REMEDIAL PLAN

ORANGE & ROCKLAND UTILITIES, INC. WEST NYACK, NEW YORK INACTIVE HAZARDOUS WASTE SITE (ID#: 3-44-014)

Prepared for:

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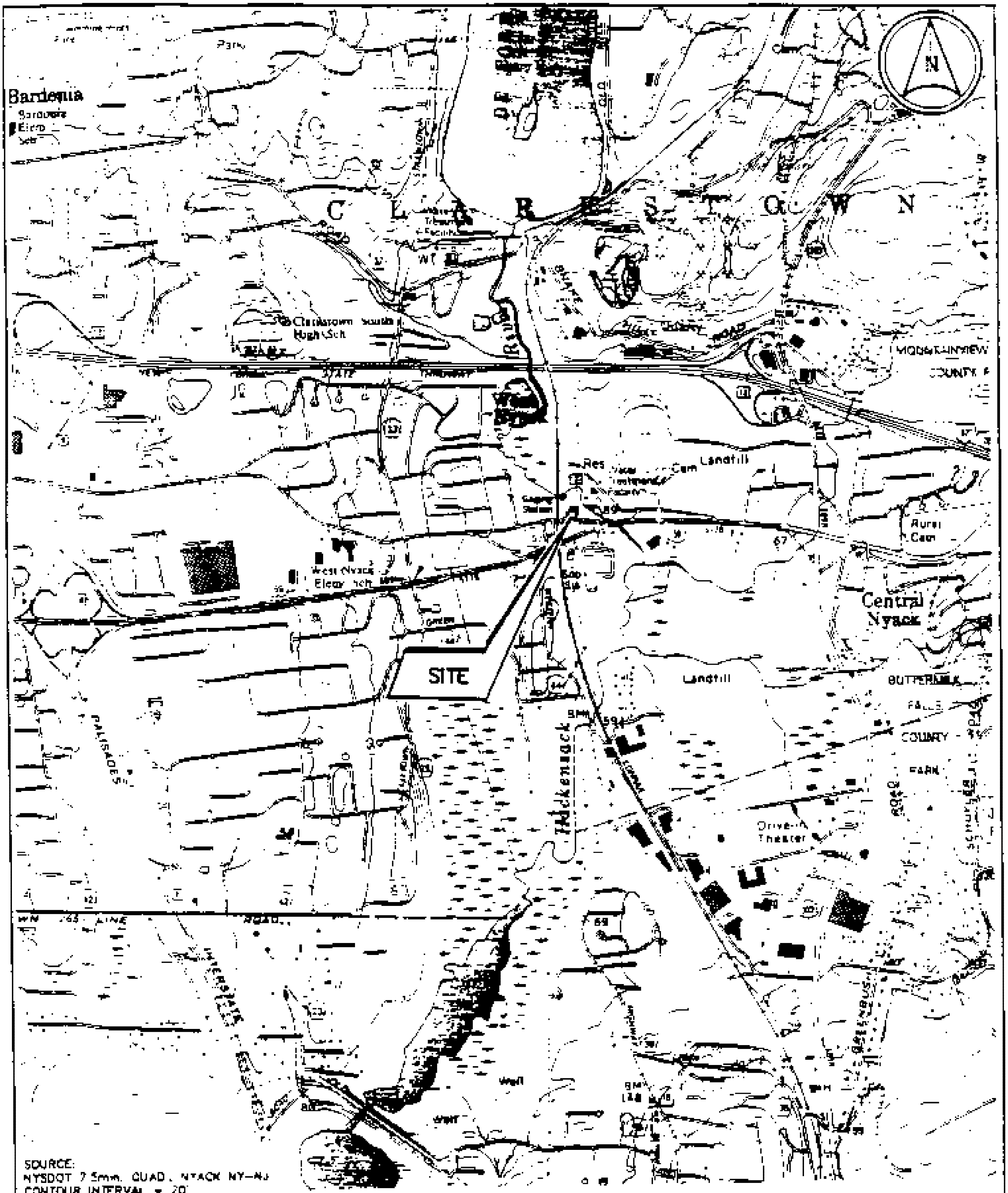
1.0 INTRODUCTION

This Remedial Plan (the Plan) has been prepared by Rust Environment & Infrastructure (Rust) for the Orange & Rockland Utilities, Inc. (ORU) West Nyack, New York Inactive Hazardous Waste Site ID# 3-44-014 (the Site). The Site is located in a developed commercial and residential area of West Nyack, Rockland County, New York (Figure 1). This Plan describes the proposed scope of work required to remediate the site in accordance with the NYSDEC Record of Decision. The Remedial Plan includes excavation of soils from an area impacted by a former leaking underground storage tank (UST) and excavation of soils from three areas on site that contain polychlorinated biphenyls (PCBs). Investigation of the Site was performed under the requirements of an Order on Consent Index #W3-0508-93-12 dated August 2, 1994 between ORU and the New York State Department of Environmental Conservation (NYSDEC).

The remedial objective for benzene and xylene is to obtain the NYSDEC recommended cleanup levels (Technical and Administrative Guidance Document HWR-94-4046: Determination of Soil Cleanup Objectives and Cleanup Levels) of 0.06 mg/Kg benzene and 1.2 mg/Kg xylene. The remedial objective for PCBs is to attain the NYSDEC recommended subsurface (depths greater than 1 foot) cleanup level of 10 mg/Kg and surface (0 to 1 foot depth) cleanup level of 1 mg/Kg. This Plan describes the remedial activities and procedures to be used in achieving this objective. The Plan also describes the decontamination and perimeter air monitoring procedures that will be employed during remediation to protect the surrounding area during the course of remedial activities. The Quality Assurance Project Plan (QAPjP) is incorporated in this Plan as Appendix A. The QAPjP specifies quality assurance/quality control policies and procedures that will be followed during implementation of the project. The commercial laboratory selected to perform confirmatory soil and effluent water analysis will be required to submit a separate Laboratory Quality Control Manual. The Health and Safety Plan (HASP) is also incorporated in this Plan as Appendix B. The HASP will be implemented during remediation to protect Rust employees working on-site. The Contractor selected to perform the remedial work will be required to prepare and submit its own HASP. The scope of the remedial work is described in Section 3 of this Plan. Additional details of the remedial work are provided in the Drawings and Specifications (Appendix C).



RUST ENVIRONMENT & INFRASTRUCTURE

SITE LOCATION MAP

Figure 1

ORANGE AND ROCKLAND UTILITIES, INC.

VILLAGE OF WEST NYACK — ROCKLAND COUNTY, NEW YORK

PROJECT NO. 38301.200	DATE 9/94	DWG. NO. 38301-03	SCALE 1"=2000'	FIGURE NO. 1

2.0 BACKGROUND INFORMATION

2.1 Site Description

The Site is approximately three acres in size and is situated north of Route 59 and immediately north of the Old Nyack Turnpike, and seven-tenths of a mile west of the intersection of Routes 59 and 303. The Site is bordered on the west by Consolidated Rail Corporation (Conrail) rail tracks and a small property occupied by Yaboo Fence Company, Inc. for storage purposes. The Hackensack River borders the Site to the north and east (see Figure 1).

The Hackensack River flows from north to south, occupying a broad valley bottom of low relief. This valley bottom exists generally at elevations of 50 to 70 feet, but has rolling hills that rise from 100 to 150 feet. The river valley is approximately 6,000 feet wide where it is crossed by NYS Route 59, and maintains that width for about 2,000 feet north of the Site and about 6,000 feet south of the Site (Lawler, Matusky and Skelly, 1992 [LMS, 1992]).

The land surface rises steeply to a long north-south trending ridge at the eastern edge of the Hackensack River floodplain where elevations reach 300 to 500 feet. This long north-south trending ridge forms a topographic divide between the Hudson River and Hackensack River drainage basins. The land rises abruptly to elevations of about 250 feet on the western edge of the Hackensack River floodplain, though not as steeply as on the eastern edge.

One of the rolling hills in the Hackensack River valley mentioned above exists immediately to the west and south of the subject Site. The ground surface rises to 80 feet on the west and 100 feet on the south side of NYS Route 59. This landform creates a small local divide that separates shallow groundwater and surface water that flows northeast toward and across the Site from waters that flow south and west into a large wetland area downstream from the Site.

The Site is mostly flat, sloping gently from southwest to northeast, with the southwest corner rising slightly to approximately 69 feet, which is about 6 to 7 feet higher than most of the Site. The range of elevations encountered at the Site is from 50 to 70 feet.

2.2 Site History

The Site is currently used as a satellite station for ORU's line crews with garage facilities for utility service repair trucks, parking space for ORU vehicles, and as office space for two outside tenants and for several other ORU departments. From the late 1920's to approximately 1981 the Site was used to store and repair electrical transformers, capacitors and other utility equipment. Two underground storage tanks located in the center of the Site were used to store gasoline for fueling ORU's utility service repair trucks. In April 1980, it was discovered that one tank was leaking. As a result, this tank was repaired and relined in 1980 and later removed in 1989 after failing tightness testing. The second tank was found to be sound and remains in service for diesel fuel storage.

2.3 Description of the Surrounding Area

The Site is located at 180 West Nyack Road in the hamlet of West Nyack, Town of Clarkstown, Rockland County, New York. The Town of Clarkstown has a population of 79,346 according to a 1990 Census. The surrounding region is an extensively developed commercial and residential area. There are three NYSDEC regulated wetland areas located within a one half mile radius of the Site and two NYSDEC regulated wetland areas located within a two mile radius of the Site.

2.4 Previous Investigations

2.4.1 Summaries of Previous Investigations

Presented below is a chronological list of previous investigations performed at the Site. In addition, a brief summary of activities performed and recommendations provided, based upon review of results and conclusions from each investigation is also included:

<u>1980</u>: In response to concerns over the possibility of soil contamination and migration of PCBs into the Hackensack River due to the historical operation of the facility, Paulus, Sokolowski and Sartor (PSS) performed a soil, surface water, sediment, and groundwater investigation. PSS concluded that PCBs were not migrating from the Site but recommended that monitoring wells be installed and a short-term monitoring program be established.

<u>June-August, 1981</u>: ORU examined on-site air, soil, and groundwater and Hackensack River surface water and sediment for PCB content. PCBs were detected in low concentrations in the following media: soil (on-site), groundwater (on-site), surface water, and sediment from the nearby Hackensack River.

<u>May, 1987</u>: Wehran Engineering of Middletown, New York performed a Phase I investigation for the NYSDEC. Wehran recommended that a Phase II investigation be performed.

<u>May, 1988</u>: NUS Corporation (NUS) completed a Preliminary Assessment of the Site for the USEPA. The report recommended that surface water sampling be conducted at the intake point of the Nyack Water Company.

<u>August, 1988</u>: NUS completed a Final Draft Site Inspection Report of the Site for the USEPA in which recommendations for further action at the Site were identified as being a high priority.

<u>July, 1989</u>: Dames and Moore (D&M) of Pearl River, New York performed a groundwater investigation due to a failed integrity test on an on-site underground storage tank (UST) and the identification of "petroleum" contaminated soil during its subsequent excavation. D&M installed five monitoring wells and sampled the newly installed wells and three existing wells. Based on the analytical results, D&M confirmed the

presence of petroleum-related constituents and the probability of chlorinated solvents in on-site groundwater.

February, 1990: ORU sampled on-site groundwater and surface water and sediment from the Hackensack River. All samples were analyzed for PCBs with PCBs being detected in only one sediment sample from the Hackensack River.

July, 1991: ORU signed a Consent Order with the NYSDEC to conduct a Phase II investigation to verify that no PCBs or chlorinated solvents were present in on-site soil and/or groundwater.

March, 1992: Lawler, Matusky and Skelly Engineers (LMS) performed a Phase II investigation. LMS conducted sampling of on-site soil (shallow surface and subsurface), surface water, and sediment from the Hackensack River and on-site groundwater. Each sample was analyzed for the Target Compound List (TCL) organic parameters. PCBs were only identified in on-site soil and Hackensack River sediment samples while chlorinated solvents were identified in on-site soil and groundwater.

2.4.2 Summary of the Remedial Investigation/Feasibility Study

ORU retained Rust to conduct a Remedial Investigation and Feasibility Study (RI/FS) for the Site, and the RI report was submitted on April 24, 1996. The overall objective of the RI was to determine the nature and extent of chemical impacts to Site soils and groundwater and Hackensack River surface water and sediments. Once the nature and extent of impact was determined, the data presented in the report was used to prepare the FS. The FS report was submitted in March of 1997 and amended in July of 1997. The FS identifies, evaluates and recommends a cost-effective, environmentally sound, long-term remedial action.

Based on the findings of the Remedial Investigation, the following conclusions have been reached:

- Subsurface soil in the vicinity of the UST area exhibit BTEX concentrations that are elevated with respect to the NYSDEC RSCO's. There is an estimated 6,000 cubic yards of impacted soils located above and below the groundwater table;
- Subsurface soil in the area of the suspected dry well does not represent a significant source of chlorinated VOCs;
- PCB impacted soil in the vicinity of soil boring SB-24 is limited to the immediate vicinity of the boring;
- No evidence of subsurface soil contamination exists in the suspected debris disposal area located in the northeast section of the Site;
- Hackensack River surface water analytical data indicates that the Site has not had an impact on surface water quality with respect to PCBs;
- Hackensack River sediment data indicate that the Site has not had a significant impact on sediment quality with respect to PCBs. Sediments exhibiting concentrations elevated with respect to upgradient background are limited in extent;

- Groundwater flow in both the overburden and bedrock interface regimes is to the northeast;
- It is expected that an upward gradient from the bedrock to the overburden exists across the entire northern half of the Site, due to influences posed by the Hackensack River.
- Upgradient background groundwater data indicate that the TCE and to a significant extent the 1,2-DCE is related to an off-site source;
- Overburden groundwater impacted by petroleum constituents is limited to the three wells, MW-2, MW-3 and MW-4, located immediately downgradient of the UST area. MW-3 and MW-4 concentrations have decreased. Groundwater from monitoring wells EXW-4 and EXW-5 at the downgradient Site boundary has not been impacted by BTEX. However, groundwater flow rates indicate that BTEX compounds may not have reached these locations;
- Bedrock interface groundwater monitoring wells at the upgradient Site boundary and the eastern and central section of the Site exhibit elevated concentrations of chlorinated VOCs. The 1,1,1-TCA and associated degradation products appear Site related; and
- The fish and wildlife criteria specific analysis indicates that Hackensack River sediment concentrations, at a limited number of locations, exhibit concentrations that exceed the PCB sediment criteria screening value of 0.042 mg/kg. However, the available data indicate that the areal extent of impacted sediments is limited and therefore excavation/remediation of the sediments is not warranted.

3.0 REMEDIAL PLAN

The remedial alternative selected for the Site consists of the excavation and off-site disposal of contaminated soil in excess of the NYSDEC recommended cleanup levels. As detailed below and in the QAPjP, soils in an area that contain elevated BTEX concentrations (*i.e.*, in excess of 0.06 mg/Kg benzene and 1.2 mg/Kg xylene) will be excavated and thermally treated off-site at an appropriate, permitted facility. In the three PCB areas, soils in excess of 10 mg/Kg PCB will be excavated and disposed of off-site in an appropriate, permitted facility. Near-surface soils[1] in excess of 1 mg/Kg PCBs but less than 10 mg/Kg will be excavated and temporarily stockpiled for re-use as backfill of the deeper portions of the excavations. The treated BTEX soil will be returned to the facility and used as backfill in the BTEX excavation. The treatment facility will provide analytical documentation that the soils meet the NYSDEC Technical and Administrative Guidance Memorandum HWR-94-4046 (January 24, 1994) for benzene (60 ug/kg) and xylenes (1,200 ug/kg total xylenes).

Analysis of soil samples by immunoassay is outlined in Section 3.2.2 of the QAPjP. The PCB immunoassay test kit cutoff concentrations outlined below have been calculated by multiplying the required site action level by the test kit's reactivity factor, an estimated extraction recovery factor, an estimated analytical confidence factor and an estimated percent solids value for the soils (also outlined in Section 3.2.2 of the QAPjP). Excavated soils from the three PCB areas will be screened on-Site using PCB-specific immunoassay test kits and handled as follows:

- **Test kit results greater than 5 mg/Kg PCBs**

  Soil will be excavated and loaded directly into over the road haul trucks and transported to the disposal facility.

- **Test kit results less than 5 mg/Kg but greater than 0.5 mg/Kg PCBs**
  Soil will either:

  A) Be left in place and sampled for PCBs. Upon receipt of confirmatory PCB results less than 10 mg/Kg, the area will be temporarily secured pending placement of a minimum one foot final cover during closure and restoration; or

  B) Be excavated and stockpiled in individual stockpiles no larger than 20 cubic yards and sampled for PCBs. Upon receipt of confirmatory PCB results less than 10 mg/Kg, soils will be released for use as deep backfill on the site during closure.

[1] For the purpose of this work plan, near-surface soils are defined as those materials found between 0 and 1 foot below the current ground surface.

- **Test kit results less than 0.5 mg/Kg PCBs**

  Soils will be left in place and sampled for PCBs. Upon receipt of confirmatory PCB results less than 1 mg/Kg, the area will be considered clean.

To direct and define the limit of excavation for the BTEX area, on-site analysis of samples collected from the excavation will be conducted for benzene and xylene using a portable gas chromatograph (GC). To direct and define the limit of excavation for the three PCB areas, on-site analysis of samples collected from the excavations will be conducted using PCB-specific immunoassay test kits. When the GC and/or test kit results indicate that the contaminated soils have been removed, final post-excavation samples will be collected from the base and sides of an excavation and analyzed by the SCI Lab Albany, Inc. analytical laboratory to confirm the results of the on-site testing prior to backfilling the excavation.

Following the initial excavation at each location, a preliminary determination of whether additional excavation is necessary will be made by on-site analysis of samples collected from the base and side walls of the excavation. If the results of one or more of the preliminary samples indicate that concentrations in the excavation are likely to exceed the cleanup levels, additional soil will be excavated as directed by the Rust on-site representative. The additional excavation and on-site testing will be repeated as necessary until the results indicate that the clean-up levels are likely to have been achieved. Prior to backfilling, final confirmation that clean-up levels have been achieved will be sought by collection and laboratory analysis of post-excavation samples in accordance with Section 3.4.1 of this Work Plan and Section 3.3 of the QAPjP. An as built drawing showing the surveyed areal extent of excavations, elevation of the bottom of the excavations and locations of post-excavation samples will be provided in the certification report.

Perimeter and work area air monitoring stations will be established prior to performing any intrusive activity that would result in soil disturbance of any kind, whether in the work zones or support areas. This air monitoring program will be implemented in order to evaluate and mitigate potential public exposure to airborne contaminants during the remedial action.

During the excavation activities in the BTEX area, continuous air monitoring shall be conducted in the immediate work zone around the excavation using a photoionization detector (PID). In addition, air monitoring around the work zone perimeter shall also be periodically conducted with the PID. During the remedial activities in the PCB areas, a perimeter air monitoring program will be conducted to evaluate and mitigate potential public exposure to airborne PCBs and potentially contaminated particulates. These air monitoring programs will be coordinated with the Rust HASP.

3.1 Site Preparation

Site access and traffic paths will be clearly marked by the Contractor as directed by Rust's on-Site representative. Site access for remedial work will be via the gate immediately east of the Service Building. A second gate is located immediately to the west of the Service Building and will be used by ORU and building tenants to provide access during the remedial work. The Site is restricted from public access by permanent chain link fencing. Access to the excavation areas on Site will be restricted by the use of high-visibility fencing, caution tape and/or barricades, as necessary.

The locations of the former soil sampling points will be located and marked. If required by the disposal facility, representative soil samples will be collected from areas of previously identified contamination, analyzed and submitted with waste profiles to the disposal facility for evaluation and acceptance prior to commencing excavation activity. Rust will mark the areas to be excavated with marking paint and subdivide the areas into smaller areas based upon the expected depth of the final excavation.

Prior to commencing any intrusive activities in the three PCB areas on-Site the air monitoring program will be implemented as specified in Section 4.0 of this Plan.

Silt fence, haybales, and other erosion control devices as needed will be installed between the Site and the Hackensack River as shown on the Drawings. Portions of the Site fencing will be temporarily removed, and alternate security barricades will be installed along the river.

Prior to beginning work on site, a temporary water treatment system will be set up by the Contractor. The treatment system will consist of a flocculent tank, settling tank, and pressure filter to remove suspended solids from the water and carbon adsorbers for organic chemical removal. Discharge conditions and sampling requirements are attached to the Specifications and are discussed in Section 3.2.

Prior to commencement of excavation in the BTEX Area, a culvert well will be installed and initial dewatering operations will be completed. The treatment system will be utilized as necessary during the remediation to treat dewatering effluent and run-off water, if any, from active excavation faces.

3.2 Water Treatment System and Discharge Criteria

Prior to beginning work on site, a temporary water treatment system will be set up by the Contractor. The treatment system will consist of a flocculent tank, settling tank, and pressure filter to remove suspended solids from the water and carbon adsorbers for organic chemical removal.

Water from the treatment system will be discharged to the Hackensack River downstream of the Nyack Water Company intake. The discharge limits for the water treatment system are listed below

Effluent Discharge Parameter	Daily Maximum Discharge Limit
Flow	36,000 Gallons Per Day
pH (range)	6.5-8.5 SU

Effluent Discharge Parameter	Daily Maximum Discharge Limit
Oil & Grease	15 mg/l
BOD, 5 Day	5 mg/l
Total Suspended Solids	10 mg/l
Total Dissolved Solids	200 mg/l
Turbidity	5 NTUs
Benzene	0.8 [1] mg/l
Ethylbenzene	5.00 ug/l
Toluene	5.00 ug/l
Xylene (total)	5.00 ug/l
Trichloroethene	3.00 ug/l
1,1,1-Trichloroethane	5.00 ug/l
PCBs (Each Aroclor)	0.065 [1,2] ug/l

Note:

- [1] Discharge limit is set at the Practical Quantitation Limit. Actual surface effluent standard limitation is below this limit.
- [2] The discharge must be monitored for PCBs using USEPA Method 608. The laboratory will make all attempts to achieve a minimum detection level (MDL) of 0.065 ug/l
- Samples will be grab samples
- The discharge rate will not exceed the effective treatment system capacity. All monitoring data, engineering submissions and modification requests will be submitted to Mr. Ramanand Pergadia, NYSDEC Region 3.

During the initial treatment of water, the effluent will be stored in a fractionation tank. Prior to discharge the water will be sampled and analyzed for the effluent discharge parameters listed above to ensure the effectiveness of the treatment system and that all parameter concentrations are below the discharge limits. Following confirmation of the treatment system operation, the treatment system will be discharged directly to the Hackensack River. A sample will be collected weekly to monitor treatment system operation. A one week turnaround time will be required. If subsequent discharge analytical data indicate that parameter concentrations are above the discharge limit, the treatment system will be modified.

3.3 Soil Excavation Plan

The perimeter of each excavation will be secured with high visibility fencing or barricades. Transporters will be loaded on-site, as close as practical to the area being excavated (or adjacent to stockpiled soil designated for off-site disposal). Polyethylene sheeting will be placed on the ground, adjacent to the transporter body, on the side being loaded by the excavator. It is anticipated that the soil excavation will proceed as outlined below.

Excavation will initially begin in the BTEX area by excavation of trenches to evaluate subsurface conditions with respect to the quantity of groundwater and install dewatering points. Additionally, test pits will be excavated and samples collected and analyzed to meet the disposal facility permit requirements.

Excavation will begin in the Eastern PCB Area. Soil from the Eastern PCB Area will be sampled and managed according to the protocol described in Section 3.0. Soils stockpiled for later use as fill will be temporarily placed in the Northern PCB Area. Excavation of the Eastern PCB Area will proceed until the clean-up objectives are attained or until physical barriers prevent further excavation. Upon receipt of confirmatory analytical data, backfill placement and paving of the Eastern Area will be completed.

Following excavation in the eastern PCB area, soils with PCB concentrations at or above 50 ppm will be removed. This soil will be transported to CWM Chemical Services Model City facility for disposal as a TSCA waste. Samples will be collected and submitted to a laboratory to document that soils with PCB concentrations at or above 50 ppm have been removed from the excavations.
If evidence of BTEX contamination exists in any of the PCB soils that are proposed to remain on site, characterization of the soils relative to BTEX clean-up criteria will be performed as described below. One or more permitted treatment or disposal facilities may be selected, based on the characteristics of the material being disposed of, distance from the site, and ability to accommodate anticipated volumes.

Upon excavation of PCB soils above 50 ppm, excavation will begin in the BTEX Area. Excavation of the BTEX area will begin on the western and southern sides of the area. As portions of the excavation are verified to be "clean," soils stockpiled from excavation of the Eastern PCB Area will be placed as backfill. Excavation of the BTEX Area will proceed until the clean-up objectives are attained or until physical barriers prevent further excavation.

Upon completion of the BTEX soils removal, excavation will begin in the Northern PCB Area. Soil from the Northern PCB Area will be sampled and managed according to the protocol described in Section 3.0. Soils being tested for use as deep backfill, will be temporarily stockpiled as described in the Specifications. Upon receipt of confirmatory analytical data for the temporary stockpiles, the soil will be placed as backfill in the former BTEX area. Excavation of the Northern PCB Area will proceed until the clean-up objectives are attained or until physical barriers prevent further excavation.

3.4 Management of Excavated Soil

All excavated material will be stored on-site in accordance with 40 CFR 761.65. The size of the Site significantly limits the amount of material which may be stockpiled on-site, however. The material will be stockpiled on polyethylene sheeting in pre-designated locations, attempting to avoid areas where soils will need to be moved to allow later remedial excavation. The Contractor will be responsible for covering the stockpiles with polyethylene sheeting to prevent rain infiltration and run-off.

Excavated material with PCB concentrations below 10 mg/Kg, as determined by on-Site testing with PCB-specific immunoassay test kits, will be temporarily stored in individual stockpiles no larger than 20 cubic yards. Each stockpile will be sampled and tested by the designated analytical laboratory to confirm that the PCB concentration is less than 10 mg/Kg. Five representative samples will be collected from throughout the stockpile, composited and submitted to the analytical laboratory for analysis by USEPA SW-846 Method 8082, modified to include dual column confirmation. After the results of this confirmation sampling are available, stockpiles with PCB concentrations less than 10 mg/Kg may be combined into larger stockpiles if additional space is required.

All stockpiled material requiring off-site disposal will be loaded onto permitted transporters lined with polyethylene sheeting. If required, a hazardous waste manifest will be completed and will accompany each truck load of material to the disposal facility.

3.5 Soil Sampling and Analysis

All sampling will be conducted in accordance with procedures specified in the QAPjP. Unless otherwise specified, all samples will be collected and analyzed as individual, uncomposited samples.

3.5.1 Post Excavation Sampling

BTEX

After soil is removed to the appropriate depth as outlined in the Work Plan, post-excavation samples will be collected from the base of each excavation using an approximately 50' x 50' square sampling grid. Soil samples will not be collected when bedrock or extremely large boulders cover the base of an excavation. Post-excavation samples will also be collected from the walls of the excavation. A side wall sample will be collected approximately every 50 lineal feet along excavation walls halfway between the ground surface and the base of the excavation. In excavations deeper than 5 feet, two side wall samples will be collected approximately every 50 lineal feet along excavation walls, one halfway between the ground surface and the base of the excavation and the other just above the base of the excavation.

PCBs

After soil is removed to the appropriate depth as outlined in the Work Plan, post-excavation samples will be collected from the base of each excavation using an approximately 50' x 50' square sampling grid. Soil samples will not be collected when bedrock or extremely large boulders cover the base of an excavation. Post-excavation samples will also be collected from the walls of the excavation. To document the removal of soils with PCB concentrations above 1 mg/Kg in the 0 to 1 foot depth, a side wall sample will be collected approximately every 50 lineal feet along all excavation walls from the interval between 0-1 foot below the ground surface. To document the removal of PCB soils above 10 mg/Kg below 1 foot, a side wall sample will be collected approximately every 50 lineal feet along excavation walls, halfway between the interval between 1 foot below the ground surface and the base of the excavation. In excavations deeper than 5 feet, two side wall samples will be collected approximately every 50 lineal feet along excavation walls, one halfway between the interval between 1 foot below the ground surface and the base of the excavation and the other just above the base of the excavation.

3.5.2 On-site Analysis

To direct and define the limit of excavation, on-site analysis of samples collected from the excavations will be conducted for BTEX using a portable gas chromatograph (GC). When the GC results indicate that the contaminated soils have been removed and the excavation is "clean," final post-excavation samples will be submitted, under proper chain-of-custody, to an analytical laboratory for benzene and xylene analysis by USEPA SW-846 Method 8021.

If the post-excavation sample results are below the specified cleanup levels of 0.06 mg/Kg benzene and 1.2 mg/Kg xylene, the area corresponding to the post-excavation sample locations will be designated for backfill. If the post-excavation sample results exceed the applicable cleanup levels additional excavation will be performed, if possible, in an effort to attain the cleanup level. If a sample exceeds the clean-up level for benzene but not for xylene, the sample will be extracted in accordance with EPA Method 1311 (Toxicity Characteristic Leaching Procedure) and analyzed for benzene. If the extract analysis exhibits less than 0.7 ug/L of benzene the post-excavation sample locations will be designated for backfill. If the TCLP analysis exhibits more than 0.7 ug/L of benzene additional excavation will be performed, if possible, in an effort to attain the cleanup level.

To determine if further excavation is necessary, excavation samples will be analyzed for PCBs using the Ohmicron RaPID Assay® system. This assay kit is based on immunoassay technology and provides semi-quantitative PCB results in a timely manner. The assay kit antibody binds with differing affinity to the different Aroclors. Aroclors 1254 and 1260 react most strongly to the system, while Aroclors 1242 and 1248 give a lesser, although still significant, response to the system. Historically, the PCBs detected on the Site have been identified as Aroclors 1248 and 1254. The assay kit has been calibrated with Aroclor 1254, and the reactivity factor for Aroclor 1248 is 0.85.

As detailed in the QAPjP, the more conservative factor of 0.85 has been used in determining the cutoff concentration for the test kit analyses

3.6 Fugitive Dust Suppression

Real-time monitoring of dust will be performed during soil excavation and handling activity in accordance with Section 4.1. The Contractor will be required to maintain watering equipment on the site. In the event that visible emissions of dust are observed, the Contractor will be required to apply a water spray for dust suppression to the source of the dust. In the event that the action level is reached (150 ug/m^3 and 100 ug/m^3 above background level), or if dust is observed leaving the Site, additional dust suppression techniques will be immediately employed. One or more of the following additional dust suppression techniques will be employed:

- Applying water on haul roads
- Wetting equipment and excavation faces
- Spraying water on buckets during excavation and dumping
- Hauling materials on-site in properly tarped containers
- Restricting vehicle speeds
- Covering excavated areas and material after excavation activity ceases
- Reducing the excavation size

Atomizing water sprays may be used to prevent overly wet conditions. Given the relatively small size of the Site and the resulting ease of keeping excavated areas moist, it is expected that these dust suppression measures will suffice to prevent fugitive dust from exceeding the specified action levels. If the dust suppression techniques do not lower particulates to an acceptable level, or if extreme wind conditions occur, work will be suspended until appropriate corrective measures are approved or the extreme wind conditions subside.

3.7 Backfill and Site Restoration

Excavated areas will be backfilled only after analysis of post-excavation samples by the designated analytical laboratory indicates that the cleanup objectives have been attained. Excavated soil will be designated for use on-Site as backfill only after analysis of samples by the designated analytical laboratory indicates that the concentration of PCBs is less than 10 mg/Kg.

Backfill material will consist of a mixture of clean fill material and potentially the BTEX soil that has been thermally treated. If the thermally treated BTEX soil is used as backfill, a sample will be collected every 500 cubic yards and analyzed for benzene and xylene to document that concentrations are below the NYSDEC Recommended Soil Cleanup Objectives (RSCOs) in TAGM 4046.

The thermally treated BTEX soils will not be placed in the excavation until confirmation that benzene and xylene concentrations are below the TAGM 4046 RSCOs. The BTEX treated soil will be temporarily stockpiled on site until the clean areas in the excavation can be backfilled. No area that has not been documented as clean will be backfilled with any material. The BTEX soil will not be used as backfill within one foot of the original grade. One foot of clean fill will be used to bring the excavation to final grade. Additionally, structural fill and asphalt pavement (approximately 16.5 inches total) will be placed across the top of the original grade.

Following completion off the final area of excavation, site restoration and paving will be performed as described in the Specifications and Drawings (Appendix C). Backfill will generally be placed to follow the original site grades and to promote drainage.

Security fencing around the site will be replaced. After the site has been sufficiently restored to prevent erosion, the erosion control structures will be removed and disposed of.

3.8 Transporter and Equipment Decontamination

No vehicles will leave the Site without first undergoing decontamination in the designated decontamination area. Transporter vehicles and excavating equipment will be decontaminated on-site, in a pre-designated Decontamination Area, before leaving the Site. After loading, the transporter will proceed to the Decontamination Area where its body, wheels and tires will be cleaned to remove loose, potentially contaminated soil particles. The transporter will then proceed to a designated area on the paving immediately adjacent to the Site for final inspection. Any loose, potentially contaminated material adhering to the tires will be removed by brushing and returned to the stockpiled material on-site.

Decontamination of excavating or other earth moving equipment will also be performed on-site in the Decontamination Area by brushing the surfaces to remove potentially contaminated soil particles. Equipment will be decontaminated 1) prior to exiting the Site and 2) upon completion of excavating and backfilling operations, before placing and grading the top soil cover.

4.0 AIR MONITORING

Perimeter and work area air monitoring stations will be established prior to performing any soil excavating or moving activity that would result in soil disturbance. This air monitoring program will be implemented in order to evaluate and mitigate potential public exposure to airborne PCBs and potentially contaminated particulates during the remedial action. The air monitoring program will be coordinated with the Health and Safety Plan (HASP). The HASP provides a proactive plan to monitor and upgrade, as necessary, the fugitive dust control measures used during the remedial action. Perimeter air monitoring will be performed during the excavation, transportation and stockpiling of soils potentially contaminated with PCBs on the Site.

Based upon a review of analytical data and historical knowledge of Site chemistry, the principal hazardous chemicals associated with the soil intrusive work are benzene, xylene and PCBs. The work tasks associated with the excavation, transportation and stockpiling of soils have the potential to disperse PCB contaminated particulates. Of possible concern is the exposure to nearby residents, although due to the location of the Site, the nature of the soils being handled, and dust suppression measures that will be employed, it appears that the potential to impact the surrounding community is minimal.

Total particulate emissions will be monitored using real-time instrumentation, and laboratory analyses will be used to measure the total PCB concentration at the perimeter of the Site if the particulate emissions exceed allowable levels. The advantage of real-time monitoring is that it enables detection and control of emissions as they are generated. The perimeter air monitoring program provides an ambient air monitoring approach to assess and control the potential off-Site emissions during these activities. As described below, air monitoring for PCBs will be performed continuously during Site activities at three (3) different locations around the perimeter of the Site.

At the completion of soil intrusive activities, the raw data will be tabulated and reviewed by an industrial hygienist. A brief summary report detailing the methods, results and a discussion of the data will be prepared.

4.1 Total Particulate Emissions

Particulate emissions will be monitored and controlled in accordance with NYSDEC TAGM HWR-89-4031 "Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites." The purpose of the monitoring will be to aid in preventing the off-site migration of contaminated soil and to protect both on-site personnel from high levels of dust and the public around the site from exposure to any dust. The particulate monitoring device will be a MIE personalDataRAM (pDR), a MIE Miniram Model PDM-3 Particulate Monitor, or equivalent. These devices measure real-time concentrations of total dust (all particle sizes), including the respirable (<10 micron) fraction.

The action level will be established at 150 ug/m^3 total dust integrated over a period of 15 minutes. Because the respirable fraction of dust is a subset of the total dust measured by the pDR and

Miniram, this action level is more conservative (*i.e.*, more stringent) than the 150 ug/m^3 respirable dust action level specified in TAGM HWR-89-4031. If particulate levels are detected in excess of 150 ug/m^3, the upwind background level will be measured immediately. If the working site particulate measurement is greater than 100 ug/m^3 above background, or if dust is observed leaving the Site, additional dust suppression techniques (Section 3.4) will be implemented to reduce the generation of fugitive dust and corrective action will be taken to protect site personnel and reduce the potential for contaminant migration.

Based on a conservative, maximum PCB concentration of 120 mg/Kg in Site soils, the Site action level for total particulates based on PCB content would be 10 mg/m^3 (see QAPjP for detailed derivation). This level is significantly higher (*i.e.*, less stringent) than the standard of 150 ug/m^3 for uncontaminated fugitive dust.

The Site Safety Officer (SSO) will use a Miniram as a mobile air sampling station to monitor key locations relating to the work including the:

- source (within work area exclusion zone);
- work area exclusion zone perimeter;
- the Site perimeter; and
- other locations which may become necessary to monitor based upon the SSO's judgement.

The sampling locations for real-time air monitoring will include all of the sampling locations for continuous air monitoring. During the excavation activities in the BTEX area, continuous air monitoring shall be conducted in the immediate work zone around the excavation using a photoionization detector (PID) equipped with a 10.2 eV or 11.7 eV lamp (*e.g.*, the HNu PI-101). In addition, air monitoring around the work zone perimeter shall also be periodically conducted with the PID. This air monitoring will be performed continuously throughout excavation activities in the BTEX area. In the event that the action level of continuous sustained readings of 5 ppm above background in the breathing zone is exceeded at the perimeter, the excavation work will be stopped and appropriate work practices and procedures will be employed to prevent continued elevated measurements at the work zone perimeter.

Particulate monitoring consists of a 15 minute time-weighted average for each measurement. Particulate monitoring will be conducted at each of the perimeter stations at a frequency of at least one measurement per hour during field activities.

The SSO will also be responsible for recording the general weather conditions in a field log book. An on-site meteorological station will not be utilized during the monitoring program. However, certain data will be recorded at the initiation and completion of each sampling event to identify the general weather conditions. Data to be collected will include rainfall, temperature, cloud cover, relative humidity, wind speed and wind direction. These observations will be recorded every hour, along with the Miniram readings at each of the Site perimeter sampling locations. A wind sock will be installed on the site so that the prevailing wind direction can be monitored throughout the day. The wind direction will be recorded each time air monitoring sampling occurs.

4.2 PCB Concentrations at Perimeter of Site

There will be a total of three continuous air monitoring stations, with one located upwind of intrusive activities, one downwind, and one permanent location along the southern fence line east of the Service Building. The actual number of samples analyzed will be based upon site conditions. No samples will be analyzed unless there is a particulate monitoring exceedence, as defined in Section 2.4.3 of the QAPjP. The upwind air sampling media will be analyzed by the laboratory only if PCBs are detected in the downwind sample(s). Ambient monitoring of PCBs in air will be conducted continuously during each work shift concurrent with the remedial activities, and monitoring will not be implemented on days when there are no soil disturbing activities.

Representative air samples will be collected for PCB analysis in accordance with either NYSDOH Method 311-I or the sampling method outlined in NIOSH Method 5503 (issued 2/15/84 and revised 8/15/87). A flow rate of approximately 0.2 L/min. will be used, and each sample will be collected daily over the entire period while soil intrusive activities are occurring at each of the fixed sampling points. These measurements will represent the potential community exposure during active Site conditions, and samples will be analyzed using an expedited turnaround time of 24 hours.

The actual number of samples analyzed will be based upon Site conditions. The upwind air sampling media will be analyzed by the laboratory only if PCBs are detected in the downwind sample(s). The precision of the monitoring data will be evaluated by providing field duplicate samples for laboratory analysis at the rate of one field duplicate for every twenty samples collected (a rate of 5% of samples collected). A field blank for each type of media used will be analyzed for each day that sampling is performed.

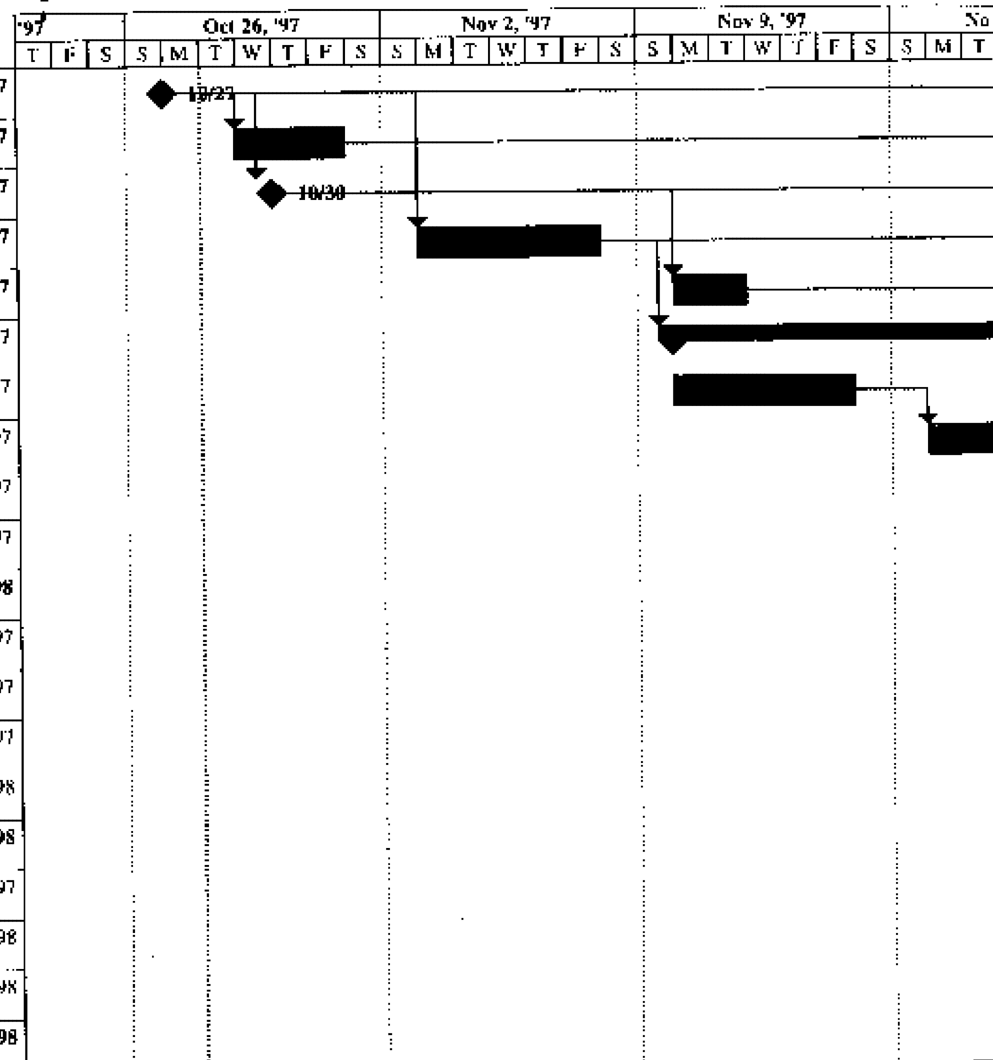
Ambient monitoring of PCBs in air will be conducted continuously during each work shift concurrent with the remedial activities, and monitoring will not be implemented on days when there are no soil disturbing activities.

5.0 SCHEDULE

The schedule for the remediation is presented in Figure 3.0. Contractor mobilization to the Site will be on November 3, 1997 at which time trenching/dewatering in the BTEX area and excavation in the Eastern PCB area will begin. Target completion date is January 9, 1998. This will include all phases except pavement of the Site. The Eastern PCB area will be paved in the fall of 1997. The remainder of the Site will be paved in the spring of 1998 when the asphalt plants re-open.

Figure 2

ID	Task Name	Duration	Start	Finish
1	**Project Initiation/Rust Site Rep. On-Site**	**0d**	**10/27/97**	**10/27/97**
2	**Rust Mobilization**	**3d**	**10/29/97**	**10/31/97**
3	**On Site Pre-Construction Meeting**	**0d**	**10/30/97**	**10/30/97**
4	**Contractor Mobilization**	**5d**	**11/3/97**	**11/7/97**
5	**Test trench for dewatering**	**2d**	**11/10/97**	**11/11/97**
6	**Eastern PCB Area**	**15d**	**11/10/97**	**12/3/97**
7	Excavate impacted soils based on test kits	5d	11/10/97	11/14/97
8	Lab analysis for post-excavation samples	2d	11/17/97	11/18/97
9	Complete excavation backfill and compaction	3d	11/19/97	11/21/97
10	Place asphalt base layer and pave entire area	5d	11/24/97	12/3/97
11	**BTEX Area**	**27d**	**11/24/97**	**1/9/98**
12	Excavate/install shoring along building	3d	11/24/97	12/1/97
13	Remove tank	1d	12/2/97	12/2/97
14	Complete excavation of impacted soil	12d	12/3/97	12/18/97
15	Complete excavation backfill and compaction	11d	12/19/97	1/9/98
16	**Northern PCB Area**	**10d**	**12/19/97**	**1/8/98**
17	Excavate impacted soils based on test kits	5d	12/19/97	12/30/97
18	Lab analysis for post-excavation samples	2d	12/31/97	1/5/98
19	Complete excavation backfill and compaction	3d	1/6/98	1/8/98
20	**Target Completion Date for Project**	**0d**	**1/9/98**	**1/9/98**



Project: ORU/West Nyack
Date: 10/26/97

Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress

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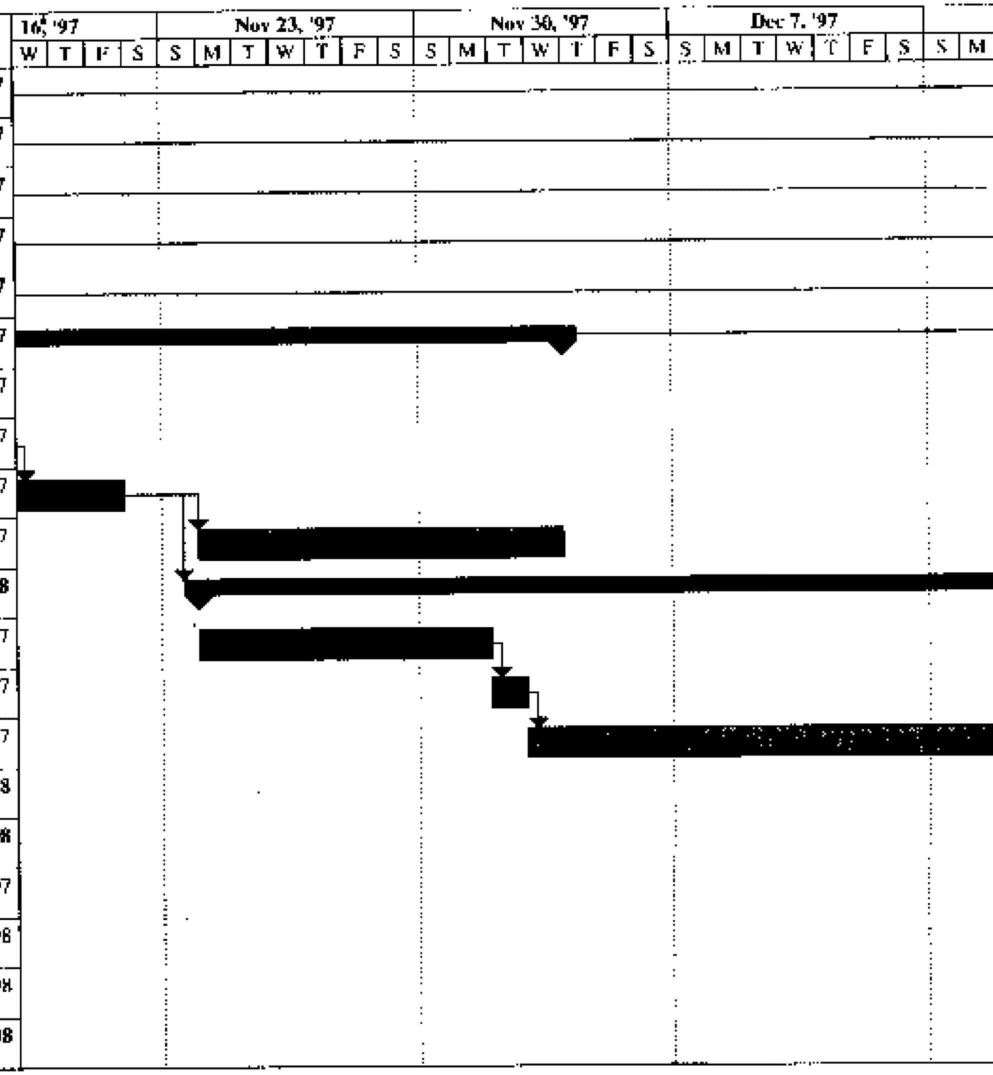
Figure 2

ID	Task Name	Duration	Start	Finish
1	**Project Initiation/Rust Site Rep. On-Site**	0d	10/27/97	10/27/97
2	**Rust Mobilization**	3d	10/29/97	10/31/97
3	**On Site Pre-Construction Meeting**	0d	10/30/97	10/30/97
4	**Contractor Mobilization**	5d	11/3/97	11/7/97
5	**Test trench for dewatering**	2d	11/10/97	11/11/97
6	**Eastern PCB Area**	15d	11/10/97	12/3/97
7	Excavate impacted soils based on test kits	5d	11/10/97	11/14/97
8	Lab analysis for post-excavation samples	2d	11/17/97	11/18/97
9	Complete excavation backfill and compaction	3d	11/19/97	11/21/97
10	Place asphalt base layer and pave entire area	5d	11/24/97	12/3/97
11	**BTEX Area**	27d	11/24/97	1/9/98
12	Excavate/install shoring along building	3d	11/24/97	12/1/97
13	Remove tank	1d	12/2/97	12/2/97
14	Complete excavation of impacted soil	12d	12/3/97	12/18/97
15	Complete excavation backfill and compaction	11d	12/19/97	1/9/98
16	**Northern PCB Area**	10d	12/19/97	1/8/98
17	Excavate impacted soils based on test kits	5d	12/19/97	12/30/97
18	Lab analysis for post-excavation samples	2d	12/31/97	1/5/98
19	Complete excavation backfill and compaction	3d	1/6/98	1/8/98
20	**Target Completion Date for Project**	0d	1/9/98	1/9/98



Project: ORU/West Nyack
Date: 10/28/97

Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress

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Figure 2

ID	Task Name	Duration	Start	Finish
1	**Project Initiation/Rust Site Rep. On-Site**	0d	10/27/97	10/27/97
2	**Rust Mobilization**	3d	10/29/97	10/31/97
3	**On Site Pre-Construction Meeting**	0d	10/30/97	10/30/97
4	**Contractor Mobilization**	5d	11/3/97	11/7/97
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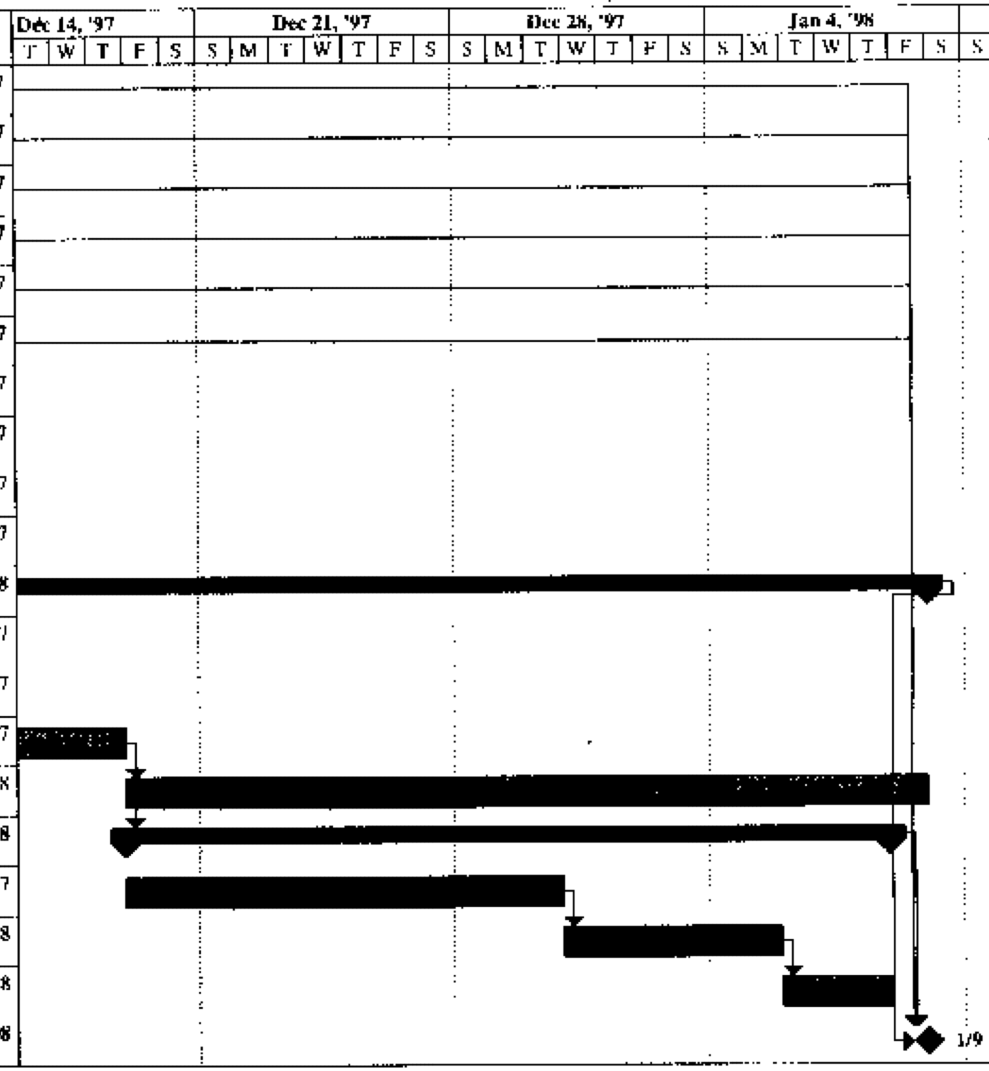
12	Excavate/install shoring along building	3d	11/24/97	12/1/97
13	Remove tank	1d	12/2/97	12/2/97
14	Complete excavation of impacted soil	12d	12/3/97	12/18/97
15	Complete excavation backfill and compaction	11d	12/19/97	1/9/98
16	**Northern PCB Area**	10d	12/19/97	1/8/98
17	Excavate impacted soils based on test kits	5d	12/19/97	12/30/97
18	Lab analysis for post-excavation samples	2d	12/31/97	1/5/98
19	Complete excavation backfill and compaction	3d	1/6/98	1/8/98
20	**Target Completion Date for Project**	0d	1/9/98	1/9/98



Project: ORU/West Nyack
Date: 10/28/97

Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress

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6.0 CITIZEN PARTICIPATION PLAN

ORU's community relations personnel will contact the local residents to inform them of the upcoming remediation. The local residents will be informed of the anticipated start and completion dates as well as the general scope of the remediation. ORU will also notify their employees and building tenants at the site. Following completion of the remediation, ORU will prepare a fact sheet detailing the activities associated with the remediation. The fact sheet will be distributed to the local residents, employees and building tenants and the document repositories. Additionally, the fact sheet will be submitted to the complete contact list that was included in Appendix B of the Remedial Investigation/Feasability Study Citizen Participation Plan (October 31, 1994)

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN

Quality Assurance Project Plan

Orange & Rockland Utilities, Inc. West Nyack, New York Inactive Hazardous Waste Site (ID#: 3-44-014)

Prepared for:

Orange & Rockland Utilities, Inc.
One Blue Hill Plaza
Pearl River, New York 10965

Prepared by:

Rust Environment &
Infrastructure
12 Metro Park Road
Albany, New York 12205

August, 1997

Rust Environment & Infrastructure

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LIST OF ATTACHMENTS

ATTACHMENT A

APPENDICES

1.0 INTRODUCTION

1.1 Purpose

This Quality Assurance Project Plan (QAPjP) has been prepared by Rust Environment & Infrastructure (Rust) to supplement the Remedial Work Plan for the Orange & Rockland Utilities, Inc. West Nyack, New York Inactive Hazardous Waste Site ID# 3-44-014 (the Site). The overall objective is to identify procedures for sampling, chain-of-custody, laboratory analysis, instrument calibration, data reduction and reporting, internal quality control, audits, preventive maintenance, and corrective action. It presents the field and laboratory quality assurance/quality control (QA/QC) policies and procedures that will be followed during the implementation of this project.

1.2 Overall Sampling Summary

The Work Plan associated with this QAPjP describes the proposed scope of work required to excavate soils in an area that contain elevated concentrations of benzene, toluene, ethylbenzene and xylene (BTEX) associated with a former leaking underground storage tank (UST) and polychlorinated biphenyls (PCBs) in three other areas.

BTEX

After soil is removed to the appropriate depth as outlined in the Work Plan, post-excavation samples will be collected from the base of each excavation using an approximately 50' x 50' square sampling grid. Soil samples will not be collected when bedrock or extremely large boulders cover the base of an excavation. Post-excavation samples will also be collected from the walls of the excavation. A side wall sample will be collected approximately every 50 lineal feet along excavation walls halfway between the ground surface and the base of the excavation. In excavations deeper than 5 feet, two side wall samples will be collected approximately every 50 lineal feet along excavation walls from the interval between the ground surface and the base of the excavation, one halfway between the ground surface and the base of the excavation and the other just above the base of the excavation.

Post-excavation samples will be collected with stainless steel trowels. If the depth of the excavation is 4 feet or more, post-excavation samples will be collected from the bucket of the excavator with stainless steel trowels. These samples will be placed into appropriate labeled sample containers, and packaged in a cooler containing ice.

To direct and define the limit of excavation, on-site analysis of samples collected from the excavations will be conducted for BTEX using a portable gas chromatograph (GC). When the GC results indicate that the contaminated soils have been removed and the excavation is "clean," final post-excavation samples will be submitted, under proper chain-of-custody, to an analytical laboratory for benzene and xylene analysis by USEPA SW-846 Method 8021.

If the post-excavation sample results are below the specified cleanup levels of 60 ug/Kg benzene and 1.2 mg/Kg xylene, the area corresponding to the post-excavation sample locations will be designated for backfill. If the post-excavation sample results exceed the applicable cleanup levels additional excavation will be performed, if possible, in an effort to attain the cleanup level. If a sample exceeds the clean-up level for benzene but not for xylene, the sample will be extracted in accordance with EPA Method 1311 (Toxicity Characteristic Leaching Procedure) and analyzed for benzene. If the extract analysis exhibits less than 0.7 ug/L of benzene the post-excavation sample locations will be designated for backfill. If the TCLP analysis exhibits more than 0.7 ug/L of benzene additional excavation will be performed, if possible, in an effort to attain the cleanup level.

PCBs

After soil is removed to the appropriate depth as outlined in the Work Plan, post-excavation samples will be collected from the base of each excavation using an approximately 50' x 50' square sampling grid. Soil samples will not be collected when bedrock or extremely large boulders cover the base of an excavation. Post-excavation samples will also be collected from the walls of the excavation. To document the removal of soils with PCB concentrations above 1 mg/Kg in the 0 to 1 foot depth, a side wall sample will be collected approximately every 50 lineal feet along all excavation walls from the interval between 0-1 foot below the ground surface. To document the removal of PCB soils above 10 mg/Kg below 1 foot, a side wall sample will be collected approximately every 50 lineal feet along excavation walls, halfway between the interval between 1 foot below the ground surface and the base of the excavation. In excavations deeper than 5 feet, two side wall samples will be collected approximately every 50 lineal feet along excavation walls from the interval between 1 foot below the ground surface and the base of the excavation, one halfway between the interval between 1 foot below the ground surface and the base of the excavation and the other just above the base of the excavation.

Post-excavation samples will be collected with stainless steel trowels. If the depth of the excavation is 4 feet or more, post-excavation samples will be collected from the bucket of the excavator with stainless steel trowels. These samples will be placed into appropriate labeled sample containers, and packaged in a cooler containing ice.

To direct and define the limit of excavation, on-site analysis of samples collected from the excavations will be conducted using PCB-specific immunoassay test kits. When the test kit results indicate that the contaminated soils have been removed and the excavation is "clean," final post-excavation samples will be submitted, under proper chain-of-custody, to an analytical laboratory for analysis by USEPA SW-846 Method 8082 (modified to include dual column confirmation), as appropriate.

If the post-excavation sample results are below the specified cleanup levels of 1 mg/Kg total PCBs for soils within a foot of the original surface and 10 mg/kg total PCBs for soils deeper than a foot then the area corresponding to the post-excavation sample locations will be designated for backfill. If the post-excavation sample results exceed the applicable cleanup levels additional excavation will be performed, if possible, in an effort to attain the cleanup level.

Stockpiles will be sampled and tested by the designated analytical laboratory to confirm that the material is suitable for use as backfill below 1 foot depth. Five representative samples will be collected from throughout the stockpile, composited and submitted to the analytical laboratory for PCB analysis by USEPA SW-846 Method 8082 (modified to include dual column confirmation).

2.0 SAMPLING PROCEDURES

Sampling will be conducted by personnel experienced in conducting sampling of a variety of media. Prior to any sampling event, the personnel responsible for sampling will:

- review the sampling procedures;
- assemble and inspect all field equipment necessary for sample collection;
- note and replace any items that are in short supply or are showing indication of wear;
- contact the laboratory to obtain the appropriate sample containers and preservatives; and
- determine any constraints such as delivery time and confirm the method of sample shipment with the laboratory.

Upon receipt of sampling containers from the laboratory, the containers will be counted and assessed as to their general condition. Containers will be labeled with the sampling point location (except for blind duplicates) and required analysis. The specific sampling procedure is summarized in the following section. Following collection, the sample containers will be placed in a cooler containing enough wet ice and/or ice packs to maintain the temperature at 4°C (± 2°C) and transported to the laboratory for analysis.

2.1 Excavation and Post-Excavation Soil Sampling

Collecting surface soil samples with a stainless steel trowel/spatula is most appropriate for shallow post-excavation confirmation samples to a depth of zero to six inches (0-6") below the exposed soil surface. Stainless steel is preferred to chrome-plated scoops or trowels. The depth to which samples should be collected is dependent on soil excavation conditions. The sampling procedures are detailed below.

Soil Sampling With a Scoop/Trowel

1. After determining the sampling location as described previously in Section 1.2, collect a sample using a dedicated trowel or similar instrument. Any non-dedicated equipment used must be decontaminated between samples as described in Section 2.2.

2. Collect the sample from the top 3 to 6 inches of soil over a horizontal area large enough to produce a sufficient quantity of soil for subsequent laboratory analysis. Record the surface area and depth of the collected sample.

3. Collect approximately 24 ounces of material at each location and place it in a stainless steel bowl or on a clean plastic sheet. Homogenize the material using a limited cone and quarter procedure, which involves continual mixing of the sample into the shape of a cone. Remove large non-analyzable materials (*e.g.*, rocks, twigs, *etc.*) that fall to the base of the cone by gravity. Upon completion of coning, divide the sample into four quarters of equal size, and alternately remove and place equal amounts from each quarter in an appropriate sample container.

4. Tightly cap and clearly label the sample container.

5. Place the sample container on ice in a cooler for transport to the laboratory and complete all chain-of-custody documents as described in Section 4.3 and record sampling information in the field notebook as described in Section 7.1.

6. Decontaminate non-dedicated equipment after use and/or between sample locations as described in Section 2.2.

2.2 Decontamination Procedures

All non-dedicated equipment and tools used to collect samples for chemical analyses (including trowels, spatulas, spoons or scoops) will be decontaminated using the following procedures:

- Non-phosphate detergent wash;
- Tap water rinse;
- Laboratory-grade methanol or isopropanol rinse; and
- Distilled/deionized water rinse.

If equipment is to be stored for future use, allow it to air dry, and then wrap it in aluminum foil (shiny-side out) or seal in plastic bags. Rust personnel will use dedicated, pre-decontaminated stainless steel trowels for the collection of the post-excavation soil samples and for the transfer of the samples into the appropriate sample containers. Dedicated, pre-decontaminated stainless steel bowls or new polyethylene sheeting will be used for homogenizing each soil sample that will be submitted for chemical analyses. Any decontamination fluids generated at the Site will be placed into appropriate receptacles for proper handling and disposal.

2.3 On-Site Analysis

2.3.1 BTEX

To determine if further excavation of BTEX impacted soil is necessary, excavation samples will be analyzed for benzene and xylene using a portable gas chromatograph (GC). Post-excavation sample analysis will be confirmed by sending the samples to an analytical laboratory for analysis by USEPA SW-846 Method 8021 to ensure that the remedial action level has been met prior to backfilling an excavation. The GC analysis procedure is discussed in detail in Section 3.2.1.

2.3.2 PCBs

To determine if further excavation of PCB impacted soil is necessary, excavation samples will be analyzed for PCBs using the Ohmicron RaPID Assay® system. This system is based on immunoassay technology and provides semi-quantitative PCB results in a timely manner. Post-excavation sample analysis will be confirmed by sending the samples to an analytical laboratory for analysis by USEPA SW-846 Method 8082, modified to include dual column confirmation, to ensure that the remedial action level has been met prior to backfilling an excavation. The immunoassay analysis procedure is discussed in detail in Section 3.2.2.

2.4 Air Monitoring

2.4.1 Introduction

Perimeter and work area air monitoring stations will be established prior to performing any intrusive activity that would result in soil disturbance of any kind, whether in the work zones or support areas. This air monitoring program will be implemented in order to evaluate and mitigate potential public exposure to airborne PCBs and potentially contaminated particulates during the remedial action.

The air monitoring program will be coordinated with the Health and Safety Plan (HASP). The HASP provides a proactive plan to monitor and upgrade, as necessary, the fugitive dust control measures used during the remedial action. Perimeter air monitoring will be performed during excavation, transportation and stockpiling of potentially PCB contaminated soils on the Site.

During the excavation activities in the BTEX area, continuous air monitoring shall be conducted in the immediate work zone around the excavation using a photoionization detector (PID) equipped with a 10.2 eV or 11.7 eV lamp (*e.g.*, the HNu PI-101). In addition, air monitoring around the work zone perimeter shall also be periodically conducted with the PID. This air monitoring will be performed continuously throughout excavation activities in the BTEX area. In the event that the action level of continuous sustained readings of 5 ppm above background in the breathing zone is exceeded at the perimeter, the excavation work will be stopped and appropriate work practices and procedures will be employed to prevent continued elevated measurements at the work zone perimeter.

2.4.2 Potential Emissions

This air monitoring program provides an ambient air monitoring approach to assess and control the potential off-site emissions during these activities. Of possible concern is the exposure to nearby residents, although due to the location of the Site, the nature of the soils being handled, and the identified PCB concentrations in the soils it appears that the potential to impact the surrounding community is minimal.

Based upon a review of analytical data and historical knowledge of site chemistry, the principal hazardous chemical associated with the soil intrusive work is PCBs. The work tasks associated with the excavation, transportation and stockpiling of soils have the potential to disperse PCB contaminated particulates. Total particulate emissions will be monitored using real-time instrumentation and laboratory analyses will be used to measure the total PCB concentration at the perimeter of the Site. The advantage of real-time monitoring is that it enables detection and control of emissions as they are generated. Perimeter air monitoring for PCBs will be performed continuously during site activities at three (3) different locations around the perimeter of the Site: One upwind of the site activities, one downwind, and a permanent monitoring station located along the southern fenceline of the Site (east of the building and adjacent to Old Nyack Turnpike).

2.4.3 Particulate Monitoring

Particulate emissions will be monitored and controlled in accordance with NYSDEC TAGM HWR-89-4031 "Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites." The purpose of the particulate monitoring will be to aid in preventing the off-site migration of contaminated soil and to protect both on-site personnel from high levels of dust and the public around the site from exposure to any dust. The particulate monitoring device will be a MIE personalDataRAM (pDR), MIE Miniram Model PDM-3 Particulate Monitor, or equivalent. The pDR is a passive air monitoring device that uses light scattering as its operating principle. As air passes through the detection area, the light intensity is transformed into a voltage proportional to the concentration of particulates. This device measures real-time concentrations of total dust (all particle sizes), including the respirable (<10 micron) fraction.

Based on TAGM HWR-89-4031, the action level will be established at 150 ug/m^3 integrated over a period of 15 minutes. Because the respirable fraction of dust is a subset of the total dust measured by the pDR, this action level is more conservative (*i.e.*, more stringent) than the 150 ug/m^3 respirable dust action level specified in TAGM HWR-89-4031. If particulate levels are detected in excess of 150 ug/m^3, the upwind background level will be measured immediately. If the working site particulate measurement is greater than 100 ug/m^3 above background, or if dust is observed leaving the Site, additional dust suppression techniques (Remedial Work Plan Section 3.4) will be implemented to reduce the generation of fugitive dust and corrective action will be taken to protect site personnel and reduce the potential for contaminant migration.

Currently, the American Conference of Government Industrial Hygienists (ACGIH) recommends a Threshold Limit Value (TLV) Time Weighted Average (TWA) of 0.5 mg/m^3 for Aroclor 1254 and 10 mg/m^3 for total particulates.

To compare the Site action level of 150 ug/m^3 with a potential PCB based action level for total particulates, the ACGIH 8-hour TLV-TWA of 0.5 mg/m^3 for Aroclor 1254 could be used in setting the air monitoring program action limit. The 8-hour TLV-TWA is the time-weighted average concentration for a normal 8-hour workday, to which nearly all workers may be repeatedly exposed, day after day, without adverse health effects. TWAs permit excursions above the TLV, provided they are compensated by equivalent excursions below the TLV-TWA during the day. The amount by which the TLVs may be exceeded for short periods without injury to health depends upon a number of factors, such as the nature of the contaminants, whether the effects are cumulative, and the frequency with which high concentrations can occur.

Using the following information, the maximum concentration of PCB particulates that could potentially be emitted during soil disturbance can be estimated for high PCB areas (*i.e.*, 120 parts per million total PCBs):

- A maximum weighted concentration of approximately 120 mg/kg of PCBs in soil has been identified on-site.
- The ACGIH-TLV-TWA for total particulates is 10 mg/m^3.
- The ACGIH TLV-TWA for Aroclor 1254 is 0.5 mg/m^3.
- The TLV-TWA adjusted by a safety factor of 10 is 0.05 mg/m^3.

First, the maximum weighted concentration of PCBs is converted to a fraction:

$$(120 \text{ mg/kg})/(1 \times 10^6) = 0.00012 \text{ parts PCBs in total particulates.}$$

The resulting quotient is multiplied by the TLV-TWA for total particulate to determine the maximum concentration of PCBs that would be found in a total particulate concentration of 10 mg/m^3:

$$(0.00012 \text{ parts PCBs})(10 \text{ mg/m}^3) = 0.0012 \text{ mg PCBs per m}^3 \text{ of air.}$$

This concentration is not in excess of the adjusted TLV-TWA of 0.05 mg/m^3 for PCB particulates. Therefore, based on the preceding analysis, the PCB based Site action level for total particulates would be 10 mg/m^3. This level is much higher (less stringent) than the standard of 150 ug/m^3 for uncontaminated fugitive dust. Therefore, the Site action level for fugitive dust will be the more conservative level of 150 ug/m^3.

The Site Safety Officer (SSO) will use a Miniram or equivalent as a mobile air sampling station to monitor key locations relating to the work including the:

- source (within work area exclusion zone);
- work area exclusion zone perimeter;
- Site perimeter (as discussed above); and
- other locations which may become necessary to monitor based upon the SSO's judgement.

The sampling locations for real-time air monitoring will be the three sampling locations selected for continuous air monitoring.

Particulate monitoring consists of a 15 minute time-weighted average for each measurement. Particulate monitoring will be conducted at all perimeter stations at a frequency of at least one measurement per hour during field activities.

If at any time the action level is exceeded (*i.e.*, sustained for more than 15 minutes), the Contractor shall cease activities and implement dust suppression techniques (Remedial Work Plan, Section 3.4) before continuing work.

The SSO will also be responsible for recording the general weather conditions in a field log book. An on-site meteorological station will not be utilized during the monitoring program. However, certain data will be recorded at the initiation and completion of each sampling event to identify the general weather conditions. Data to be collected will include rainfall, temperature, cloud cover, relative humidity, wind speed and wind direction. A sling psychrometer will be used to measure temperature and relative humidity, and the other data will be generalized (*e.g.*, light rainfall, 25°C, mostly cloudy, 92% relative humidity, winds 5 to 10 mph from the west). These observations will be recorded every hour, along with the pDR readings at each of the Site perimeter sampling locations. If more detailed weather data is required at a later date, then data will be obtained from the National Weather Service (NWS). A wind sock will be installed on the site so that the prevailing wind direction can be monitored throughout the day. The wind direction will be recorded each time air monitoring sampling occurs.

2.4.4 Reporting

At the completion of soil intrusive activities, the raw data will be tabulated and reviewed by an industrial hygienist. A brief summary report detailing the methods, results and a discussion of the data will be prepared.

3.0 ANALYTICAL PROCEDURES

3.1 Laboratory Selection

Analytical services for this project will be provided by an analytical laboratory, subcontracted by Rust, that has received the appropriate certifications under the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP).

3.2 Monitoring Strategies - On-Site Analysis

3.2.1 On-Site BTEX Analysis

A portable GC equipped with a photoionization detector (PID) and an onboard computer will be used to analyze the samples for benzene and xylene. The GC generates quantitative data specific to each compound by analyzing gaseous samples. After injection into the instrument, the sample flows through a chromatographic column prior to reaching the photoionization detector (PID). The various volatile organic compounds (VOCs) pass through this column at different rates and thus reach the detector at different times relative to the injection time. A record of detector response versus time is obtained during each analysis and the presence of VOCs in the sample is manifested by peaks on the chromatogram.

The GC measures two parameters for each peak observed during the analysis. First, the length of time (known as the retention time) is measured between the initial injection of the sample and the detection of the peak; each VOC has a characteristic retention time by which it is tentatively identified. Second, the system integrates the detector response to measure the area under the peak. The area measured is proportional to the concentration of the compound in the sample. The concentration of each analyte in the sample may then be calculated by direct comparison with the detector response to a standard of known concentration. The GC will be programmed to analyze the samples for benzene, m- & p- xylene (these isomers coelute) and o-xylene.

3.2.2 On-Site PCB Analysis

To analyze soil samples by immunoassay, the contaminant of concern (in this case, PCBs) must first be extracted from the soil matrix. PCB specific antibodies compete with the enzyme conjugate for a limited number of antibody binding sites in the sample extract, and any PCBs or enzyme conjugate which is not bound to the antibody in the tube is washed away. A color reagent is then added that reacts with the enzyme conjugate to produce a color whose intensity is inversely proportional to the concentration of the target analyte in the sample. Differential absorbance of the final assay solution is then measured and converted into final concentration values using a spectrophotometer.

The kit antibody binds with differing affinity to the different Aroclors. Aroclors 1254 and 1260 react most strongly to the system, while Aroclors 1242 and 1248 give a lesser, although still significant, response to the system. Historically, the PCBs detected on site have been identified as Aroclors 1248, 1254 and 1260. The PCB RaPID Assay kit has been calibrated with Aroclor 1254. Aroclors 1254 and 1260 react most strongly in the system, and the reactivity factor for Aroclor 1248 is 0.85.

The more conservative reactivity factor of 0.85 has been used when determining the cutoff concentration used for the test kit analyses as described below:

Optimizing the PCB RaPID Assay System for Detection of Aroclor 1248 at 10 ppm in Soil

Required Action Level	10 ppm	Site *Action Level* for soils greater than 1' below grade.
Reactivity Factor	0.85	The *Reactivity Factor* of the RaPID Assay System to Aroclor 1248 as reported by Ohmicron.
Extraction Recovery Factor	0.85	The *Extraction Recovery Factor* obtained from the RaPID Prep Sample Extraction kit package insert as reported by Ohmicron.
Analytical Confidence Factor	0.80	An *Analytical Confidence Factor* of 0.8 is estimated to yield 96.1% negative results at a PCB concentration of 5 ppm Aroclor 1248 (0.5 x Action Level [10 ppm Aroclor 1248]), yielding a 3.9% "false positive" rate at 5 ppm.
Estimated Percent Solids	0.80	The estimated *Percent Solid* value for the soils.
Cutoff Concentration	5 ppm	(10 ppm) x (0.85) x (0.80) x (0.80) = 5.44 ppm. The *Cutoff Concentration* has been rounded down to 5 ppm to be more conservative.

Optimizing the PCB RaPID Assay System for Detection of Aroclor 1248 at 1 ppm in Soil

Required Action Level	1 ppm	Site *Action Level* for soils greater than 1' below grade.
Reactivity Factor	0.85	The *Reactivity Factor* of the RaPID Assay System to Aroclor 1248 as reported by Ohmicron.
Extraction Recovery Factor	0.85	The *Extraction Recovery Factor* obtained from the RaPID Prep Sample Extraction kit package insert as reported by Ohmicron.
Analytical Confidence Factor	0.80	An *Analytical Confidence Factor* of 0.8 is estimated to yield 96.1% negative results at a PCB concentration of 5 ppm Aroclor 1248 (0.5 x Action Level [10 ppm Aroclor 1248]), yielding a 3.9% "false positive" rate at 5 ppm.
Estimated Percent Solids	0.80	The estimated *Percent Solid* value for the soils.
Cutoff Concentration	0.5 ppm	(1 ppm) x (0.85) x (0.80) x (0.80) = 0.544 ppm. The *Cutoff Concentration* has been rounded down to 5 ppm to be more conservative.

3.3 Monitoring Strategies - Laboratory Analyses

3.3.1 Laboratory BTEX Analysis

As discussed in Section 1.2, once the analysis of excavation samples using the field GC indicate that the excavation is "clean," post-excavation samples will be submitted, under proper chain-of-custody, to an analytical laboratory for benzene and xylene analysis by USEPA SW-846 Method 8021. If the post-excavation sample results are below the specified cleanup levels of 60 ug/Kg benzene and 1.2 mg/Kg xylene the area corresponding to the post-excavation sample locations will be designated for backfill. If the post-excavation sample results exceed the applicable cleanup levels additional excavation will be performed, if possible, in an effort to attain the cleanup level. If a sample exceeds the clean-up level for benzene but not for xylene, the sample will be extracted in accordance with EPA Method 1311 (Toxicity Characteristic Leaching Procedure) and analyzed for benzene. If the extract analysis exhibits less than 0.7 ug/L of benzene the post-excavation sample locations will be designated for backfill. If the TCLP analysis exhibits more than 0.7 ug/L of benzene additional excavation will be performed, if possible, in an effort to attain the cleanup level.

The actual number of samples analyzed will depend upon the extent of the excavation required to remove the contaminated soils. All samples will be submitted with a request for an expedited turnaround time of 24 hours and no excavation will be backfilled until the results of the corresponding post-excavation samples have been reported by the laboratory and the test kit results have been confirmed. In addition to the results reported within 24 hours of sample receipt at the laboratory, NYSDEC Category B deliverables will be required within 30 days of sample receipt at the laboratory.

3.3.2 Laboratory PCB Analysis

As discussed in Section 1.2, once the analysis of excavation samples using PCB-specific immunoassay test kits indicate that the excavation is "clean," post-excavation samples will be submitted, under proper chain-of-custody, to an analytical laboratory for PCB analysis by USEPA SW-846 Method 8082, modified to include dual column confirmation. If the post-excavation sample results are below the cleanup levels of 1 mg/Kg for soils within a foot of the surface and 10 mg/kg for soils deeper than a foot, the area corresponding to the post-excavation sample locations will be designated for backfill. If the post-excavation sample results exceed the applicable cleanup level additional excavation will be performed, if possible, in an effort to attain the cleanup level.

The actual number of samples analyzed will depend upon the extent of the excavation required to remove the contaminated soils. All samples will be submitted with a request for an expedited turnaround time of 24 hours and no excavation will be backfilled until the results of the corresponding post-excavation samples have been reported by the laboratory and the test kit results have been confirmed. In addition to the results reported within 24 hours of sample receipt at the laboratory, NYSDEC Category B deliverables will be required within 30 days of sample receipt at the laboratory.

3.4 Monitoring Strategy - PCBs in Air

Representative air samples will be collected for PCB analysis in appropriate areas in the line of potential contaminant travel in accordance with either NYSDOH Method 311-1 or the sampling method outlined in NIOSH Method 5503 (issued 2/15/84 and revised 8/15/87). A flow rate of approximately 0.2 L/min. will be used, and each sample will be collected daily over the entire period while soil intrusive activities are occurring at each of the fixed sampling points as described above in Section 2.4.2. These measurements will represent the potential community exposure during active site conditions, and samples which require analysis (see below) will be submitted to the laboratory using an expedited turnaround time of 24 hours.

The actual number of samples analyzed will be based upon site conditions. No samples will be analyzed unless there is a particulate monitoring exceedance, as defined in Section 2.4.3 of this QAPjP. The upwind air sampling media will be analyzed by the laboratory only if PCBs are detected in the downwind sample(s). The precision of the monitoring data will be evaluated by providing field duplicate samples for laboratory analysis at the rate of one field duplicate for every twenty samples analyzed (a rate of 5%). A field blank for the type(s) of media used will be collected for each day that sampling is performed and analyzed if the associated samples require analysis.

Ambient monitoring of PCBs in air will be conducted continuously during each work shift concurrent with the remedial activities, and monitoring will not be implemented on days when there are no soil disturbing activities.

4.0 SAMPLE LABELING, HANDLING, AND SHIPPING

4.1 Sample Identification/Labeling

All samples will be assigned a unique identification code consisting of three or four parts. These parts generally consist of the project, sample type, location, and additional identification codes, as needed. Examples of the codes used for each sample type are identified below.

Post-Excavation Soil Samples

Examples: PES-1
PES-2
PES-3
⋮
PES-*n*

Air Samples

Examples: U-*mm/dd*
D-*mm/dd*
R-*mm/dd*

Where the letters U (upwind), D (downwind) and R (residential) represent each of the three (3) sampling locations located around the perimeter of the Site (as discussed previously), and *mm/dd* represents the date the sample was collected.

Quality Assurance/Quality Control Samples

Matrix Spike/Matrix Spike Duplicate Samples - Post-excavation QA/QC will include a matrix spike (MS) and matrix spike duplicate (MSD) sample at a frequency of not less than 5% (one MS/MSD pair per every 20 samples collected). They will receive the following code:

Example: PES-17 MS/MSD

Field Duplicate Samples - Field duplicate samples are sent blind to the laboratory. The sample location where the blind field duplicate was collected is marked both in the field notebook and on the copy of the chain-of-custody record retained by the sampling team (see Attachment A). A blind field duplicate sample will be collected at a frequency of one per every 20 post-excavation samples.

Field Blanks - Field blanks are not required when dedicated sampling equipment is used and therefore will not be collected as part of the excavation and post-excavation soil sampling program. As discussed previously, one (1) field blank will be collected daily as part of the perimeter air monitoring program. If non-dedicated sampling equipment is used in the excavation/post-excavation soil sampling program, field blanks will be analyzed at a frequency of not less than 5% (one field blank per every 20 samples collected). In either case, they receive the following code:

Example: FB-*mm/dd* (where *mm/dd* represents the date the field blank was collected)

All sample containers for the post-excavation sampling program will be labeled prior to sample collection. A non-removable label on which the following information is recorded with a permanent water-proof marker will be affixed to each sample container for shipment to the laboratory:

- project name/location (ORU/West Nyack);
- sample identification code;
- date and time the sample was collected (except for field duplicates);
- type of sample (soil); and
- analysis requested (modified USEPA SW-846 Method 8082).

All sampling media for the perimeter air monitoring program will also be labeled prior to sample collection.

4.2 Containers, Preservation, and Holding Times

All sample containers used will be of traceable quality purchased and supplied by the laboratory. Amber glass containers sealed with teflon-lined lids which are inert with respect to the sampled material will be used to submit the post-excavation samples to the laboratory. Clean, new ziploc bags will be used for the excavation samples which are screened using the immunoassay field test kits. These bags are also inert with respect to the material being sampled and provide an efficient and economical means of collecting the samples used for real-time screening purposes.

The selection of sample containers used to collect the post-excavation samples is based on the following considerations:

- sample matrix;
- analytical methods;
- potential contaminants of concern;
- reactivity of container material with sample; and
- QA/QC requirements.

No chemical preservative is required for soils samples, although the samples will be kept on ice in a cooler at a temperature of 4°C (±2°C). The holding time for the BTEX post-excavation samples which will be sent to the laboratory is 10 days from the verified time of sample receipt (VTSR). The holding time for the PCB post-excavation samples which will be sent to the laboratory is 5 days from the verified time of sample receipt (VTSR) for extraction and 40 days from VTSR for analysis. As noted previously, an expedited turnaround of 24 hours will be requested since no excavation will be backfilled prior to obtaining the analytical results for the post-excavation samples.

4.3 Chain-of-Custody Protocol and Shipping Requirements

A chain-of-custody record will be initiated by Rust upon sample collection (Attachment A) and by the laboratory providing the sample containers. The laboratory record traces the path of the initial sample bottles and preservation at the laboratory to the field for sample collection. The Rust chain of custody is initiated at the point of sample collection and documents their return to the laboratory for analysis.

The Rust Project Manager or designated representative will notify the laboratory of the anticipated schedule of upcoming field sampling activities. This notification will include information concerning the number and type of samples, as well as the anticipated date(s) of shipment of samples to the laboratory.

The laboratory will be responsible for supplying insulated containers (typically coolers) for storing and shipping the samples. Each sample shipping cooler has a unique identification number marked on the outside and inside, and is sealed with two adhesive tags assigned with unique identification numbers assigned by the laboratory. The seal number may be recorded on the chain-of-custody form. Separate numbered seal tags are provided for return shipment.

All sample bottles within each shipping container are individually labeled with an adhesive identification tag provided by the laboratory. In the event that laboratory tags are not available, Rust sample identification tags are used.

Field samplers receiving the sample containers check each cooler for the integrity of the seals. Coolers with both seals broken are returned to the laboratory with the containers unused. Field samplers break the seals and inspect the contents for breakage.

Once the sample containers are filled, they are immediately placed in the cooler with sealed bags of ice ("wet ice") or synthetic ice packs ("blue ice") to maintain the samples at 4°C (±2°C). The field sampler indicates the Client Name, Project Number, Site Location, Sampler, Rust Contact, Laboratory Contact, Lab Identification, Date Report Required, Sample Identification, Date, Time, Sample Matrix, Collection Vessel, Lowering Device, Number of Sample Containers, Preservative and an indication of whether the sample is a Composite or Grab sample in the spaces provided on the appropriate chain-of-custody form for each sample. The Comment column of the chain of custody form is used to record specific considerations associated with sample acquisition, such as the analyses to be performed.

The identification numbers of each cooler shipped are written on the chain-of-custody form and the respective shipping manifest (if applicable). The chain-of-custody forms are signed and placed in a sealed plastic ziploc bag in the cooler. The completed shipping containers are closed, and two paper seals are affixed to the latch and lid. The seals must be broken to open the cooler and if the seals are broken before receipt at the laboratory the possibility of tampering is plainly indicated.

The cooler is shipped to the laboratory via an overnight courier under appropriate chain-of-custody procedures. Whenever possible, the samples will be shipped within 24 hours of collection. Samples will not be shipped later than 48 hours following collection. When the laboratory receives the coolers, it will check the custody seals prior to opening the cooler and sign the chain of custody form following inspection of the cooler's contents, thus accepting custody of the samples.

5.0 DATA QUALITY REQUIREMENTS

5.1 Analytical Methods

The analytical method used to analyze the samples associated with the BTEX post-excavation soil sampling program will be USEPA SW-846 Method 8260. The analytical method used to analyze the samples associated with the PCB post-excavation soil sampling program will be USEPA SW-846 Method 8082, modified to include dual column confirmation, in accordance with the QA/QC guidelines from the NYSDEC ASP (October 1995). The analytical method used to analyze the samples associated with the perimeter air monitoring will be either NYSDOH Method 311-1 or NIOSH Method 5503. The laboratory is responsible for being familiar with these methods and all procedures and deliverables pertaining to New York State analytical work, including specific Category B deliverable requirements outlined in the ASP. All calibration QC criteria from the ASP for CLP analyses must be followed.

5.2 Data Quality Objectives

Excavation sampling for BTEX will be conducted using a field GC to determine if further excavation is necessary to reach the cleanup goals of the project: 60 ug/Kg for benzene and 1.2 mg/Kg for xylene. If the field GC indicates that these goals have been met, post-excavation samples will be submitted to the analytical laboratory for benzene and xylene analysis by USEPA SW-846 Method 8260.

Excavation sampling for PCBs will be conducted using immunoassay field test kits to determine if further excavation is necessary to reach the cleanup goals of the project: 1 mg/Kg for soils less than 1 foot below grade and 10 mg/Kg for soils greater than 1 foot below grade. If the field test kits indicate that these goals have been met, post-excavation samples will be submitted to the analytical laboratory for PCB analysis by modified USEPA SW-846 Method 8082.

Data quality objectives (DQO) for data measurement are generally defined in terms of six parameters: precision, accuracy, representativeness, comparability and completeness (PARCC). The following DQO's have been established to ensure that the data collected as part of this program are sufficient and of adequate quality for their intended uses. Data collected and analyzed in conformance with the DQO process described in this Quality Assurance Manual are used to assess the uncertainty associated with decisions related to the Site.

5.2.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. To maximize precision, established sampling and analytical procedures are consistently followed. Analytical precision is monitored through analysis of matrix spike duplicates and field duplicates. Matrix spike duplicates for organic compounds are analyzed at a frequency of once for every 20 samples as specified by the ASP. Precision is expressed as the relative percent difference (%RPD):

$$\%RPD = 100 \times 2[(X_1 - X_2)/(X_1 + X_2)]$$

where X_1 and X_2 are reported concentrations for each duplicate sample and subtracted differences represent absolute values. The equation is taken from *"Data Quality Objectives for Remedial Response Activities"* (EPA/540/G-87/003, March 1987).

5.2.2 Accuracy

Accuracy measures the bias in a measurement system. Laboratory accuracy is assessed through use of laboratory internal QC samples, matrix spikes, and surrogate recovery. The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical methods on similar samples. A matrix spike and matrix spike blank are analyzed once for every twenty samples, as specified in the ASP.

Accuracy values can be presented in a variety of ways. Average error is one way of presenting this information; however, more commonly, accuracy is presented as percent bias or percent recovery. Percent bias is a standardized average error (the average error divided by the actual or spiked concentration and converted to a percentage). Percent bias is unitless and allows accuracy of analytical procedures to be compared easily. Percent recovery provides the same information as percent bias. Routine organic analytical protocols require a surrogate spike in each sample. Percent recovery is defined as:

% Recovery	=	(R/S) x 100
Where S	=	spike surrogate concentration
R	=	reported surrogate concentration
and % Bias	=	% Recovery - 100

This equation is taken from *"Data Quality Objectives for Remedial Response Activities"* (EPA/540/G-87/003, March 1987). Percent recovery criteria published by the NYSDEC as part of the 1991 NYSDEC ASP and those determined from laboratory performance data are used to evaluate accuracy in matrix spike and blank spike quality control samples.

5.2.3 Representativeness

Representativeness is a qualitative parameter that expresses the degree to which sample data accurately and precisely represent actual conditions. In the field, the representativeness of the data depends on selection of appropriate sampling locations, collection of an adequate number of samples, and use of consistent sampling procedures. The sampling procedures, as described in the attachments, are designed with the goal of obtaining representative samples for each of the different matrices.

In the analytical laboratory, the representativeness of the analytical data is a function of the procedures used in processing the samples. The objective for representativeness is to provide data of the same high quality as other analyses of similar samples using the same methods during the same time period within the laboratory. Representativeness is determined by comparing the quality control data for these samples against other data for similar samples analyzed at the same time.

5.2.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Analytical results are comparable to results of other laboratories with the use of the following procedures/programs: instrument standards traceable to National Institute of Standards and Testing (NIST) or NYSDEC sources; the use of standard methodology; reporting results from similar matrices in consistent units; applying appropriate levels of quality control within the context of the laboratory quality assurance program; and participation in inter-laboratory studies to document laboratory performance. By using traceable standards and standard methods, the analytical results can be compared to other laboratories operating similarly. The QA Program documents internal performance, and the inter-laboratory studies document performance compared to other laboratories. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance.

5.2.5 Completeness

Completeness is the percentage of measurements made that are judged to be valid measurements. The completeness goal is to generate the maximum amount possible of useable data (*i.e.*, 100% usable data). Data is considered usable unless qualified during validation as "R", rejected.

5.2.6 Reporting Limits

The reporting limits or quantification limits that are desired for each analysis are those specified by NYSDEC as part of the 1995 ASP Superfund CLP, or lower. It is understood that all such limits are dependent upon matrix interferences. Reporting limits may vary as a result of dilution.

5.3 Field Quality Assurance Samples

5.3.1 Field Duplicate Samples

Field duplicate samples are used to assess the variability of a matrix at a specific sampling point and to assess the reproducibility of the sampling method. Field duplicate samples are defined as a second sample collected from the same location, at the same time, in the exact same manner as the first and placed into a separate container (with no prior mixing). Field duplicate samples are collected at a frequency of one per every twenty (20) samples per matrix. Each duplicate sample is analyzed for the same parameters as the samples collected that day. Thus, both field and laboratory variability are evaluated. Acceptance and control limits for the laboratory follow NYSDEC ASP guidelines for organic analyses. However, any deviations in the data with respect to the limits will be discussed in the report. Although there are no established QC limits for field duplicate RPD data, Rust considers RPD values of 40% or less an indication of acceptable sampling and analytical precision.

5.3.2 Split Samples

Split samples are usually used for performance audits or inter-laboratory comparability of data. The collection of split samples is not anticipated during the course of this project. However, if the state (or other appropriate agency) requests split samples to be collected, then the following applies: A split sample is defined as two separate samples taken from a single aliquot that has been thoroughly mixed or homogenized prior to the formation of the two separate samples.

5.4 Laboratory Quality Assurance Samples

5.4.1 Method Blanks

Method blanks are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instrument as the sample is prepared and analyzed in the laboratory. A method blank is defined as an aliquot of laboratory deionized water on which every step of the method is performed and analyzed along with the samples. Method blanks are analyzed at a frequency of one (1) for every 20 samples analyzed, or every analytical batch, whichever is more frequent.

5.4.2 Spiked Samples

Two types of spiked samples are analyzed as part of the analytical QA/QC program, and include matrix spikes (MS) and matrix spike duplicates (MSD). Matrix spike samples are analyzed to evaluate instrument and method performance on samples of similar matrix. Matrix spike duplicates are analyzed to determine the precision of the method and instrument. These samples are analyzed and the percent recovery is determined to assess matrix interferences affects on the methods. One MS/MSD sample will be analyzed for every 20 post-excavation samples.

6.0 EQUIPMENT CALIBRATION AND MAINTENANCE

6.1 Field Equipment

6.1.1 Calibration

Field equipment that may be used during collection of environmental samples includes a photoionization detector (PID), an MIE personalDataRAM (pDR) or equivalent, an HNu 311-D GC or equivalent equipped with a PID and an appropriate column for BTEX analysis, a RPA-I™ RaPID Photometric Analyzer or equivalent, and air sampling pumps. The PID is used for soil screening and health and safety surveys and is calibrated in accordance with the manufacturer's instructions at the beginning of the day, whenever the instrument is shut off for more than two hours and/or at the discretion of the SSO.

All air monitoring equipment used (*i.e.*, the particulate monitor and air sampling pumps) will be calibrated in accordance with the manufacturer's recommendations. Results of all calibration tests and adjustments will be recorded in the appropriate field notebook for inclusion in the final project file. Where necessary, copies may be included in the final project report. Each of the sampling pumps used will be calibrated against an NBS traceable primary standard (*e.g.*, a BIOS DryCal DC-1 Calibrator) immediately prior to sampling and again immediately following the sampling to accurately calculate the volume of air flow through the sample media.

The RPA-I™ RaPID Photometric Analyzer is a spectrophotometer used in conjunction with the Ohmicron RaPID Assay® system and will be calibrated in accordance with the manufacturer's recommendations. Results of all calibration tests and adjustments are recorded on the printout provided by the RPA-I™ and may be included as an Appendix to the final report.

Prior to the analysis of any samples using the field GC, the instrument will be calibrated in accordance with the manufacturer's instructions to recognize the characteristic retention times of benzene, m- & p-xylene and o-xylene and convert peak areas into concentrations for each of these compounds. A continuing calibration standard will be analyzed at the beginning of each day and at a minimum frequency thereafter of once per every ten (10) samples.

6.1.2 Maintenance

Preventive maintenance of field equipment is performed to keep all instruments in proper working order. This maintenance is monitored with a system of logbooks kept for each instrument. All preventative maintenance activities are recorded in the logbooks, along with documentation of any problems and repairs. Review of these logs and internal communication between QA/QC personnel and field personnel allow for identification and correction of potential problems.

Prior to field sampling events, each piece of field equipment is inspected to ensure it is operational. If necessary, the equipment is serviced. Meters that require charged batteries are fully charged or have fresh batteries. Due to Rust's extensive inventory of supplies and equipment, downtime should not occur. Field personnel carry key spare parts and equipment into the field to prevent downtime.

Field equipment returned from a site is inspected to confirm it is in working order. This inspection is recorded in the logbook or field notebooks, as appropriate. The last user is responsible for recording any equipment problems in the logbook.

6.2 Laboratory Equipment

All laboratory equipment is calibrated according to the requirements of the 1995 NYSDEC ASP, NYSDOH methods and/or NIOSH methods for each analysis in accordance with the manufacturer's specifications.

In general, preventative maintenance of laboratory equipment follows the guidelines recommended by the manufacturer. A malfunctioning instrument is repaired immediately or through a service call to the manufacturer.

7.0 DATA DOCUMENTATION

7.1 Field Notebook

Field notebooks will be initiated at the start of on-site work. One notebook will be dedicated to the Rust representative overseeing intrusive activities and the collection of post-excavation samples. Another notebook dedicated to the perimeter air monitoring will be initiated and maintained by the SSO, and a third notebook will be dedicated to the field analysis of the excavation samples. All original forms and notebooks used during field activities become part of the permanent project file. Each field notebook will include the following daily information, where applicable:

- date;
- meteorological conditions;
- crew members;
- brief description of proposed field activities for that day;
- locations where work is performed;
- problems and corrective actions taken;
- records of all field measurements;
- description of all modifications to the work plan;
- record of all field data sampling point locations;
- pertinent sample collection information;
- chain-of-custody information; and
- calibration of field equipment.

8.0 CORRECTIVE ACTIONS

Corrective actions are required when a problem arises that impedes the progress of the investigation as detailed in the project plans, or when field or analytical data are not within the objectives specified in the Work Plan or QAPjP. Corrective actions include those actions implemented to promptly identify, document, and evaluate the problem and its source, and to correct the problem. These corrective actions are documented in the project file. Prior to implementing any deviations from the approved procedures contained in the QAPjP, the Project Manager and Quality Assurance Officer (QAO) must be notified.

8.1 Field Procedures

Project personnel continuously monitor ongoing work performance as part of their daily responsibilities. If a condition is noted that would have an adverse impact on data quality, corrective actions are taken. Situations that require corrective action include the following:

- standard operating procedures and or protocols identified in the project-specific work plan or QAPjP have not been followed;
- equipment is not calibrated properly or in proper working order;
- QC requirements have not been met; and
- performance or system audits identify issues of concern.

The problem, its cause, and the corrective action implemented are documented. The QAO is responsible for initiating and approving corrective actions.

8.2 Laboratory Procedures

During all investigations/studies, instrument and method performance and data validity are monitored by the analytical laboratory performing the analyses. The laboratory calibrates its instruments and documents the calibration data. Laboratory personnel continuously monitor the performance of its instruments to ensure that performance data fall within acceptable limits. If instrument performance or data fall outside acceptable limits, or when any condition is noted that has an adverse effect on data quality, then the laboratory implements appropriate corrective actions. Situations that require corrective action include the following:

- protocols defined by the project-specific QAPjP have not been followed;
- identified data acceptance standards are not obtained;
- equipment is not calibrated properly or in proper working order;
- sample and test results are not completely traceable;
- QC requirements have not been met; and
- performance or system audits identify issues of concern.

The laboratory QAO is responsible for initiating and approving corrective actions. The corrective actions may include one or more of the following:

- re-calibration or standardization of instruments;
- acquiring new standards;
- repairing equipment; and
- reanalyzing samples or repeating portions of work.

System audits and calibration procedures with data review are conducted by the laboratory at a frequency so that errors and problems are detected early, thus avoiding the prospect of redoing large segments of work. When Rust provides independent data validation, the laboratory is notified as soon as possible of any situations requiring corrective action so that corrective actions can be implemented in a timely manner.

9.0 DATA REDUCTION, REVIEW AND REPORTING

9.1 Laboratory Data

The laboratory is required to meet all applicable documentation, data reduction, and reporting protocols as specified in the 1995 NYSDEC ASP CLP. Calculations of sample concentrations are performed using the appropriate regression analysis program, response factors, and dilution factors, where applicable. The laboratory (through its assigned QAO) conducts its own internal review of the analytical data generated for a specific project prior to sending the data to Rust. Deficiencies discovered during the laboratory internal data validation, as well as the corrective actions used to correct the deficiency are documented in the laboratory Case Narrative submitted with each data package.

The laboratory reports the data in tabular form by method and sample. The laboratory is required to submit analytical results that are supported by a complete NYSDEC ASP/CLP data package to enable the quality of the data to be determined. This standard backup data includes supporting documentation (chromatograms, raw data, *etc.*), sample preparation information, and sample handling information (*i.e.*, chain-of-custody documentation).

9.2 Data Review

In addition to the laboratory's in-house review of the data, Rust chemists review all analytical data prior to its incorporation into a final report. Upon receipt of the laboratory data analytical package, the data reviewer:

1. Reviews the data package to determine completeness. It must contain all sample chain-of-custody forms, case narratives including sample/analysis summary forms, QA/QC summaries with supporting documentation, relevant calibration data, instrument and method performance data, documentation of the laboratories ability to attain the method detection limits for target analytes in required matrices, data report forms with examples of calculations, and raw data. The laboratory is promptly notified of any deficiencies, and must produce the documentation necessary to correct the deficiencies within 10 calendar days.

2. Reviews the data package to determine compliance with the applicable portions of the work plan. The data reviewer confirms that the data is produced and reported consistent with the QAPjP and laboratory quality control program, protocol-required QA/QC criteria are met, instrument performance and calibration requirements were met, protocol required calibration data are present and documented, data reporting forms are complete, and problems encountered during the analytical process and actions taken to correct the problems are reported.

3. Prepares a tabular summary of the reported data. The data reviewer summarizes the data in a tabular format to provide the data in more accessible format.

If necessary, data validation may be performed to define and document analytical data quality to determine if the data quality is sufficient for the intended use(s). If required, this data validation will be performed in accordance with the United States Environmental Protection Agency (USEPA) document **USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review** (February 1994) and the USEPA Region II document **CLP Organics Data Review and Preliminary Review** (SOP No. HW-6, Revision No. 8, January, 1992), where applicable.

During data validation, a Rust chemist reviews the appropriate data and reporting forms outlined below. Once the entire data package has been reviewed, a narrative report and deliverables summary will be prepared describing data reduction, usability, reporting and validation procedures. This report indicates the quality of the data and identify any specific problem areas. The data validation/usability reports would be available for review prior to submission of the report.

Benzene and Xylene Analysis and Reporting

- Deliverable Requirements
- Case Narrative
- Holding Times
- System Monitoring Compound (SMC) Recoveries
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results
- Blank Summary and Data
- GC/MS Instrument Performance Check
- Target Compound Identification/Quantitation
- Quantitation Reports and Mass Spectral Data
- Initial and Continuing Calibration Data
- Internal Standard Areas and Retention Times
- Field Duplicate Data

PCB Analysis and Reporting

- Case Narrative
- Deliverables Requirements
- Holding Times and Sample Preparation
- Surrogate Recoveries and Summary (Form 2)
- MSB/MS/MSD Recoveries and Summary (Form 3)
- Instrument and Method Blanks and Summaries (Form 4C)
- PCB Initial Calibration of and Multi-Component Analytes (Forms 6E and 6F) and Data
- PCB Calibration Verification Summary (Form 7E) and Data
- PCB Analytical Sequence (Form 8D) and Data
- PCB Clean-up Procedures QA/QC (Forms 9A and 9B)
- PCB Identification Summaries of Multi-Component Analytes (Form 10B) and Data
- PCB Analysis Data Sheet (Form 1D) and Data
- Field Duplicate Data

9.3 Field/Engineering Data

Field data (information collected in the field through observation, manual measurement, and/or field instrumentation) is recorded in the project field logbook, data sheets, and/or forms. This data is reviewed by the field manager and the project manager for adherence to the work plan and QAPjP requirements. The final reporting of the data is reviewed by the project field personnel, who also participate in data reduction and evaluation.

Field documentation, data calculations, transfers, and interpretations are conducted by field personnel, and reviewed for accuracy by the appropriate task manager, project manager and/or QAO for:

- general completeness;
- readability;
- usage of appropriate procedures;
- appropriate instrument calibration and maintenance;
- reasonableness in comparison to present and past data collected;
- correct sample locations; and
- correct calculation and interpretations.

Approximately 5% of all calculations are checked through recalculation. If appropriate, field data forms, and calculations are included in project report appendices. Original field logs/forms, documents and data reduction are kept in the project file.

10.0 QUALITY ASSURANCE CONTROLS

The Project Manager and the QAO are responsible for ensuring that quality QA/QC records such as chain-of-custody forms, field notebooks, and data summaries are being properly prepared. The Project Manager is responsible for ensuring that all records are properly filed. Information received from outside sources, such as laboratory analytical reports, is retained at Rust. Access to working project files is restricted to project personnel.

10.1 Field Audits

The Project Manager and Project QA/QC Officer are responsible for ensuring that all field investigations are performed in accordance with the requirements and specifications outlined in this QAPjP. The QAO is responsible for providing QA/QC supervision and guidance relative to all work performed by Rust employees and subcontractors assigned to the project.

As part of Rust's field QA/QC program, a field audit is performed by Rust's QAO or a designated representative on projects where sampling activities extend for more than one week. The primary purpose of the field audit is to monitor project sampling practices. The QA/QC field audit is performed during sampling to evaluate the performance of work during the collection of samples for laboratory analysis.

For projects of short duration (i.e., continuous field work of less than one week), a formal audit of field activities is not performed. The field team leader or appropriate task manager monitor field performance and document all work performed in field notes, a narrative, and a checklist of tasks. The Project Manager and/or Project QA/QC Officer review this documentation to ensure the necessary information has been recorded and conduct discussions with field team members to verify that field activities were performed according to the project Work Plan, QAPjP and HASP. The QAO communicates concerns, if any, to the field team as appropriate. A field audit will not be performed in conjunction with this project.

10.2 Meetings

Periodic meetings between the Project Manager and QAO will be held to review quality assurance procedures, field work, laboratory performance and data documentation and review. Any potential problems identified during the review are documented and addressed. If necessary, they are reported to management for review and appropriate corrective action.