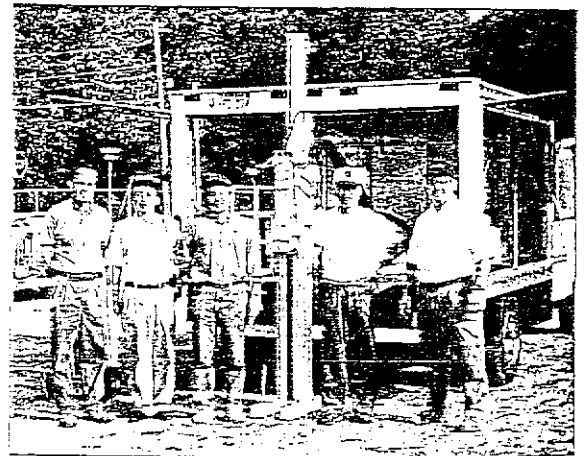
- TB45SL 5/16-in. ID x 7/16-in. OD, 25 ft. roll

Tygon Tubing

- TB50TY 1/4-in. ID x 9/32-in. OD, 100 ft. roll

Silicone Tubing Adapter

- AT118 Silicone Tubing, 3 in., and Poly Tubing, 1.5 in.



Tom (left) and Larry (right) welcome Geoprobe representative from Japan, Ted Hamada (next to Larry) from International Business Corp., and his Tokyo guests during a Kansas visit. Guests at Geoprobe Systems are always welcome.

Geoprobe Systems

The Probes. The Tools. The Service.

Appendix C

Sections 4.0 and 6.2

Compendium of Superfund Field Operations Manual

CSFOM SECTION 4.0

- o Sample traffic reports (e.g., Special Analytical Services (SAS); see Exhibits 5-2, 5-3, and 5-9)
- o Chain-of-custody (COC) forms and records (see Exhibits 5-4, 5-5, and 5-6)
- o Receipt-for-samples forms (varies among EPA regions; see Subsection 4.7 and Exhibit 4-3)
- o Field Investigation Team (FIT) receipt (for sample forms and field notebooks not serially numbered by the U.S. EPA)
- o Field notebooks
- o Airbills or bills of lading
- o Dioxin analysis forms (as applicable)
- o Photographic logs

Subsection 4.6 describes procedures for these records; Subsection 5.1.6 shows completed exhibits of the first three items.

4.6 PROCEDURES

Sample identification documents must be prepared to maintain sample identification and chain of custody. The following are sample identification documents:

- o Sample identification tags
- o Sample traffic reports
- o Chain-of-custody records
- o Receipt-for-samples forms
- o Custody seals
- o Field notebooks

These documents are usually numbered (serialized) by EPA. Some varieties of custody seals, field notebooks, or photographic logs may not be serialized.

The following additional forms are used for samples shipped to CLP laboratories:

- o Organic traffic reports
- o Inorganic traffic reports
- o High-hazard traffic reports
- o SAS request forms
- o Dioxin shipment records (as applicable)

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- o Chain-of-custody (COC) forms and records (see Exhibits 5-4, 5-5, and 5-6)
- o Receipt-for-samples forms (varies among EPA regions; see Subsection 4.7 and Exhibit 4-3)
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- o Inorganic traffic reports
- o High-hazard traffic reports
- o SAS request forms
- o Dioxin shipment records (as applicable)

Completed examples of these forms are in Subsection 5.1.6 of this compendium.

The organization's document control officer (designated on exhibits in this subsection as the Regional Document Control Officer or RDCO) or another designated person maintains a supply of the documents listed above, including field notebooks. The document control officer is responsible for the inventory of serialized documents and the assignment of these documents to specific projects. Unused field documents are usually returned to the document control officer at the end of the field sampling event. The document control officer notes the return of these documents in the serialized document logbook. In some EPA regions, unused field documents are retained by the sampler to whom they were originally assigned for use on future projects. The sampler maintains a personal logbook in which is recorded the final disposition of all relevant field information. Unused, returned documents may be checked out to another project by the RDCO, as needed. A cross-reference of serialized field documents is usually maintained for each project in the project files. A sample cross-reference matrix is shown in Exhibit 4-1.

The document control officer orders sample identification tags, receipt-for-samples forms, custody seals, and chain-of-custody records from the EPA regional offices. Traffic reports and SAS request forms are obtained through the Sample Management Office (SMO) representative.

Exhibit 4-2 shows how the sample control documents can be integrated into the document control procedures used in an EPA project. The procedures for using each document are discussed below. Subsection 4.7 discusses regional variations; however, because procedures change and vary from region to region, the EPA Regional Sample Coordinating Center (RSCC) should be contacted during the planning of field activities to obtain the most current procedures. Appendix A of the User's Guide to the CLP contains a directory of RSCC contacts and telephone numbers.

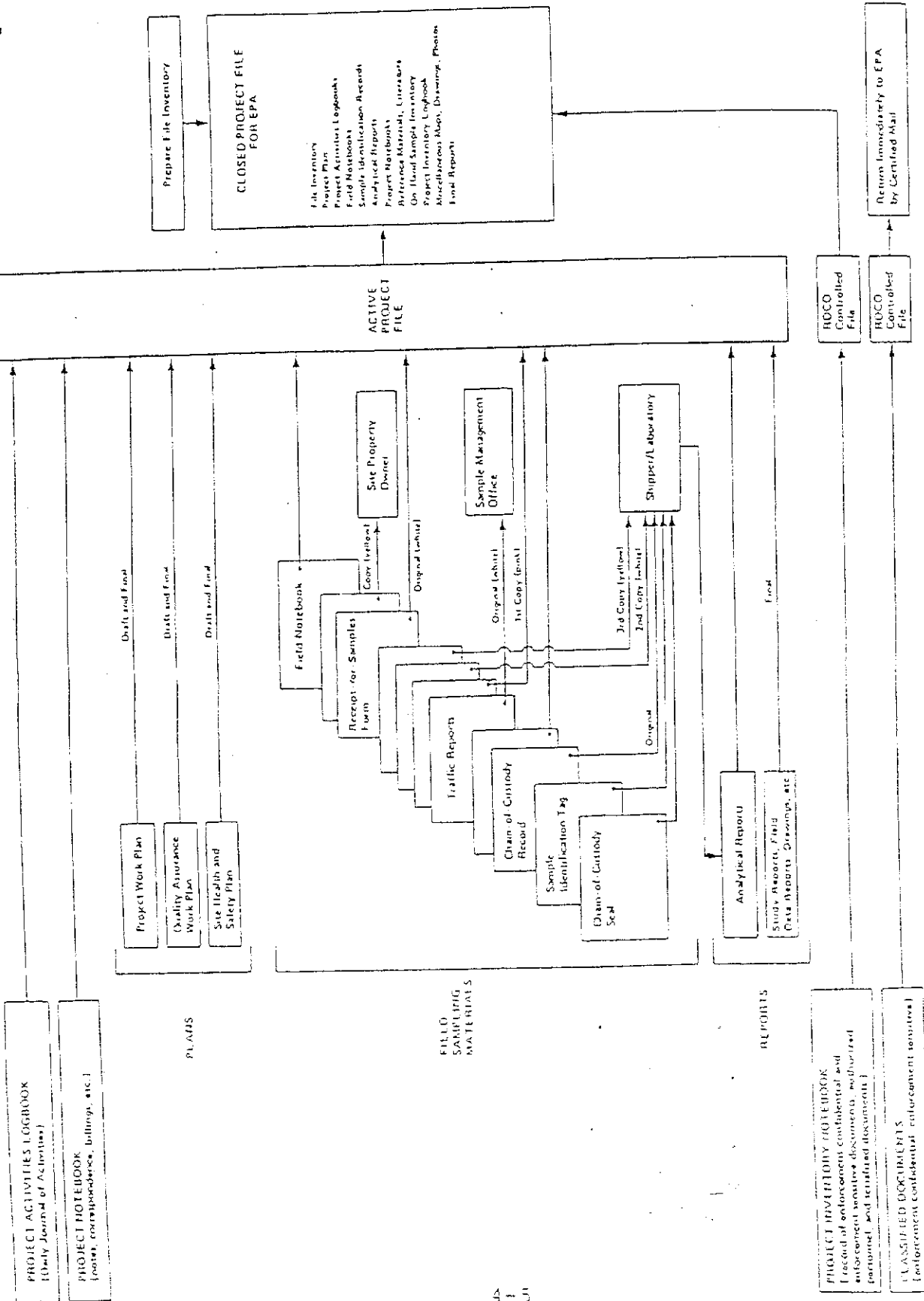
4.6.1 SAMPLE IDENTIFICATION TAGS

Sample identification tags (see Exhibit 5-7) are distributed as needed to field workers by the SM (or designated representative). Procedures vary among EPA regions. Generally, the EPA serial numbers are recorded in the project files, the field notebook, and the document control officer's serialized document logbook. Individuals are accountable for each tag assigned to them. A tag is considered to be in an individual's possession until it has been filled out, attached to a sample, and transferred to

REFER MAT OR LIZH JUNE

Sample Station	Sample Identification Tag Number	Type of Analysis	Organic Traffic Report Number	Inorganic Traffic Report Number	High-hazard Traffic Report Number	Dioxin Forms	Chain-of-Custody Record Number	Receipt-for-Samples Form Number	Airbill Number	Date Shipped

Exhibit 4-2 DOCUMENT CONTROL PROCEDURES



NOTE: Select analytical service forms are distributed as follows:
 Original (white) - EMO
 1st Copy (yellow) - Active Project Files
 2nd & 3rd Copies (pink & gold) - Shipper/Laboratory

another individual along with the corresponding chain-of-custody record. Sample identification tags are not to be discarded. If tags are lost, voided, or damaged, the facts are noted in the appropriate field notebook, and the SM is notified.

Upon the completion of the field activities, unused sample identification tags are returned to the document control officer, who checks them against the list of assigned serial numbers. Tags attached to those samples that are split with the owner, operator, agent-in-charge, or a government agency are accounted for by recording the serialized tag numbers on the receipt-for-samples form (Exhibit 4-3). Alternatively, the split samples are not tagged but are accounted for on a chain-of-custody form.

Samples are transferred from the sample location to a laboratory or another location for analysis. Before transfer, however, a sample is often separated into fractions, depending on the analysis to be performed. Each portion is preserved in accordance with prescribed procedures (see User's Guide to the CLP and Section 6 of this compendium) and is identified with a separate sample identification tag, which should indicate in the "Remarks" section that the sample is a split sample.

The following information is recorded on the tag:

- o CLP case/SAS number(s). The unique number(s) assigned by SMO to identify the sampling event (entered under "Remarks" heading)
- o CLP sample number. The unique sample identification number (from the TR, DSR, or PL) used to document that sample (entered under "Remarks" heading)
- o Project code. An assigned contractor project number
- o Station number. A unique identifier assigned to a sampling point by the sampling team leader and listed in the sampling plan
- o Date. A six-digit number indicating the year, month, and day of collection
- o Time. A four-digit number indicating the local standard time of collection using the 24-hour clock notation (for example, 1345 for 1:45 p.m.)

- o Station location. The sampling station description as specified in the sampling plan
- o Samplers. Each sampler's name and signature
- o Preservative. Whether a preservative is used and the type of preservative
- o Analysis. The type of analysis requested
- o Tag number. A unique serial number, stamped on each tag
- o Batch number. The sample container cleaning batch number, recorded in the "Remarks" section
- o Remarks. The sampler's record of pertinent information, such as batch number, split samples, and special procedures
- o Laboratory sample number. Reserved for laboratory use

The tag used for water, soil, sediment, and biotic samples contains an appropriate place for identifying the sample as a grab or a composite, the type of sample collected, and the preservative used, if any. The tag used for air samples requires the sampler to designate the sequence number and identify the sample type. Sample identification tags are attached to or folded around each sample and are taped in place.

After collection, separation, identification, and preservation, a traffic report is completed and the sample is handled using chain-of-custody procedures discussed in the following sections. If the sample is to be split, aliquots are placed into similar sample containers. Depending on the EPA region, sample identification tags are completed and attached to each split and marked with the tag numbers of the other portions and with the word "split." Blank or duplicate samples are labeled in the same manner as "normal" samples. Information on blanks or duplicate samples is recorded in the field notebook. Some EPA regions require that laboratories be informed of the number of blanks and duplicates that are shipped, but not the identity of the quality assurance samples.

The printed and numbered adhesive sample labels affixed to the traffic reports are secured to sample containers by the sampler. Forms are filled out with waterproof ink, if weather permits. If a pen will not function because of inclement conditions, an indelible pencil may be used. If a

pencil is used, a note explaining the conditions must be included in the field notebook. When necessary, the label is protected from water and solvents with clear tape.

The original is sent to the SMO. The first copy is retained for the project file. The second and third copies are sent with the shipment to the laboratory. Complete instructions for the use of traffic reports are given in the User's Guide to the CLP.

4.6.2 SAMPLE TRAFFIC REPORT (TR)

The sample documentation system for the CLP sample preparation program is based on the use of the sample traffic report (TR), a four-part carbonless form printed with a unique sample identification number. One TR and its printed identification number is assigned by the sampler to each sample collected. The three types of TRs currently in use include organic, inorganic dioxin, and high-concentration TRs. (See Subsection 5.1.6 for examples of completed TRs.)

To provide a permanent record for each sample collected, the sampler completes the appropriate TR, recording the case number, site name or code and location, analysis laboratory, sampling office, dates of sample collection and shipment, and sample concentration and matrix. Numbers of sample containers and volumes are entered by the sampler beside the analytical parameter(s) requested for particular sample portions.

4.6.3 CHAIN-OF-CUSTODY FORMS AND RECORDS

Because samples collected during an investigation could be used as evidence in litigation, possession of the samples must be traceable from the time each is collected until it is introduced as evidence in legal proceedings. To document sample possession, chain-of-custody procedures are followed.

4.6.3.1 Definition of Custody

A sample is under custody if one or more of the following criteria are met:

- o The sample is in the sampler's possession.
- o It is in the sampler's view after being in possession.
- o It was in the sampler's possession and then was locked up to prevent tampering.
- o It is in a designated secure area.

4.6.3.2 Field Custody Procedures

Only enough of the sample should be collected to provide a good representation of the medium being sampled. To the extent possible, the quantity and types of samples and the sample locations are determined before the actual fieldwork. As few people as possible should handle the samples.

Field samplers are personally responsible for the care and custody of the samples collected by their teams until the samples are transferred or dispatched properly. A person is usually designated to receive the samples from the field samplers after decontamination; this person maintains custody until the samples are dispatched.

The SM determines whether proper custody procedures were followed during the fieldwork and decides if additional samples are required.

4.6.3.3 Transfer of Custody and Shipment

Samples are accompanied by a chain-of-custody (COC) form or record (Exhibits 5-4 and 5-5). When transferring samples, the individuals relinquishing and receiving them should sign, date, and note the time on the form. This form documents sample custody transfer from the sampler, often through another person, to the analyst, who is in a mobile or contract laboratory.

Samples are packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate COC record accompanying each shipment. Shipping containers are padlocked or sealed with custody seals for shipment to the laboratory. The method of shipment, courier name(s), and other pertinent information such as the laboratory name should be entered in the "Remarks" section of the COC record.

When samples are split with an owner, operator, or government agency, the event is noted in the "Remarks" section of the COC record. The note indicates with whom the samples are being split. The person relinquishing the samples to the facility or agency requests the signature of the receiving party on a receipt-for-samples form (Exhibit 4-3) (described in the following subsection), thereby acknowledging receipt of the samples. If a representative is unavailable or refuses to sign, this situation is noted in the "Remarks" section of the COC record. When appropriate, for example, when an owner's representative is unavailable, the COC record and receipt-for-samples form should contain a statement that the samples were delivered to the designated

location at the designated time. A witness to the attempted delivery should be obtained. The samples shall be secured if no one is present to receive them.

All shipments are accompanied by a COC record identifying their contents. The original form accompanies the shipment; the copies are retained by the sampler and returned to the sampling coordinator.

If nonhazardous samples are sent by mail, the package is registered, and a return receipt is requested. Note: Hazardous materials shall not be sent by mail. If samples are sent by common carrier, a bill of lading is used. Air freight shipments are sent prepaid. Freight bills, postal service receipts, and bills of lading should be retained as part of the permanent documentation for the COC records.

4.6.3.4 Laboratory Custody Procedures

Laboratory personnel are responsible for the care and custody of samples from the time they are received until the samples are exhausted or returned to the laboratory sample custodian for ultimate disposal. Laboratory-specific variations exist; however, a generally accepted laboratory chain-of-custody procedure is presented below. Any laboratory used for the analysis of samples taken in the course of EPA remedial response must have an adequate chain-of-custody procedure. This procedure is required as an exhibit in the Quality Assurance Project Plan (QAPjP) if the laboratory is not in the CLP.

A designated custodian of laboratory samples accepts custody of the shipped samples and verifies that the information on the sample identification tags matches that on the COC records. Pertinent information on shipment, pickup, courier, and condition of samples is entered in the "Remarks" section. The custodian then enters the sample identification tag data into a bound logbook, which is arranged by project code and station number.

The laboratory custodian uses the sample identification tag number or assigns a unique laboratory number to each sample; the custodian transfers the samples to the proper analyst or stores them in the appropriate secure area. A limited number of named individuals are allowed access to the sample storage area. The appropriate analysts are responsible for the samples until they are returned to the custodian.

When sample analyses and necessary quality assurance (QA) checks have been completed, the unused portion of the sample and the sample containers must be disposed of properly (see Subsection 5.2.6.4). All identifying tags, data sheets, and

laboratory records are retained as part of the permanent documentation.

4.6.4 RECEIPT-FOR-SAMPLES FORM

Section 3007(a)(2) of the RCRA states "If the officer, employee, or representative obtains any samples, prior to leaving the premises he shall give to the owner, operator, or agent-in-charge a receipt describing the samples obtained and, if requested, a portion of each such sample equal in volume or weight to the portion retained." Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), contains identical requirements.

Completing a receipt-for-samples form complies with these requirements; such forms should be used whenever splits are offered or provided to the site owner, operator, or agent-in-charge. The particular form used may vary between EPA regions; an example is shown in Exhibit 4-3. This form is completed and a copy given to the owner, operator, or agent-in-charge even if the offer for split samples is declined. The original is given to the SM and is retained in the project files. In addition, the contractor must provide analytical results from the samples collected to the owner, operator, or agent in charge, as mandated in SARA.

4.6.5 CUSTODY SEALS

When samples are shipped to the laboratory, they must be placed in padlocked containers or containers sealed with custody seals; a completed example is shown in Exhibit 5-6. Some custody seals are serially numbered. These numbers must appear in the cross-reference matrix (Exhibit 4-1) of the field document and on the COC report. Other types of custody seals include unnumbered seals and evidence tape.

When samples are shipped, two or more seals are to be placed on each shipping container (such as a cooler), with at least one at the front and one at the back, located in a manner that would indicate if the container were opened in transit. Wide, clear tape should be placed over the seals to ensure that seals are not accidentally broken during shipment. Nylon packing tape may be used providing that it does not completely cover the custody seal. Completely covering the seal with this type of tape may allow the label to be peeled off. Alternatively, evidence tape may be substituted for custody seals.

If samples are subject to interim storage before shipment, custody seals or evidence tape may be placed over the lid of

the jar or across the opening of the storage box. Custody during shipping would be the same as described above. Evidence tape may also be used to seal the plastic bags or metal cans that are used to contain samples in the cooler or shipping container. Sealing individual sample containers assures that sample integrity will not be compromised if the outer container seals are accidentally broken.

4.6.6 FIELD NOTEBOOKS

A bound field notebook must be maintained by the sampling team leader to provide daily records of significant events, observations, and measurements during field investigations. All entries are to be signed and dated. All members of the field investigation team are to use this notebook, which is to be kept as a permanent record. Observations or measurements that are taken in an area where contamination of the field notebooks may occur may be recorded in a separate bound and numbered logbook before being transferred to the project notebook. The original records are retained, and the delayed entry is noted as such.

Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during projects and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence. The field notebook entries should be factual, detailed, and objective.

4.6.7 CORRECTIONS TO DOCUMENTATION

Unless restricted by weather conditions, all original data recorded in field notebooks and on sample identification tags, chain-of-custody records, and receipt-for-samples forms are written in waterproof ink. These accountable serialized documents are not to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on an accountable document assigned to one person, that individual may make corrections simply by crossing out the error and entering the correct information. The erroneous information should not be obliterated. Any error discovered on an accountable document should be corrected by the person who made the entry. All corrections must be initialed and dated.

For all photographs taken, a photographic log is kept; the log records date, time, subject, frame and roll number, and

photographer. For "instant photos," the date, time, subject, and photographer are recorded directly on the developed picture. The serial number of the camera and lens are recorded in the project notebook. The photographer should review the photographs or slides when they return from developing and compare them to the log to assure that the log and photographs match. It can be particularly useful to photograph the labeled sample jars before packing them into shipping containers. A clear photograph of the sample jar, showing the label, any evidence tape sealing the jar, and the color and amount of sample can be most useful in reconciling any later discrepancies.

4.7 REGION-SPECIFIC VARIANCES

Region-specific variances are common; the SM should contact the EPA RPM or the RSCC before any sampling campaign to ascertain the latest procedures. Future changes in variances will be incorporated in subsequent revisions to this compendium.

4.7.1 REGION I

Region I uses a standard contractor serialized chain-of-custody form and an unnumbered chain-of-custody seal, which are placed on the outside of the shipping cooler. Numbered sample bottle labels are used for REM site work and numbered tags for FIT site work.

4.7.2 REGION II

Region II uses an unnumbered chain-of-custody form and numbered sample bottle labels for all site work. Custody seals are placed on the outside of the shipping cooler.

4.7.3 REGION III

Region III uses a serialized chain-of-custody form and numbered sampling tags. Chain-of-custody seals used by Region III are unnumbered and placed on the outside of the shipping cooler.

4.7.4 REGION IV

Region IV has a detailed procedural discussion in the Engineering Support Branch Standards Operating Procedures and Quality Assurance Manual, U.S. EPA, Region IV, Environmental Services Division, 1 April 1986.

4.7.5 REGION V

Region V uses a serialized chain-of-custody seal. Region V seals are color coded; orange is used for REM and FIT work. Seals are placed on the outside of the shipping cooler only if the samples are sent the same day as collected; otherwise, seals are placed across sample jar lids. FIT does not note whether or not samples were split on the chain-of-custody record. FIT includes the corresponding Traffic Report number under the remarks section of the tag. The bottle lot numbers or "batch numbers" are not recorded here, but on the "Chain-of-Custody form."

4.7.6 REGION VI

Region VI does not use a serialized number control system on custody seals.

4.7.7 REGION VII

Region VII personnel provide onsite sample control. Samples are logged into a computer by regional personnel. Although contractor personnel do not seal and log samples, chain of custody is followed as described above.

4.7.8 REGION VIII

Region VIII does not use a serialized number control system on custody seals.

4.7.9 REGION IX

Region IX does not use a serialized number control system on chain-of-custody seals.

4.7.10 REGION X

Region X does not use a serially numbered custody seal. Seals are signed, and the sample ID number is written on the seal.

4.8 INFORMATION SOURCES

Superfund Amendments and Reauthorization Act (SARA).
Section 104(m), "Information Gathering Access Authorities."

U.S. Environmental Protection Agency. NEIC Policies and Procedures. EPA-330/9-78-001-R. May 1978. (Revised February 1983.)

U.S. Environmental Protection Agency. REM IV Zone Management Plan. Contract No. 68-01-7251, CH2M HILL and U.S. EPA.

U.S. Environmental Protection Agency. User's Guide to the Contract Laboratory Program. Office of Emergency and Remedial Response. December 1986.

U.S. Environmental Protection Agency. Zone II REM/FIT Quality Assurance Manual. Contract No. 68-01-6692, CH2M HILL and Hazardous Site Control Division.

WDR230/016.

CSFOM SECTION 6.2

- o Store the samples so that their temperature is maintained at 4°C until the time of analysis.
- o Samples to be analyzed for TCL organics are packed in ice and shipped to the laboratory with ice in the cooler.

The following RAS samples do not require preservatives:

- o Soil or sediment samples
- o Medium- or high-concentration water samples

Exhibit 6-3 lists the preservatives used for frequently requested special analytical services.

3. The samples are shipped to the laboratory for analysis.

Exhibit 6-3 SAMPLE PRESERVATION REQUIREMENTS

Analysis	Preservation
Acidity	Cool, 4°C
Alkalinity	Cool, 4°C
Bicarbonate	Cool, 4°C
Carbonate	Cool, 4°C
Chloride	None
Chemical Oxygen Demand (COD)	H ₂ SO ₄ to pH <2, Cool, 4°C
EP toxicity	None
Nitrogen	
Ammonia	H ₂ SO ₄ to pH <2, Cool, 4°C
Kjeldahl, total	H ₂ SO ₄ to pH <2, Cool, 4°C
Nitrate	H ₂ SO ₄ to pH <2, Cool, 4°C
Nitrite	Cool, 4°C
Oil and grease	H ₂ SO ₄ to pH <2, Cool, 4°C
Sulfate	Cool, 4°C
Solids	
Total dissolved	Cool, 4°C
Total suspended	Cool, 4°C
Total Organic Carbon (TOC)	H ₂ SO ₄ or HCl to pH <2, Cool, 4°C
Total Organic Halogen (TOH or TOX)	Several crystals of sodium thiosulfate if chlorine is present, cool, 4°C

Refer to RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD) and SW-846 for additional information on sample preservation, recommended containers, maximum holding times, and volume requirements. EPA's Characterization of Hazardous Waste Sites, Vols. 1 and 2, and Soil Sampling QA User's Guide contain information regarding holding time criteria for soil- or sediment.

6.2.2 DEFINITIONS

The definitions are the same as those in Subsection 6.1.2.

6.2.3 APPLICABILITY

The procedures described in this subsection apply to samples collected at a waste site. They must be followed whether shipping to a CLP laboratory or a noncontract laboratory.

The shipment of hazardous materials is governed by the Transportation Safety Act of 1974. Following is a list of references that detail the regulations:

- o Title 49 CFR
 - Parts 100-177--Shipper Requirements and Hazardous Material Table
 - Parts 178-199--Packaging Specifications
 - Section 262.20--Hazardous Waste Manifest
- o International Civil Aviation Regulations (ICAO)
 - Technical Instructions for the Safe Transport of Dangerous Goods by Air (lists mandatory international and optional domestic regulations)
- o International Air Transport Association (IATA)
 - Dangerous Goods Regulations (This tariff incorporates 49 CFR, ICAO, and additional IATA regulations. Most international and domestic airlines belong to IATA and require conformance to all applicable regulations.)
- o Tariff BOE-6000-D (reprint of 49 CFR with updates)

6.2.4 RESPONSIBILITIES

Detailed responsibilities are described in the procedures subsection. General responsibilities are assigned as follows:

- o Site Managers will state, to the best of their knowledge, whether samples planned for collection are environmental or hazardous samples.
- o Equipment manager will procure shipping supplies (metal cans, shipping labels, vermiculite, etc.) using RSCC whenever needed.
- o Sampling personnel will properly label and package the samples.

6.2.5 RECORDS

The user should refer to Section 4 for discussion of the records associated with sample collection and chain-of-custody forms.

The following records are associated with the labeling and shipping process:

- o Sample tag or label
- o Traffic report label
- o Custody seal
- o Chain-of-custody (COC) form
- o Bill of lading (airbill or similar document)

Examples of the first four documents are given in Subsections 4.6 and 5.1.6; an example of an airbill is given in Subsection 6.2.

6.2.6 PROCEDURES

The procedures described in this subsection are carried out after the sample preservation described in Subsection 6.1.6.2. They are generic in nature; an approach to regional differences is presented in Subsection 6.2.7.

6.2.6.1 Environmental Samples

Low-concentration samples are defined as environmental samples and should be packaged for shipment as follows:

1. A sample tag is attached to the sample bottle. Examples of properly completed sample tags are given in Exhibit 5-7.
2. All bottles, except the volatile organic analysis (VOA) vials, are taped closed with electrical tape (or other tape as appropriate). Evidence tape may be used for additional sample security.
3. Each sample bottle is placed in a separate plastic bag, which is then sealed. As much air as possible is squeezed from the bag before sealing. Bags may be sealed with evidence tape for additional security.
4. A picnic cooler (such as a Coleman or other sturdy cooler) is typically used as a shipping container. In preparation for shipping samples, the drain plug is taped shut from the inside and outside, and a large plastic bag is used as a liner for the cooler. Approximately 1 inch of packing material, such as asbestos-free vermiculite, perlite, or styrofoam beads, is

placed in the bottom of the liner. Other commercially available shipping containers may be used. However, the use of such containers (cardboard or fiber boxes complete with separators and preservatives) should be specified in the sampling plan and approved by the EPA RSCC if CLP is used.

5. The bottles are placed in the lined picnic cooler. Cardboard separators may be placed between the bottles at the discretion of the shipper.
6. Water samples for low- or medium-level organics analysis and low-level inorganics analysis must be shipped cooled to 4°C with ice. No ice is to be used in shipping inorganic low-level soil samples or medium/high-level water samples, or organic high-level water or soil samples, or dioxin samples. Ice is not required in shipping soil samples, but may be utilized at the option of the sampler. All cyanide samples, however, must be shipped cooled to 4°C.
7. The lined cooler is filled with packing material (such as asbestos-free vermiculite, perlite, or styrofoam beads), and the large inner (garbage bag) liner is taped shut. Sufficient packing material should be used to prevent sample containers from making contact during shipment. Again, evidence tape may be used.
8. The paperwork going to the laboratory is placed inside a plastic bag. The bag is sealed and taped to the inside of the cooler lid. A copy of the COC form should be included in the paperwork sent to the laboratory. Exhibit 5-4 gives an example of a properly completed COC form. The last block on the COC form should indicate the overnight carrier and airbill number. The airbill must be filled out before the samples are handed over to the carrier. The laboratory should be notified if another sample is being sent to another laboratory for dioxin analysis, or if the shipper suspects that the sample contains any other substance for which the laboratory personnel should take safety precautions.
9. The cooler is closed and padlocked or taped shut with strapping tape (filament-type).
10. At least two signed custody seals are placed on the cooler, one on the front and one on the back. Additional seals may be used if the sampler or shipper thinks more seals are necessary. Exhibit 5-6 gives an example of the two types of custody seals available.

11. The cooler is handed over to the overnight carrier, typically Federal Express. A standard airbill is necessary for shipping environmental samples. Exhibit 6-4 shows an example of the standard Federal Express airbill.

6.2.6.2 Hazardous Samples

Medium- and high-concentration samples are defined as hazardous and must be packaged as follows:

1. A sample tag is attached to the sample bottle. Examples of properly completed sample tags are shown in Exhibit 5-7.
2. All bottles, except the VOA vials, are taped closed with electrical tape (or other tape as appropriate). Evidence tape may be used for additional security.
3. Each sample bottle is placed in a plastic bag, and the bag is sealed. For medium-concentration water samples, each VOA vial is wrapped in a paper towel, and the two vials are placed in one bag. As much air as possible is squeezed from the bags before sealing. Evidence tape may be used to seal the bags for additional security.
4. Each bottle is placed in a separate paint can, the paint can is filled with vermiculite, and the lid is fixed to the can. The lid must be sealed with metal clips or with filament or evidence tape; if clips are used, the manufacturer typically recommends six clips.
5. Arrows are placed on the can to indicate which end is up.
6. The outside of each can must contain the proper DOT shipping name and identification number for the sample. The information may be placed on stickers or printed legibly. A liquid sample of an uncertain nature is shipped as a flammable liquid with the shipping name "FLAMMABLE LIQUID, N.O.S." and the identification number "UN1993." A solid sample of uncertain nature is shipped as a flammable solid with the shipping name "FLAMMABLE SOLID, N.O.S." and the identification number "UN1325." If the nature of the sample is known, 49 CFR 171-177 is consulted to determine the proper labeling and packaging requirements.

7. The cans are placed upright in a cooler that has had its drain plug taped shut inside and out, and the cooler has been lined with a garbage bag. Vermiculite is placed on the bottom. Two sizes of paint cans are used: half-gallon and gallon. The half-gallon paint cans can be stored on top of each other; however, the gallon cans are too high to stack. The cooler is filled with vermiculite, and the liner is taped shut.

8. The paperwork going to the laboratory is placed inside a plastic bag and taped to the inside of the cooler lid. A copy of the COC form, an example of which is shown in Exhibit 5-4, should be included in the paperwork sent to the laboratory. The sampler keeps one copy of the COC form. The laboratory should be notified if a parallel sample is being sent to another laboratory for dioxin analysis, or if the sample is suspected of containing any substance for which laboratory personnel should take safety precautions.

9. The cooler is closed and sealed with strapping tape. At least two custody seals are placed on the outside of the cooler (one on the front and one on the back). More custody seals may be used at the discretion of the sampler.

10. The following markings are placed on the top of the cooler:

- o Proper shipping name (49 CFR 172.301)
- o DOT identification number (49 CFR 172.301)
- o Shipper's or consignee's name and address (49 CFR 172.306)
- o "This End Up" legibly written if shipment contains liquid hazardous materials (49 CFR 172.312)

Other commercially available shipping containers may be used. The SM should ascertain that the containers are appropriate to the type of sample being shipped. The SM should clearly specify the type of shipping container to be used in the QAPjP.

11. The following labels are required on top of the cooler (49 CFR 172.406e):

- o Appropriate hazard class label (placed next to the proper shipping name)
- o "Cargo Aircraft Only" (if applicable as identified in 49 CFR 172.101)

12. An arrow symbol(s) indicating "This Way Up" should be placed on the cooler in addition to the markings and labels described above.
13. Restricted-article airbills are used for shipment. Exhibit 6-5 shows an example of a restricted article Federal Express airbill. The "Shipper Certification for Restricted Articles" section is filled out as follows for a flammable solid or a flammable liquid:

- o Number of packages or number of coolers
- o Proper shipping name: if unknown, use
 - Flammable solid, N.O.S., or
 - Flammable liquid, N.O.S.
- o Classification; if unknown, use
 - Flammable solid or
 - Flammable liquid
- o Identification number; if unknown, use
 - UN1325 (for flammable solids) or
 - UN1993 (for flammable liquids)
- o Net quantity per package or amount of substance in each cooler
- o Radioactive materials section (Leave blank.)
- o Passenger or cargo aircraft (Cross off the nonapplicable. Up to 25 pounds of flammable solid per cooler can be shipped on a passenger or cargo aircraft. Up to 1 quart of flammable liquid per cooler can be shipped on a passenger aircraft, and up to 10 gallons of flammable liquid per cooler can be shipped on a cargo aircraft.)
- o Name and title of shipper (printed)
- o An emergency telephone number at which the shipper can be reached within the following 24 to 48 hours
- o Shipper's signature

Note: The penalties for improper shipment of hazardous materials are severe; a fine of \$25,000 and 5 years' imprisonment can be imposed for each violation. The SM or designee is urged to take adequate precautions.

6.2.7 REGIONAL VARIANCES

There are no known regional variances for the shipment of hazardous samples. However, regional variances for the shipment of environmental samples (low concentration) are common. Information in a compendium on such variances can become dated rapidly. Thus, users are urged to contact the EPA RPM or the RSCC for the latest regional variances.

1. Region I includes the five-digit laboratory number of each sample in the "Remarks" section of the chain-of-custody form to act as a cross check on sample identification.
2. Separators must be placed between the bottles of samples shipped from a Region IV site. ESD also tapes the VOA vials and uses blue ice.
3. Region V tapes the VOA vials and does not line the cooler with a plastic bag. Region V FIT indicates the OTR/ITR number, bottle lot numbers, sample concentrations, and matrix in the right-hand portion of the "Remarks" section of the chain-of-custody form. The custody seal numbers, airbill number, and "samples shipped via Federal Express" are included in the lower right-hand section.
4. Region VI does not tape sample bottles, put sample bottles in plastic bags, or line coolers with plastic. Glass bottles are wrapped with "bubble wrap" instead of cardboard separators. In addition, the traffic report stickers are placed at the liquid level on the sample bottles to allow the laboratories to check for leakage.
5. Region VIII does not put the sample in a plastic bag.

Because information on variances can become dated rapidly, the user should contact the EPA RPM or RSCC for current regional practices and requirements. Future changes and additional regional variances will be incorporated in Revision 01 of this document.

6.2.8 Information Sources

CH2M HILL. REM/FIT Documentation Protocol for Region V.
May 1984.

Code of Federal Regulations, Title 49, Parts 171 to 177,
Transportation.

U.S. Environmental Protection Agency. Engineering Support
Branch Standard Operating Procedures and Quality Assurance
Manual. Region IV, Environmental Services Division.
I April 1986.

U.S. Environmental Protection Agency. The User's Guide to
the Contract Laboratory Program. Office of Emergency and
Remedial Response. December 1986.

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Appendix D
Laboratory Qualifications

STATEMENT
OF
QUALIFICATIONS

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1.4 Waste Characterization and Treatability

Chemtech has extensive experience in the sampling and analysis of waste drums. The following are some of the analyses performed on these types of samples:

- Physical Characteristics
- Chemical Compositions
- Hazardous Characteristics
- Ignitability, Corrosivity Reactivity
- Toxicity Characteristic Leaching Procedure (TCLP)
- Synthetic Leaching Procedure (SLP)
- ASTM Leaching Procedure

2.0 SAMPLING AND ANALYTICAL METHODOLOGIES

Sampling and analysis are performed using Chemtech's Standard Operating Procedures (SOP's) for analysis which are prepared based on US EPA and States Regulatory Agencies approved analytical and sampling procedures.

3.0 DATA PROCESSING AND REPORTING

The data processing and report generation department coordinates the data management requests and the assembly of a report in accordance with the specific requirements of the customer. Chemtech's data management capabilities complement its analytical services, by providing a solution for understanding, assessment and evaluation of large volume and complex analytical data.

3.1 Report Formats:

Chemtech is capable of providing different levels of reporting to meet specific regulatory and customer requirements; including standard, EPA Superfund, Contract Laboratory Protocol (CLP), NJDEP Reduced Deliverables, NJDEP Regulatory Deliverables-US EPA/CLP Methods and Non- USEPA/CLP Methods, and NYSDEC ASP formats

3.2 Electronic Data Deliverables (EDD):

Computer readable diskettes in DOS, ASCII formats are available for CLP and ASP packages. These disks can be used to directly load analytical results into most database softwares. Other customized spreadsheets EDD based on the specific projects requirements are available in other ASCII, Quattro pro, Excel, or Lotus database formats.

Chemtech can also provide ERPIMS and IRDMIS EDD in support of US Department of Defense-Air Force and Army Corps of Engineers Projects.

3.3 Data Archival/Data Retrieval

Chemtech maintains all raw data, laboratory notebooks, and other documentation pertinent to each project for three years from the date of report. Data retrieval from archives will be handled in a similar fashion to a request for analysis.

To maintain the client confidentiality, a specific written work request authorized by the original client must be submitted for retrieval of any data.

4.0 FACILITIES

Chemtech occupies over 18,000 square feet of space at 205 Campus Plaza 1, Edison, NJ. The single level facility houses the corporate headquarters as well as the laboratory facilities. The facility allows for contiguous space expansion.

Entrance to the laboratory is controlled by a security system. During regular business hours, entrance is into the Office/Reception area or directly into the sample receiving area (doorway or loading dock). After normal business hours, entrance and exit is by authorized personnel only. This entrance requires a security code.

All critical temperature areas, such as freezers, ovens, refrigerators, data processing rooms, phone and modem system rooms are closely monitored to ensure the integrity of the samples, analysis and reporting of the data. All temperatures are properly documented in the appropriate logbooks.

4.1 Sample Receipt Area

A separate portion of the laboratory equipped with hoods and adequate ventilation is designated as sample receipt area. The provided work space includes the benches with chemical resistant tops for receiving and safe handling of the coolers and samples.

4.2 Storage Area

Walking cooler and large commercial size refrigerators equipped with locks for security, are used to store the samples. Standards are stored in separate refrigerators away from the samples. The cool storage capacity is designed for simultaneous processing of large size projects.

4.3 Sample Preparation Laboratories

The sample preparation laboratories are isolated from the other sections to prevent cross contamination between the digested and undigested samples. These laboratories are equipped with four large hoods and digestion of Low, Medium and High Concentration for organic and inorganic samples according to the EPA CLP and Non-CLP methodologies.

4.4 - Classical and General Chemistry Laboratory

An area encompassing over 2000 square feet and 300 square feet of bench space enables this laboratory to handle large and multi parameter projects for all matrices.

4.5 Instrumentation Laboratories

These laboratories consist of AA Lab, ICAP Lab, GC Lab and GC/MS Lab. Separated from each other and the rest of the operation, these laboratories are designed for a clean and contamination free environment to process a large number of samples for CLP and Non-CLP analyses.

4.6 Laboratory Hood Ventilation System

All hoods are monitored for air velocity and the information is logged in the logbooks. Every instrument is operated under a separate ventilation system and the entire laboratory is under negative pressure and is designed for a very safe working environment.

4.7 Chemical Hygiene Plan

Chemtech has taken all of the required steps to bring each of the division facilities into compliance with the OSHA Laboratory Standard. A site specific CHP is located at each facility. The CHP was prepared by an independent qualified consulting firm.

On site safety and hazardous substance training has been completed, as required, by the Laboratory Standard.

5.0 INSTRUMENTATION

Partial list of instruments includes:

GAS CHROMATOGRAPH/MASS SPECTROMETRY SYSTEMS

Instrumentation	Make	Model	Autosampler	Data System
GC/MS # 1 "M"	Hewlett-Packard	5971A	Arcon/Tekmar	HP Chemstation
GC/MS # 2 "V"	Hewlett-Packard	5971A	Arcon/Tekmar	HP Chemstation
GC/MS # 3 "S"	Hewlett-Packard	5971A	HP 7673	HP Chemstation
GC/MS # 4 "J"	Hewlett-Packard	5971	HP 7673	HP Chemstation
GC/MS # 5 "C"	Hewlett-Packard	5970	Tekmar	HP Chemstation
GC/MS # 6 "D"	Hewlett-Packard	5970	Tekmar	HP Chemstation
GC/MS # 7 "E"	Hewlett-Packard	5970	Tekmar	HP Chemstation
GC/MS # 8 "F"	Hewlett-Packard	5970	HP 7673	HP Chemstation
GC/MS # 9 "H"	Hewlett-Packard	5970	Tekmar	HP Chemstation
GC/MS # 10 "I"	Hewlett-Packard	5970	Precept	HP Chemstation
GC/MS # 11 "Z"	Hewlett-Packard	5970	HP7673	HP Chemstation
GC/MS # 12 "K"	Hewlett-Packard	5970	HP7673	HP Chemstation
GC/MS # 13 "L"	Hewlett-Packard	5970	Tekmar	HP Chemstation
GC/MS # 14 "N"	Hewlett-Packard	5970	HP7673	HP Chemstation
GC/MS # 15 "B"	Hewlett-Packard	5971	HP7673	HP Chemstation

GAS CHROMATOGRAPHS

Instrumentation	Make	Model	Autosampler	Detector	Data System
GC # 1	Hewlett-Packard	5890	HP7673	Dual ECD	HP Chem
GC # 2	Hewlett-Packard	5890	HP7673	Dual ECD	HP Chem
GC # 3	Hewlett-Packard	5890	HP7673A	Dual ECD	HP Chem
GC # 4	Hewlett-Packard	5890	HP7673A	Dual ECD	HP Chem
GC # 5	Hewlett-Packard	5890	HP7673A	Dual ECD	HP Chem
GC # 6	Hewlett-Packard	5890	HP7673A	Dual ECD	HP Chem
GC # 7	Hewlett-Packard	5890II	HP7673A	Dual ECD	HP Chem
GC # 8	Hewlett-Packard	5890	HP7673A	Dual FID	HP Chem
GC # 9	Perkin Elmer	Autosys	PE Autosys.	Hall/PID	HP Chem
GC # 10	Tracor	540	Tekmar	Hall/PID	HP Chem
GC # 11	Varian	3400	Tekmar	PID	HP Chem
GC # 12	Treometrics	9000	Demension	PID/Hal/FID	HP Chem

TOTAL ORGANIC HALOGENS

Instrumentation	Make	Model	Autosampler	Detector	Data System
TOX Analyzer	Mitsubishi	TOX-10E	TOX-10E	NA	Chemtech LIMS/Labtrol

HPLC SYSTEMS

Make	Model	Autosampler	Detector	Data System
Hewlett Packard	1100 (UVD)	HP Series	UV/Fluorescent	PC

ORGANIC EXTRACTION SYSTEM

Instrumentation	Make	Model	Autosampler
GPC	ABC	AS2000	ABC-1000
GPC	OI	AP-500	AP-500
Turbovap	Zymark	II	NA

SPECTROPHOTOMETERS

Instrumentation	Make	Model	Data System
ICP	Thermo Jarrell Ash	TRACE 61E	Chemtech LIMS/Labtrol
ICP	Thermo Jarrell Ash	TRACE 61E	Chemtech LIMS/Labtrol
GFAA	Perkin Elmer	5100	Chemtech LIMS/Labtrol
AACV	Spectro	Spectro Product	Chemtech LIMS/Labtrol
HG Analyzer	Leeman Labs	PS 20011	Chemtech LIMS/Labtrol
IR	Perkin Elmer	1310	Chemtech LIMS/Labtrol
UV/VIS	GBC	UV/VIS 918	Chemtech LIMS/Labtrol

GENERAL CHEMISTRY

Instrumentation	Make	Model	Data System
Ion Chromatograph	Millpare	CLA	PC
Auto-Analyzer	Lachat	Quik Chem	PC

6.0 STATE CERTIFICATIONS:

A. New York State, Department of Health (NYSDOH # 11376):

1. Potable Water:
2. Non-Potable Water / Wastewater
3. Environmental Analyses / Air and Emissions
4. - Environmental Analyses / Solid And Hazardous Waste

B. New York State Department of Health, ASP Certification

ASP / CLP Inorganic and Organic Analysis

C. State of New Jersey, Department of Environmental Protection (NJDEP # 12013):

1. Potable Water
2. Non-Potable Water
3. Solid and Hazardous Waste
4. CLP

D. State of Oklahoma, Department of Environmental Quality (# 9705)

1. Drinking Water
2. Wastewater
3. Solid

E. State of Connecticut Department of Health (# PH 0649)

1. Potable Water
2. Wastewater
3. Sewage
4. Effluent
5. Soil
6. Trade Waste

F. State of Rhode Island (#232)

G. USDA Soil Permit-Expires June, 2005

7.0 LABORATORY ORGANIZATION AND MANAGEMENT STRUCTURE

Prior to start of any analytical work on any project, the requirements of the client and Statement of Work are fully discussed among project manager, supervisors, analysts, and the staff assigned to the project. During these meetings laboratory personnel are familiarized with the requirements, and are asked to participate in the planning and implementation of the project.

Chemtech uses a Project Management system to plan, coordinate, integrate and monitor project activities. Efficient and effective project management is critical to the successful execution of any contract and to building lasting customer relationships. To assure that there is a clear and specific understanding of all the technical and administrative aspects of a project, an initial "project kick off meeting" is scheduled with the customer and our project management team.

At Chemtech, Project Management Teams are organized as a unit separate from laboratory operations. In this manner, laboratory project managers work with the customer to address the project requirements and with the laboratory operations staff to schedule and track the project's progress. Our Technical Director is an integral part of the Project Management Team. His responsibilities include the review of all technical issues as they relate to analytical protocols and regulatory requirements.

This team approach to project management provides the customer with a team of qualified laboratory professionals who can answer all questions and solve problems in a responsive manner.

As soon as samples are scheduled to arrive at the laboratory the Laboratory Supervisor, QA/QC Supervisor, and Laboratory Manager are notified. Laboratory procedures and personnel involved shall be reviewed and analysts shall be scheduled to process the upcoming workload.

After the samples arrive in the laboratory, the sample custodian will check the containers, verifying the content. He will follow the SOP for sample receipt, making sure that all the necessary documents have been received, and that all the information is correct, and all the samples are in good condition. In case any problem is encountered, the information will be given to the Laboratory Manager, who will call the project officer in charge, for further guidance. Upon adopting the project officer's recommendations regarding the found discrepancies, or if all the documentation and samples are in a good condition, the sample custodian will sign and date the chain-of-custody form and will start the logging -in process. The samples will be logged into the computer according to the SOP. Log page, and labels will be

produced. The labels will be placed on each appropriate bottle, and they will be matched to the information on the bottles for the second time. These labels shall contain the project sample numbers, and Chemtech case and sample numbers. The log pages will be placed in the case folders and a copy will be given to Laboratory Manager.

The Laboratory Manager at this point will prepare the sample preparation log page. This sheet will be reviewed by the QA/QC Supervisor for completeness. This sheet will list all of the samples of the same matrix.

Sample log pages will indicate the matrices of the samples, project sample and case numbers, Chemtech sample and case numbers, dilution factors, balance standardization check weight (in case of digestion by weight), and name of the analyst. The Laboratory Supervisor shall oversee the sample preparation and make sure that all the requirements of the contract are fully implemented. He also will check by estimation the sample volume for liquids and sample weight for soil and sludges, ensuring adequate sample volume for completion of the analyses.

After completion of sample preparation, the digestion log page will be signed and dated by the analyst. The digestion log page is submitted to the QA/QC Supervisor and is placed in the permanent case folder, in order to be sent out as part of the documentation.

Analysts will start the analyses for indicated parameters utilizing contract required instrumentation, and methodologies.

Sample duplicates, spikes and all the other QC involved shall be completed. If at any time any analyst has a problem with any part of the analysis, he will contact the Laboratory Manager and QA/QC Supervisor requesting guidance.

All the information regarding the analyses shall be recorded in permanent logbooks and a copy of these log pages will be placed in the folder, as part of the submittal. If at any time there is a problem with one of instruments, the analysis will be performed on the back-up unit. Every instrument and every analyst performing the analyses has at least one backup. When necessary the laboratory has and will operate twenty-four hours in three consecutive shifts per day, seven days a week.

After each section of the analyses is completed, the computer printout containing the results and all information pertaining to the case, with the analyst's signature shall be submitted to the QA/QC Supervisor. QA/QC will immediately review the printout making sure that all the contract requirements have been met.

All analytical data produced by the analysts are reviewed by the QA/QC Supervisor for completeness, correctness, and contractual requirements. After completion of reviewing the data

it is then given to data reduction personnel for reporting. After the case is complete it is again reviewed by the QA/QC Supervisor. If everything is correct it will be submitted to the Laboratory Manager for final review and signature.

8.0 PERSONNEL QUALIFICATIONS

Emanuel Hedvat, President - Mr. Hedvat is responsible for the management of the laboratory. His responsibilities include establishing the objectives of the laboratory including the planning and implementation required to meeting the objectives. Mr. Hedvat has a BS & MS in Chemistry and over 19 years of environmental laboratory experience.

Divya Mehta, Chief Operating Officer - Mr. Mehta is responsible for all the operating functions of the laboratory, including the overall technical performance and data quality. He also provides technical expertise and the resources as required to meet contractual requirements. Mr. Mehta has a BS & MS in Chemical Engineering and over 15 years of environmental laboratory experience.

Ravinder Bajwa, QA/QC Officer - Ms. Bajwa is responsible for the QA/QC programs and ensures compliance to all Standard Operating Procedures. She is also responsible for the data validation and reporting requirements. Ms. Bajwa has a Ph. D. in Environmental Science and over 10 years of research, teaching and environmental laboratory experience.

Sarav Patel, Systems Manager - Mr. Patel is responsible for managing and updating all computer systems used in the laboratory, including the LIMS. He is also responsible for generating and updating the automated process for laboratory deliverables, including coordinating the preparation of all electronic deliverables. Mr. Patel has a BS in Computer Science and over 4 years of laboratory computer experience.

Thomas Mancuso, Laboratory Director & Organic Manager - Mr. Mancuso is responsible for managing the day to day functions of the laboratory including the accurate and timely reporting of data in compliance with the regulatory requirements. He is also in charge of the Organic Department, including Sample Prep, GC and GC/MS. Mr. Mancuso has a BS in Chemistry and over 18 years of environmental laboratory experience.

Hamex Patel, Inorganic Manger - Mr. Patel is in charge of the Inorganic Department, including Sample Prep, Wet Chemistry and Trace Metals. He is responsible for managing the day to day functions of the department including scheduling data processing and data quality. Mr. Patel has a BS in Chemical Engineering over 3 years of environmental laboratory experience.

9.0 QUALITY ASSURANCE OVERVIEW

Chemtech, operate under a quality assurance program which covers every level of the company and controls all aspects of the analytical laboratory measurement and reporting process. The Chemtech Quality Assurance/Quality Control (QA/QC) Manual governs the operations of all Chemtech analytical laboratories.

9.1 Quality Policy

Chemtech is committed to the production of analytical data meeting specific defined quality standards and to continue improvements in all areas of our operation. As a result of having a focus on environmental analyses, an emphasis is placed on timelines of work, meeting data quality objectives, and the legal defensibility of the data. Each operation maintains a local perspective in its scope of services and client relations and maintains a national perspective in terms of quality. Under the guidance of this quality assurance manual, a level of quality, which is acceptable on a national and international scale, is upheld in all Chemtech laboratory operations.

The corporate goal for all segments of Chemtech operations is to have uniform products and service quality standards, while encouraging local variation to meet state regulations and customer specific needs. The process of achieving this goal entails continuous evaluation and action. Chemtech management requires documentation of existing practices and improvement action plans at every stage in the analytical measurement process. Documentation is fundamental to the demonstration and management of quality practices in environmental analytical laboratories.

A spirit of innovation is an essential element to the success of Chemtech in solving the complicated analytical problems encountered with environmental samples. This spirit, combined with the discipline and attention to detail required to provide the level of service expected by our customers, is what makes Chemtech stand out among others in this field. This same spirit is what drives continuous quality improvement and which is the keystone to the Chemtech quality program.

9.2 Quality System

Chemtech has established and maintains a comprehensive quality systems appropriate to the environmental analyses and related services that it performs. The elements of the system are documented and made available for use by all laboratory personnel.

Laboratory management is committed to production of data in conformance with Chemtech documented Standard Operating Procedures and the Chemtech Quality Assurance/Quality Control (QA/QC) Manual.

Documentation of policies and procedures relating to analytical methods and QA/QC are provided in various documents. Figure 1.1. lists the documents, the responsible persons, purpose, scope of application, and period of review.

In the event of conflict or discrepancy among policies the order of precedence is as follows:

1. Chemtech Quality Assurance Policy Manual
2. Chemtech Quality Assurance/Quality Control Manual
3. Corporate SOPs except where local addenda modify requirements.
4. Local SOPs (required when a corporate SOP is unavailable)
5. Other (help notes, flow charts and condensed procedures)

Responsibility for implementation resides with the President and Laboratory/Operation Directors at each location.

9.3 Mission

Chemtech mission is to provide analytical laboratory and sampling support in the fields of environmental engineering, hydrogeology, geology, and risk assessment. Chemtech clients include a wide range of engineering and consulting firms, private industry, and the Federal Government.

Chemtech can provide comprehensive nationwide solutions to complex analytical problems, making available the specialties developed in each laboratory as well as the back-up analytical capacity for large scale projects.

9.4 Fields of Testing Covered

The methods specifically covered by this manual include the most frequently requested air, water, industrial waste, and soil methodologies currently needed to provide environmental analytical testing and sampling services in the United States. The approach of this manual is to provide an "Chemtech/minimum" level of quality assurance and quality control across all methods. All methods performed by Chemtech shall meet these minimum criteria where applicable. In some instances, Quality Assurance project plans (QAPPs), project specific data quality objectives (DQOs) or local regulations may require more stringent criteria than those contained in this manual. In these cases the

laboratory will abide by the more stringent criteria following review and acceptance of the requirements by the Laboratory Director and the laboratory Quality Assurance Manager.

9.5 Laboratory Operations Covered

The manual contains detailed operational procedures for all phases of sample handling, analysis and data reporting in the laboratory. Sampling services are not provided by Chemtech, however specifications for sampling containers provided by Chemtech and other protocols pertinent to verification of the integrity of samples as received are covered in this manual.

9.6 Management of the Manual

The Corporate Technical Director will address all comments and requests to change or add to the manual.

10. PROJECT EXPERIENCE

Client and Address	Contracting Officer/Phone Number	Contract Number/Name	Type of Contract	Period of Performance	Value of Contract
USEPA Cont. Mgmt. Res. Triangle Pk, NC	Chris Baker (919) 541-2519	68-D5-0166 3 Bid Lots	CLP Analyses of Multimedia samples for TAJ Metals	9/2/96 - open	1,655,400
Foster Wheeler Langhorne, PA	Meg Watson (215) 752-4000	Navy RAC NORTH DIV N62472-94D-0398	Analysis of Water, Soil and Waste at various sites. TCL/TAL/Form U/Rush TAT	10/98 - Present	275,000
CH2M Hill Herndon, VA	Ann West (703) 471-1441	39-31L7.0-DAS Navy CLEAN II I/R	Analysis of Soil, Water, Air & Haz-Waste at various sites in LANFIDIV	11/96 - open	350,000/year
BEM Systems Florham Park, NJ	Shobba Bodhu (201) 301-0078	NJ Transit Waterfront	TCL/TAL analyses of Soil & G'water. EPA level IV w/ GIS EDD	6/95 - open	1,500,000
ICF Kaiser Edgewood, MD	Eric Malarck (410) 612-6322	Radford Army Ammunition Plant	G'water monitoring analysis for TCL/TAL/Explosives	3/98 - Open	90,000
IT Corp. Knoxville, TN	Allen Bradley (423) 690-3211	Tinker Air Force Base	Basewide contract for yearly analysis of Mon. Wells	5/98 - 1-99	700,000
NYC Transit Auth. Brooklyn, NY	Josephine Brown (718) 243-4581	95F6227	Sampling & Analysis of Water, Soil & Air at various depots	3/1/96-3/1/99	225,000
Arecon, Ltd. Bordentown, NJ	Patrick Nocera (609) 298-0770	Squate D Industries	Analysis of TCL/TAL/Air for Remediation project	6/97 - Open	276,000
Earth Tech, Inc. Richmond, VA	Cathy Malhorne (804) 358-5858	US EPA Region II & III ERSS Contract	Analysis of Haz-Waste samples for TCL/TAL/TCLP	9/97 - Open	350,000

11. REFERENCES

Federal Programs References

Client	Contact/Phone #	Project/Contract	Value of Contract (\$)
US EPA Research Triangle Pk., NC	Chris Baker 919-541-2519	68-D5-0166 CLP - 3 Bid Lots	1,655,400.00
CH2M Hill Herndon, VA	Ann West 703-471-1441	39-3LL7.0-DAS Navy CLEAN II I/R	350,000.00/Year
Foster Wheeler Env. Langhorne, PA	Meg Watson 215-702-4039	Trenton NAWC Warminster NAWC	275,000.00
ICF Kaiser Engineers Fairfax, VA	Davida Trumbo 703-934-3996	Radford Army Ammunition Plant	90,000.00
TetraTech, NUS Oklahoma City, OK	Scott Boiling 405-741-7803	Tinker Air Force Base Oklahoma City, OK	250,000.00

Commercial References

Client	Contact/Phone #	Project/Contract	Value of Contract (\$)
BEM Systems, Inc. Florham Pk., NJ	Shobbha Boddu 201-301-0078	NJ Transit	1,500,000.00
Earth Tech, Inc. Richmond, VA	Cathy Mahone 804-358-5858	US EPA Regions II and III Emergency Response	300,000.00
Foster Wheeler Env. Langhorne, PA	Bryan Sladky 215-702-4000	PA DEP G-Tech Furlong, PA	40,000.00
NYC Transit Authority Brooklyn, NY	Josephine Brown 718-243-4581	95F6227 Analysis of Soil, Air and Water, ASP Protocol	225,000.00
Arecon, Ltd. Bordentown, NJ	Patrick Nocera 609-298-0770	The NY/NJ Port Authority-Newark 72 Hrs. TAT - CLP	230,000.00

Appendix E
Laboratory Analytical Protocols

Client:	Client ID:
Date received:	Laboratory ID:
Date extracted:	Matrix: Soil
Date analyzed:	ELAP #:

EPA METHOD 8260

Parameter	CAS No.	Results ug/kg
BENZENE	71-43-2	<5
BROMOBENZENE	108-86-1	<5
BROMOCHLOROMETHANE	74-97-5	<5
BROMODICHLOROMETHANE	75-27-4	<5
BROMOFORM	75-25-2	<5
BROMOMETHANE	74-83-9	<5
n-BUTYLBENZENE	104-51-8	<5
sec-BUTYLBENZENE	135-98-8	<5
tert-BUTYLBENZENE	98-06-6	<5
CARBON TETRACHLORIDE	56-23-5	<5
CHLOROBENZENE	108-90-7	<5
CHLORODIBROMOMETHANE	124-48-1	<5
CHLOROETHANE	75-00-3	<5
CHLOROFORM	67-66-3	<5
CHLOROMETHANE	74-87-3	<5
2-CHLOROTOLUENE	95-49-8	<5
4-CHLOROTOLUENE	106-43-4	<5
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	<5
1,2-DIBROMOETHANE	106-93-4	<5
DIBROMOMETHANE	74-95-3	<5
1,2-DICHLOROBENZENE	95-50-1	<5
1,3-DICHLOROBENZENE	541-73-1	<5
1,4-DICHLOROBENZENE	106-46-7	<5
DICHLORODIFLUOROMETHANE	75-71-8	<5
1,1-DICHLOROETHANE	75-34-3	<5
1,2-DICHLOROETHANE	107-06-2	<5
1,1-DICHLOROETHENE	75-35-4	<5
cis-1,2-DICHLOROETHENE	156-59-2	<5
trans-1,2-DICHLOROETHENE	156-60-5	<5

Client:	Client ID:
Date received:	Laboratory ID:
Date extracted:	Matrix: Soil
Date analyzed:	ELAP #:

EPA METHOD 8260

Parameter	CAS No.	Results ug/kg
1,2-DICHLOROPROPANE	78-87-5	<5
1,3-DICHLOROPROPANE	142-28-9	<5
2,2-DICHLOROPROPANE	594-20-7	<5
1,1-DICHLOROPROPENE	563-58-6	<5
ETHYLBENZENE	100-41-4	<5
HEXACHLOROBUTADIENE	87-68-3	<5
ISOPROPYLBENZENE	98-82-8	<5
p-ISOPROPYLTOLUENE	99-87-6	<5
METHYLENE CHLORIDE	75-09-2	<5
NAPHTHALENE	91-20-3	<5
n-PROPYLBENZENE	103-65-1	<5
STYRENE	100-42-5	<5
1,1,1,2-TETRACHLOROETHANE	630-20-6	<5
1,1,2,2-TETRACHLOROETHANE	79-34-5	<5
TETRACHLOROETHENE	127-18-4	<5
TOLUENE	108-88-3	<5
1,2,3-TRICHLOROBENZENE	87-61-6	<5
1,2,4-TRICHLOROBENZENE	120-82-1	<5
1,1,1-TRICHLOROETHANE	71-55-6	<5
1,1,2-TRICHLOROETHANE	79-00-5	<5
TRICHLOROETHENE	79-01-6	<5
TRICHLOROFLUOROMETHANE	75-69-4	<5
1,2,3-TRICHLOROPROPANE	96-18-4	<5
1,3,5-TRIMETHYLBENZENE	108-67-8	<5
1,2,4-TRIMETHYLBENZENE	95-63-6	<5
VINYL CHLORIDE	75-01-4	<5
ACETONE	62-64-1	<5
CARBON DISULFIDE	75-15-0	<5
2-BUTANONE	78-93-3	<5
VINYL ACETATE	108-05-4	<5
2-HEXANONE	591-78-6	<5
XYLENES (TOTAL)	1330-20-7	<15

 Laboratory Director

Client:	Client ID:
Date received:	Laboratory ID:
Date extracted:	Matrix: Soil
Date analyzed:	ELAP #:

EPA METHOD 8270

Parameter	CAS No.	Results ug/kg
Bis(2-CHLOROETHYL)ETHER	111-44-4	<666
PHENOL	108-95-1	<666
2-CHLOROPHENOL	95-57-8	<666
1,3-DICHLOROBENZENE	541-73-1	<666
1,4-DICHLOROBENZENE	106-46-7	<666
1,2-DICHLOROBENZENE	95-50-1	<666
BENZYL ALCOHOL	100-51-6	<666
Bis(2-CHLOROISOPROPYL)ETHER	108-60-1	<666
2-METHYLPHENOL	95-48-7	<666
HEXACHLOROETHANE	67-72-1	<666
N-NITROSODI-n-PROPYL AMINE	621-64-7	<666
4-METHYLPHENOL	106-44-5	<666
NITROBENZENE	98-95-3	<666
ISOPHORONE	78-59-1	<666
2-NITROPHENOL	88-75-5	<666
2,4-DIMETHYLPHENOL	105-67-9	<666
Bis(2-CHLOROETHOXY)METHANE	111-91-1	<666
2,4-DICHLOROPHENOL	102-83-2	<666
1,2,4-TRICHLOROBENZENE	120-82-1	<100
NAPHTHALENE	91-20-3	<40
4-CHLOROANILINE	106-47-8	<666
HEXACHLOROBUTADIENE	87-68-3	<666
4-CHLORO-3-METHYLPHENOL	59-50-7	<666
2-METHYLNAPHTHALENE	91-57-6	<666
HEXACHLOROCYCLOPENTADIENE	77-47-4	<1,000
2,4,6-TRICHLOROPHENOL	88-06-2	<666
2,4,5-TRICHLOROPHENOL	95-95-4	<666
2-CHLORONAPHTHALENE	91-58-7	<666
2-NITROANILINE	85-74-4	<666
ACENAPHTHYLENE	208-96-8	<40
DIMETHYLPHTHALATE	131-11-3	<666
2,6-DINITROTOLUENE	606-20-2	<666
ACENAPHTHENE	83-32-9	<40

Client:	Client ID:
Date received:	Laboratory ID:
Date extracted:	Matrix: Soil
Date analyzed:	ELAP #:

EPA METHOD 8270

Parameter	CAS No.	Results ug/kg
3-NITROANILINE	99-09-2	<666
2,4-DINITROPHENOL	51-28-5	<1,332
DIBENZOFURAN	132-64-9	<666
2,4-DINITROTOLUENE	121-14-2	<666
4-NITROPHENOL	100-02-7	<666
FLUORENE	86-73-7	<40
4-CHLOROPHENYL PHENYL ETHER	7005-72-3	<666
DIETHYLPHTHALATE	84-66-2	<666
4-NITROANILINE	100-01-6	<666
4,6-DINITRO-2-METHYLPHENOL	534-52-1	<666
N-NITROSODIPHENYLAMINE	86-30-6	<666
4-BROMOPHENYL-PHENYL ETHER	101-55-3	<666
HEXACHLOROBENZENE	118-74-1	<666
PENTACHLORPHENOL	87-86-5	<666
PHENANTHRENE	85-01-8	<40
ANTHRACENE	120-12-7	<40
Di-n-BUTYLPHTHALATE	84-74-2	<666
FLUORANTHENE	206-44-0	<40
PYRENE	129-00-0	<40
BUTYLBENZYLPHTHALATE	85-68-7	<666
3,3-DICHLOROBENZIDINE	91-94-1	<666
BENZO-a-ANTHRACENE	56-55-3	<40
CHRYSENE	218-01-9	<100
Bis(2-ETHYLEXYL)PHTALATE	117-81-7	<666
DI-n-OCTYLPHTHALATE	117-84-0	<666
BENZO-b-FLUOROANTHENE	205-99-2	<150
BENZO-k-FLUOROANTHENE	207-08-9	<100
BENZO-a-PYRENE	50-32-8	<40
INDENO(1,2,3-c,d)PYRENE	193-39-5	<40
DIBENZO-a,h-ANTHRACENE	53-70-3	<40
BENZO-g,h,i-PERYLENE	191-24-2	<100

Laboratory Director

Client:	Client ID:
Date received:	Laboratory ID:
Date extracted:	Matrix: Soil
Date analyzed:	ELAP #:

Target Compound List-Metals

PARAMETER	MDL	RESULTS mg/kg
SILVER, Ag	1.65 mg/kg	<1.65
BARIUM, Ba	3.33 mg/kg	<3.33
CADMIUM, Cd	1.65 mg/kg	<1.65
COPPER, Cu	1.65 mg/kg	<1.65
MAGNESIUM, Mg	1.65 mg/kg	<1.65
NICKEL, Ni	1.65 mg/kg	<1.65
SELENIUM, Se	1.65 mg/kg	<1.65
ZINC, Zn	1.65 mg/kg	<1.65
ALUMINUM, Al	1.65 mg/kg	<1.65
BERYLLIUM, Be	1.65 mg/kg	<1.65
COBALT, Co	1.65 mg/kg	<1.65
IRON, Fe	1.65 mg/kg	<1.65
MANGANESE, Mn	1.65 mg/kg	<1.65
LEAD, Pb	1.65 mg/kg	<1.65
THALIUM, Tl	1.65 mg/kg	<1.65
MERCURY, Hg	0.02 mg/kg	<0.020
ARSENIC, As	6.60 mg/kg	<6.60
CALCIUM, Ca	1.65 mg/kg	<1.65
CHROMIUM, Cr	1.65 mg/kg	<1.65
POTASSIUM, K	1.65 mg/kg	<1.65
SODIUM, Na	1.65 mg/kg	<1.65
ANTIMONY, Sb	1.65 mg/kg	<1.65
VANADIUM, V	1.65 mg/kg	<1.65

Performed by SW-846 Method 6010

Appendix F

Generic Community Air Monitoring Program

New York State Department of Health
 Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored **continuously** at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

June 20, 2000

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Appendix G

Resumes of Key Personnel

PERSONAL PROFESSIONAL QUALIFICATIONS

CHARLES J. VOORHIS, CEP, AICP

Licensing and Certification:

Certified Environmental Professional (CEP)
American Institute of Certified Planners (AICP)
Certified Environmental Inspector, Environmental Assessment Association
US Coast Guard Master Steam and Auxiliary Sail Vessels

Experience:

- Managing Partner of Firm, Nelson, Pope & Voorhis, LLC; Meville, New York (1/97-Present)
- Principal of Firm, Charles Voorhis & Associates, Inc.; Miller Place, New York (8/88-1/97)
- Director, Division of Environmental Protection, Department of Planning, Environment and Development; Town of Brookhaven, New York (3/86-8/88)
- Environmental Analyst, Division of Environmental Protection, Department of Planning, Environment and Development; Town of Brookhaven, New York (8/82-3/86)
- Private and Public Consultant, Planning and Environmental Issues (8/82-3/87)
- Public Health Sanitarian, Suffolk County Department of Health Services; Hauppauge, New York (1/80-8/82)
- Environmentalist I, Suffolk County Department of Environmental Control, Central Islip, New York (2/78- 8/79)

Education:

- SUNY at Stony Brook; Master of Science in Environmental Engineering, concentration in Water Resource Management, 1984
- Princeton Associates; Groundwater Pollution and Hydrology Short Course, Princeton, New Jersey, 1983
- New York State Health Department, Environmental Health Training Course, Hauppauge, New York, 1982
- Southampton College of Long Island University; Bachelor of Science in Environmental Geology, 1977



Significant Professional Achievements:

- Old Orchard Woods, DEIS and FEIS, 2000
- Town of Smithtown Armory Park, DEIS, 2000
- Town of Southold Water Supply Management & Water Protection Strategy, 2000
- CVS @ Greenlawn, DEIS and FEIS, 1998
- Knightsbridge Gardens, DEIS and FEIS, 1997
- Camelot Village @ Huntington, DEIS, 1997
- Airport International Plaza, DEIS and FEIS, 1996
- Patchogue Lace Mill, Phase I ESA, 1996
- Price Club @ New Rochelle, DEIS and FEIS, 1995
- Commack Campus Park @ Commack DEIS and FEIS, 1994
- Water Mill Shops @ Water Mill DEIS, 1993
- PJ Venture Wholesale Club @ Commack DEIS and FEIS, 1993
- Dowling College NAT Center DEIS and FEIS, 1992
- Final EIS Angel Shores @ Southold, 1991
- Town of Brookhaven Boat Mooring Plan, 1991
- Draft EIS Round Hill @ Old Westbury, 1990
- Draft EIS St. Elsewhere @ Nesconset, 1989
- GEIS Commercial Rezoning on the Towns Own Motion, 1988
- GEIS Large Lot Rezoning on the Towns Own Motion, 1988
- Award for Environmentally Sensitive Land Design, Pine Barrens Review Comm., 1988
- EQBA, Acquisition Study for Brookhaven Town, 1987
- Town of Brookhaven Land Use Plan, 1987
- Discussion of Hydrogeologic Zone Boundaries in the Vicinity of S. Yaphank, LI, NY, 1986
- Duck Farms in Brookhaven Town, Land Restoration Techniques, 1985
- Coastal Energy Impact Program, 1984
- Comprehensive Review of Industrial Zoned Land in the Sensitive Hydrogeologic Zone, Town of Brookhaven, 1983
- Groundwater Supply and Early Groundwater Use in Brookhaven Township, Suffolk County, New York 1983

Professional & Other Organizations (past and present):

- American Institute of Certified Planners
- American Planning Association, Washington, D.C.
- National Association of Environmental Professionals, Alexandria, VA
- Environmental Assessment Association, Scottsdale, Arizona
- American Water Resources Association, Syracuse, New York
- National Water Well Association, Worthington, Ohio
- New York Planning Federation, Albany, New York
- New York Water Pollution Control Association, Riverdale, New York
- Water Pollution Control Federation, Washington, D.C.
- Long Island Seaport & EcoCenter, Inc., Director, Port Jefferson, NY
- Boy Scouts of America, Trained Scoutmaster, Nathaniel Woodhull District, NY
- Historical Society of Port Jefferson, Trustee, Port Jefferson, NY
- Environmental Conservation Board, Village of Port Jefferson, NY
- Port Jefferson Village, Waterfront Advisory Committee, Port Jefferson, NY



- Town of Brookhaven Mount Sinai Harbor Advisory Committee, Medford, NY
- Brookhaven Conservation Advisory Council, Medford, New York



PERSONAL PROFESSIONAL QUALIFICATIONS

STEVEN J. McGINN, AICP, CEI

Licensing and Certification:

American Institute of Certified Planners (AICP)
OSHA 40 Hour HAZWOPER
Certified Environmental Inspector, Environmental Assessment Association (CEI)

Experience:

- Sr. Environmental Analyst, Nelson, Pope & Voorhis, LLC (January 1997 to Present)
- Environmental Analyst, Nelson & Pope, LLP (July 1989 to January 1997)
- Project Manager, Middleton Kontokosta & Associates (May 1988 to July 1989)
- Planning Aide, Town of Huntington Planning Department (January 1987 to May 1988)

Education:

- 8-Hour HAZWOPER Refresher Course, December, 1999
- 40-Hour Course Hazardous Materials Training, December, 1998
- Project Managers Bootcamp, PSMJ Resources, Inc., January 1998
- Performing Phase I Environmental Inspections, Environmental Assessment Association, Sept. 1997
- Environmental Regulations Course, Executive Enterprises, June 1996
- Environmental Impact Statements, Cook College/Rutgers University, December 1994
- State University of New York at Cortland - Bachelor of Science in Geography, January 1986

Significant Professional Achievements:

- Coram Plaza, Coram - Phase I, II & III ESA and Asbestos Survey
- 744 Clinton Street, Brooklyn - Phase I & II ESA



- Middle Island Country Club, Middle Island - Phase I & II ESA
- Tyrolean Auto Sport, Northport - Phase II & III ESA
- Long Island Children's Museum, Westbury - Phase I & II ESA
- 940 Bryant Avenue, Bronx - Phase I ESA
- 1345 Seneca Avenue, Bronx - Phase I ESA
- Red Roof Farms, Rye Brook - Phase I & II ESA
- Thomas Dodge Subaru, Port Jefferson - Phase I & II ESA
- 221 Skip Lane, Bay Shore - Phase I & II ESA
- 121 Maple Avenue (Shore Line Marina), Bay Shore - Phase I & II ESA
- 950 West Main Street, Riverhead - Phase I ESA
- Long Island Galleria/Price Club Plaza, Westbury - DEIS & FEIS
- Currans Road Development, Middle Island - DEIS & FEIS
- Timber Ridge at the Plains, Greenlawn - DEIS & FEIS
- Greene's Creek Marina, Sayville - DEIS
- Town of Brookhaven Marine Reconstruction Projects, Patchogue, Blue Point, Port Jefferson, Mount Sinai, - Tidal Wetland Permits
- Village of Lake Success, Lake Success - Land Use and Zoning Analyses
- Ridgehaven Estates, Ridge - DEIS & FEIS
- K-Mart @ Farmingville - Part III EAF
- Long Lake Estates, Coram - DEIS & FEIS

Professional Responsibilities:

- Project Manager for Phase I and Phase II Environmental Site Assessments and Asbestos Surveys for lending institutions
- Author of numerous environmental impact statements in both draft and final formats for major large scale, high-profile projects.
- Other responsibilities include the preparation of various environmental, planning and zoning studies and the preparation of various state and federal applications such as: land use and zoning studies, noise and air quality assessments, Phase I Environmental Site Assessments, feasibility studies, economic analyses, freshwater and tidal wetland permits, etc.
- Interaction with various Town, County, State and Federal officials, attorneys, developers, engineers, Town Boards, Planning Boards, and Zoning Boards of Appeals.

Professional Organizations:

- American Institute of Certified Planners, Washington, D.C.
- American Planning Association, Washington, D.C.
- National Association of Environmental Professionals, Alexandria, VA
- Environmental Assessment Association, Scottsdale, Arizona
- National Groundwater Association, Assoc. of Groundwater Scientists and Engineers



PERSONAL PROFESSIONAL QUALIFICATIONS

Eric C. Arnesen, P.G.

Education:

State University of New York at Stony Brook, Masters of Science, Hydrogeology (2000).
State University of New York at Cortland Bachelors of Science, Geology (1988).

Experience:

- Hydrogeologist, Nelson, Pope & Voorhis, LLC, Melville, NY (1999-Present). Responsible for providing technical and professional expertise for Phase I, II, III, RI/FS studies, ESAs, EISs and EAFs regarding groundwater, surface water, soil and solid waste issues. Involved in all phases of stormwater permitting.
- Hydrogeologist, Fanning, Phillips and Molnar, Ronkonkoma, NY (1998-1999). Field coordination and management of delineation and long-term monitoring programs for Air Force Center for Environmental Excellence (AFCEE) at United States Air Force Bases.
- Hydrogeologist, ERM-Northeast, Woodbury, NY (1993-1998). Field coordination and management of Phase I and II Investigation studies. Field Manager of RI/FSs, removal actions and plume delineation studies under jurisdiction of USEPA, USDOE and NYSDEC.
- Geologist/Hydrogeologist Roux Associates, Huntington, NY (1988-1993). Involved in over 30 Phase I and II investigations in all aspects of participation.

Professional Achievements:

- Conducted several Draft EISs for major development projects on Long Island which included the development of a 600,000 sq ft industrial facility on a 78 acre parcel within the Central Pine Barrens Compatible Growth Area in Yaphank and a PRC complex on a 74 acre parcel within the Central Pine Barrens Compatible Growth Area in Eastport. Considered variety of environmental resources including water, geology, soils ecology community, aesthetics, transportation, cultural, zoning, land use and planning. Evaluated impacts developments may have on these resources and proposed mitigation measures to reduce impacts. Also evaluated alternatives to proposed project to determine most appropriate and feasible development approach. Presented finding during public information meetings sponsored by Town planning boards
- Prepared several Draft EISs for the State Education Department (SED) related to the expansion and/or construction of educational facilities. Specifically, conducted an environmental review and authored the Draft EIS related to the proposed construction of a new Middle School for the Hewlett-Woodmere School District, High School expansion for the Center Moriches School District, construction for a proposed new public library in South Huntington and expansion of the Baldwin Public Library. Reviewed and analyzed potential project impacts on environmental resources, demography, public services, traffic patterns, cultural resources, aesthetics and surrounding land use. Outlined measures to be undertaken to mitigate any negative impact which may have resulted from each project.



- Conducted Part III EAF's for several development proposals including PRCs, multiple retail outlets, restaurants and apartment complexes. Addressed issues outlined in scoping documentation which include groundwater, topography, ecology, transportation cultural resources, aesthetic resources, community services, community character, sanitary disposal, etc. Analyzed impact development has on these resources and proposed mitigation measures to alleviate negative effects..
- Prepared Compatible Growth Area Application package for a Development of Regional Significance related to the construction of a light industrial facility in the Central Pine Barrens Region on Long Island, New York. Provided information requested by Central Pine Barrens Commission to ensure compliance with the standards and guidelines outlined in the Central Pine Barrens Comprehensive Land Use Plan.
- Conducted RI/FS for a electroplating facility in Farmingdale, New York. Prepared RI/FS report in accordance with NYSDEC requirements for the evaluation of remedial alternatives related to impacts to soils and groundwater. Evaluated technical data for the proposal of several remedial alternatives which included groundwater pump and treat, capping, excavation and encapsulation.
- Conducting RI/FS for an EPA listed Super Fund site in Port Jefferson, New York. Currently involved in work plan phase of process which outlines investigative approach and scope as well as risk evaluation according to EPA protocols.
- Supervised and conducted field activities related to several RI/FS and Phase II studies for a variety of facilities which include government installations, dry cleaners, and industrial facilities. Oversaw all aspects of field investigation including well and boring installations, sampling activities, geophysical studies and hydrogeological studies (pump tests, step tests, stratigraphic mapping, etc.)

Professional Affiliations:

- National Groundwater Association, 1989 to Present

Certifications

- Certified Professional Geologist, Tennessee Department of Commerce, Certification # 4471, 1999 to Present.



PERSONAL PROFESSIONAL QUALIFICATIONS

Eric C. Arnesen, P.G.

Education:

State University of New York at Stony Brook, Masters of Science, Hydrogeology (2000).
State University of New York at Cortland Bachelors of Science, Geology (1988).

Experience:

- Hydrogeologist, Nelson, Pope & Voorhis, LLC, Melville, NY (1999-Present). Responsible for providing technical and professional expertise for Phase I, II, III, RI/FS studies, ESAs, EISs and EAFs regarding groundwater, surface water, soil and solid waste issues. Involved in all phases of stormwater permitting.
- Hydrogeologist, Fanning, Phillips and Molnar, Ronkonkoma, NY (1998-1999). Field coordination and management of delineation and long-term monitoring programs for Air Force Center for Environmental Excellence (AFCEE) at United States Air Force Bases.
- Hydrogeologist, ERM-Northeast, Woodbury, NY (1993-1998). Field coordination and management of Phase I and II Investigation studies. Field Manager of RI/FSs, removal actions and plume delineation studies under jurisdiction of USEPA, USDOE and NYSDEC.
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Professional Achievements:

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- Prepared several Draft EISs for the State Education Department (SED) related to the expansion and/or construction of educational facilities. Specifically, conducted an environmental review and authored the Draft EIS related to the proposed construction of a new Middle School for the Hewlett-Woodmere School District, High School expansion for the Center Moriches School District, construction for a proposed new public library in South Huntington and expansion of the Baldwin Public Library. Reviewed and analyzed potential project impacts on environmental resources, demography, public services, traffic patterns, cultural resources, aesthetics and surrounding land use. Outlined measures to be undertaken to mitigate any negative impact which may have resulted from each project.



- Conducted Part III EAF's for several development proposals including PRCs, multiple retail outlets, restaurants and apartment complexes. Addressed issues outlined in scoping documentation which include groundwater, topography, ecology, transportation cultural resources, aesthetic resources, community services, community character, sanitary disposal, etc. Analyzed impact development has on these resources and proposed mitigation measures to alleviate negative effects..
- Prepared Compatible Growth Area Application package for a Development of Regional Significance related to the construction of a light industrial facility in the Central Pine Barrens Region on Long Island, New York. Provided information requested by Central Pine Barrens Commission to ensure compliance with the standards and guidelines outlined in the Central Pine Barrens Comprehensive Land Use Plan.
- Conducted RI/FS for a electroplating facility in Farmingdale, New York. Prepared RI/FS report in accordance with NYSDEC requirements for the evaluation of remedial alternatives related to impacts to soils and groundwater. Evaluated technical data for the proposal of several remedial alternatives which included groundwater pump and treat, capping, excavation and encapsulation.
- Conducting RI/FS for an EPA listed Super Fund site in Port Jefferson, New York. Currently involved in work plan phase of process which outlines investigative approach and scope as well as risk evaluation according to EPA protocols.
- Supervised and conducted field activities related to several RI/FS and Phase II studies for a variety of facilities which include government installations, dry cleaners, and industrial facilities. Oversaw all aspects of field investigation including well and boring installations, sampling activities, geophysical studies and hydrogeological studies (pump tests, step tests, stratigraphic mapping, etc.)

Professional Affiliations:

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Certifications

- Certified Professional Geologist, Tennessee Department of Commerce, Certification # 4471, 1999 to Present.

