REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN BARTLETT TREE COMPANY SITE NASSAU COUNTY, NEW YORK NYSDEC SITE REGISTRY NO. 130074

Prepared for

F.A. Bartlett Tree Expert Company, Charlotte, North Carolina

March 2008

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1. INTRODUCTION

This Remedial Investigation/Feasibility Study Work Plan (work plan) has been prepared pursuant to the April 2007 Order on Consent and Administrative Settlement between F.A. Bartlett Tree Expert Company (Bartlett) and the New York State Department of Environmental Conservation (NYSDEC or DEC). The work plan specifies procedures for conducting a remedial investigation and feasibility study (RI/FS) of the Bartlett Tree Company Site, DEC Registry No. 130074, located at 345 Union Avenue in the Town of North Hempstead, Nassau County, New York (the site). Consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the work plan also includes the following:

- A schedule for the performance of the anticipated RI/FS activities;
- A field sampling plan (FSP) that specifies detailed sampling and data gathering methods;
- A quality assurance project plan (QAPP) that describes quality assurance and quality control protocols necessary to achieve the initial data quality objectives;
- A citizen participation plan (CPP); and
- A health and safety plan (HASP) to protect persons at and in the vicinity of the site during performance of the RI/FS field activities.

2. SITE BACKGROUND

A brief summary of the physical setting of the site, history of site operations, and available environmental information is provided in the following sections.

2.1 Physical Setting and Description of the Site

The site is located on Long Island, at 345 Union Avenue in Westbury, Nassau County, New York (Figure 2-1). The site is located in an urban, mixed-use neighborhood of commercial and industrial facilities and residences. The site consists of a narrow parcel of land measuring approximately 340 feet in length by 60 feet wide, totaling approximately 0.4 acres. It is bordered on the north by a municipal parking lot; on the east by a lumber warehouse and automotive paint and chrome shop; on the south by Union Avenue, followed by a railroad, parking lot and cemetery; and on the west by a taxi fleet maintenance facility and construction contractor's storage yard.

The site has been occupied since the mid-1950s by Bartlett, a nationwide tree care company. The current site configuration consists of four buildings, including a two-story office structure, a garage, an enclosed storage shed, and an open shed (Figure 2-2). The facility is accessed from Union Avenue via two driveways located on either side of the Bartlett office building. A chain-link fence extends along the western and northern property boundaries. Nearly all the ground surface is paved.

Small amounts of plant health care materials are stored in the locked, fire proof storage structure located midway along the eastern side of the facility, adjacent to the garage. This storage structure has a concrete floor and meets or exceeds all relevant state and federal regulations for the storage of such materials. Granular fertilizers and chainsaw bar oil are also stored in the pesticide storage structure. Plant health care vehicles are parked in a locked garage on the ground floor of the office building near the facility entrances on Union Avenue.

Water and sewer service is currently available from the municipality. Prior to the installation of the municipal sanitary sewer system in the early 1980s, sanitary wastes may have been discharged to an on-site cesspool or drywell (Drywell 1) located in the northern portion of the site, approximately 20 feet south of the open shed. Drywell 1 is now filled with sand and secured with a cast iron cover. Architectural plans from 1963 (Knebel, 1963) show a potential second drywell or cesspool (Drywell 2) at a location approximately 112 feet north of the current office building, adjacent to the west wall of the garage, in an area that is now paved. Whether or not Drywell 2 actually existed/exists has not been determined.

The potential existence of a third drywell/cesspool is indicated by documents received from the Westbury Building Department. Architectural plans (Knebel, 1964) show a floor drain at the base of a proposed exterior stairway on the north side of the office building. The floor drain is shown connecting to a pre-cast dry well (4' diameter by 3' deep) located a few feet to the north and west of the stairway. A cast iron manhole cover is currently present in this area. A building permit application (Village of Westbury, December 19, 1966) indicates the office building's restrooms were to be connected to an 8' diameter cesspool near the north side of the building. It has not been determined whether the restrooms are currently connected to the sanitary sewer or to a drywell/cesspool.

The office building is currently heated by a natural gas-fired furnace located in a room on the first floor near the northwest corner. Bartlett contacted the Westbury Fire Department in an effort to identify any records

pertaining to potential former fuel storage tanks at the facility, but was informed that the department only has records dating to 2002, which are limited to identifying the type of heat a facility has. Architectural plans obtained from the Westbury Building Department indicate a possibility that an underground fuel oil storage tank may have been in use at one time. Plans dated 1964 (Knebel, 1964) provide for the addition of an exterior stairway on the north side of the building, an exterior heater room, and a buried 350 gallon fuel oil tank approximately four feet north of the heater room. However, later plans (Knebel, 1966) show the exterior stairway as "existing" but do not show the heater room. Currently, the exterior stairway exists but there is no structure that corresponds to the heater room. This information suggests that the heater room (and consequently the fuel oil tank) may never have been built.

2.2 History of Site Operations

Limited information on the use of the site prior to occupancy by Bartlett has been obtained from Sanborn fire insurance maps (Figure 2-2A). Two of these maps, dated 1929 and 1941, show the site as occupied by E. J. Christ (or C. Christ) Wagon Works & Auto Repairs. Structures shown on the 1929 map include a paint shop, two machine shops, two lumber storage facilities, an unlabeled structure, and a shed. The structures shown on the 1941 map are identical except that the machine shop located nearest to Union Avenue is labeled auto repair.

Since the mid-1950s the site has been used by Bartlett as a base for tree maintenance services, including applications of pesticides and herbicides. In the 1960s and 1970s, excess (unused) pesticide spray solutions were typically re-tanked for applications on the following day. Since the early 1980s, pesticide and herbicide spray solutions have been prepared in truck-mounted tanks in quantities only as large as needed for immediate, individual applications. Thus, no unused spray solution is left over to be disposed. Empty, plastic pesticide containers are triple rinsed, bagged and stored on site pending recycling as plastic. Rinse water is placed in spray tanks for mixing with new spray solutions.

Bartlett is not aware of any current or former pesticide storage area other than the locked, fire proof storage structure noted in Section 2.1. Based on architectural plans obtained from the Village of Westbury Building Department and provided previously to the DEC, the open shed at the north end of the site may have been part of a larger open shed constructed between 1963 and 1964 for the purpose of housing trucks. The architectural plans indicate the open storage shed was to extend along a portion of the east boundary line of the property. There is no evidence that pesticides were ever stored in the open shed.

On May 5, 1987, Bartlett investigated a May 1987 report that an abandoned "cistern" at the Westbury facility (Drywell 1) allegedly held empty pesticide containers. Bartlett found that Drywell 1 was partially filled with water, which was sampled, and Bartlett also recovered two Sevin containers (empty, crushed 5-gallon metal pails). After the inspection, Drywell 1 was backfilled with sand out of concern that it could cave in due to the heavy traffic in the driveway. The sample of the standing water in Drywell 1 was submitted to an independent laboratory for testing. The herbicide diazinon was detected at 0.61 ppm.

Bartlett submitted a letter report to the Nassau County Department of Health (County) on October 3, 1990 in response to the County's inspection of the Westbury facility at about that time. During the inspection, the County requested background information on Drywell 1. Bartlett's letter report to the County described the May 1987 inspection and closure of Drywell 1, and including a copy of the analytical results. The County never responded and Bartlett therefore concluded that the procedure had been acceptable to the County.

In April 1990, an anonymous caller to the DEC alleged that pesticides and herbicides were periodically placed into Drywell 1 prior to abandonment of the drywell in 1983. Specific pesticides were named, including malathion, DDT, Sevin, chlordane and lead spray for fruit trees.

2.3 Environmental Conditions

2.3.1 Previous Investigations

A preliminary site assessment (PSA) was performed in 1996-1998 by a contractor to the DEC to determine if a potential source of soil and/or groundwater contamination existed at the site (Dvirka and Bartilucci, 1998). Continuous soil samples from the unsaturated zone directly beneath Drywell 1 (8'-37' bgs) were collected by direct-push (GeoProbe®) methods. Groundwater samples were collected with a GeoProbe® groundwater sampling probe at five (5) locations (one presumed upgradient ("upgradient"), one in the location of the drywell, and three presumed downgradient ("downgradient")). At each location, groundwater was sampled at 37' bgs (below ground surface) (i.e., water table) and 62' bgs. An existing, potentially downgradient monitoring well on adjacent property at 333 Union Avenue (i.e., the adjacent, former Union Oil property) was also tested.

All samples were analyzed for the Target Compound List (TCL) pesticides, organochlorine pesticides (United States Environmental Protection Agency (USEPA) SW846 Method 8141) and herbicides (USEPA SW846 Method 8150). A subset of samples were also analyzed for the full list of TCL parameters, including volatile and semi-volatile organic compounds, polychlorinated biphenyl compounds (PCBs), cyanide and inorganic constituents.

Soil Quality

Pesticides were detected in soil samples in excess of TAGM 4046 recommended soil cleanup objectives in effect at the time for unrestricted use (RSCOs) throughout the entire soil column beneath Drywell 1. The herbicides 2,4,5-TP (Silvex) and Dicamba were detected; Silvex did not exceed its RSCO. No RSCO was established for Dicamba VOCs (primarily benzene, ethylbenzene, and xylene) and SVOCs (naphthalene, 2-methylnapthelene, and various polycyclic aromatic hydrocarbons (PAHs)) were also found in levels exceeding RSCOs. Some of these non-chlorinated compounds may be constituents of the petroleum distillates used as pesticide carriers. Inorganic constituents found in excess of RSCOs included arsenic, beryllium, copper, iron, and zinc. No site-specific information regarding background levels of these inorganic constituents has been identified. No PCBs or cyanide were detected.

Groundwater Quality

Groundwater samples collected from directly beneath Drywell 1 contained elevated levels of pesticides. The turbidity of the groundwater samples was generally very high, usually in excess of 999 NTUs, indicating that the samples contained high levels of suspended silt and clay. Most organic pesticides are relatively insoluble in water and have a high affinity for silt and clay particles. Therefore, the groundwater analytical results for pesticides may reflect elevated levels of adsorbed phase constituents as opposed to dissolved concentrations.

No pesticides were detected in the downgradient samples. Two pesticides were detected in one upgradient sample. The VOCs ethylbenzene and total xylenes were detected above standards in groundwater samples collected directly beneath Drywell 1.

The chlorinated solvents tetrachloroethene (PCE), trichloroethene (TCE), and cis- and trans-1,2-dichloroethene (DCE) were detected in groundwater. TCE and DCE can be produced in certain environments through biodegradation of PCE. TCE and DCE were found in the deeper groundwater samples (62') from both upgradient and downgradient locations, but not in the sample from directly beneath Drywell 1. PCE was detected in the shallower upgradient sample at 180 µg/L and in the deeper upgradient

sample at 6 µg/L. Low levels of PCE were also detected in the samples from directly beneath Drywell 1, but not in the downgradient samples. The DEC concluded that these findings suggest an off-site source for DCE, TCE and PCE. No SVOCs were detected in groundwater at concentrations above the NYSDEC groundwater quality standards or guidelines. No PCBs or cyanide were detected.

2.3.2 Regional Hydrogeology

Three main water bearing units are found on Long Island – the upper glacial aquifer of Pleistocene age and the underlying Magothy and Lloyd aquifers of upper Cretaceous age. In the area of the site, the upper glacial aquifer is comprised of glacial outwash consisting of fine to very coarse sand and gravel (Busciolano, 2002). The Gardiners Clay and "20-Foot" Clay, marine clay deposits of Pleistocene age along the south shore of Long Island, are reportedly absent in the area of the site (Doriski, 1983). In this portion of Long Island the upper glacial aquifer unconformably overlies the Magothy aquifer, which generally consists of fine- to medium-grained sand with interbedded lenses of coarse sand and sandy to solid clay. Doriski, 1983 mapped the surface of the Magothy aquifer in the area of the site at an elevation of approximately 50 feet bgs. The Magothy aquifer overlies the Raritan Clay which confines the underlying Lloyd aquifer. The Lloyd aquifer unconformably overlies Precambrian bedrock.

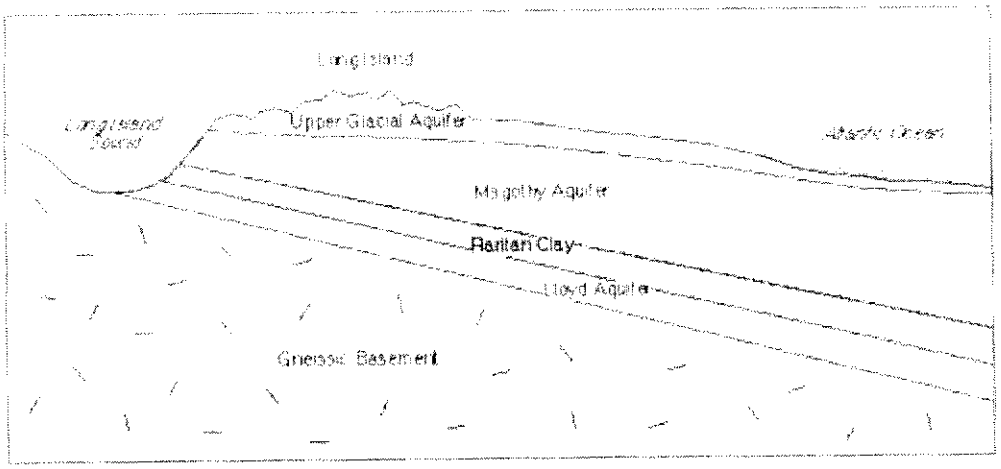

Figure 2-3 - Generalized Cross-Section (USGS)

In the area of the site the upper glacial aquifer and the upper portion of the Magothy aquifer function hydrologically as a single, unconfined unit. Groundwater in these aquifers moves laterally and discharges to surface water, and downward toward deeper aquifers. Over large areas, the rate of horizontal flow is reportedly 10 to 100 times the rate of vertical flow because stratification and clay layers within the aquifers restrict downward flow (Busciolano, 2002). A regional groundwater divide separates Long Island's aquifers into a northern zone where groundwater flows toward and discharges to Long Island Sound, and a southern zone where groundwater flows toward and discharges to the Atlantic Ocean. The area of the site is located south of this divide, and groundwater flow is expected to be in a general southwesterly direction with an unknown vertical component. The PSA report indicates that regional groundwater flow in the area of the site is south 30° west.

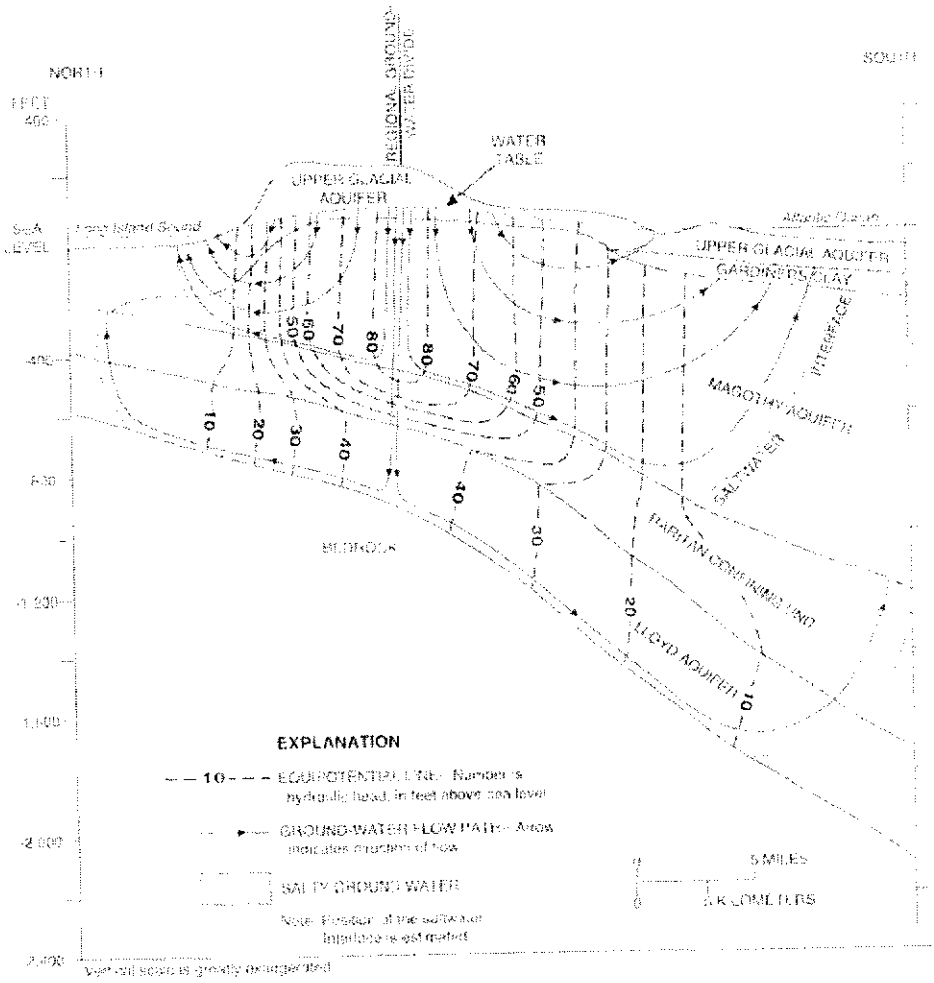

Figure 2-4 - Generalized Groundwater Flow Lines on Long Island (Busciolano, 2002)

2.3.3 Site Hydrogeology

During the PSA investigation of the site, no groundwater elevations were measured and geologic materials were not described in the saturated zone. Therefore, there is uncertainty about site-specific aquifer characteristics and groundwater flow directions. The PSA report (Page 20) indicates that a dense, black silt layer of unspecified thickness was encountered at an unspecified depth below the water table and that the interval approximately 15 feet below the water table was dry. The report also states that a clay layer is expected at approximately 100 feet bgs, but provides no basis for this assertion. For the purpose of anticipating potential on-site geologic conditions, Brown and Caldwell Associates developed cross-sections through the area of the site (Figures 2-5, 2-6, 2-7, and 2-8). The cross-sections were based on driller's boring logs from the installation of water supply wells during the 1940s and 1950s (USGS, Appendix D). The boring logs employ a variety of sometimes outmoded terminologies for the various geologic materials, which hinders attempts to classify or correlate the unconsolidated materials with confidence.

Cross-sections A-A' (Figure 2-6) and B-B' (Figure 2-7) depict the contact between the upper glacial aquifer and the Magothy. The contact between these units is not specifically identified as such in the driller's logs,

but is potentially indicated by a change from sand and/or gravel to underlying finer material (fine sand, silt or clay). In the vicinity of the site (PSA soil boring DW-1), this contact is at an elevation of approximately 50 feet bgs.

The cross-sections show the intervals of clay that were identified in each driller's log. These clay intervals occur within the Magothy aquifer at varying elevations. The lateral extent of any of these clay units is unknown. In the vicinity of the site, a layer of grey clay at approximately 170 feet below surface has been interpreted on the cross-sections as potentially laterally continuous.

Cross-section C-C' (Figure 2-8), depicts the anticipated on-site hydrogeologic conditions, including the contact between the upper glacial and Magothy aquifers, the potentially continuous clay layer at 170 feet below surface, the water table, and the locations of the PSA sampling points. The PSA report states that no clay layers were noted above the water table during GeoProbe® drilling, but that a hard layer of dense, black silt was encountered when drilling below the water table. The PSA report states that an interval 15 feet below the water table was dry and that probes had to be advanced another 8 to 10 feet to reach the saturated zone beneath the dense silt layer. No logs were provided for the probes that were advanced below the water table, and information on the depth and thickness of the dense silt layer is unavailable.

3. CONCEPTUAL SITE MODEL

A conceptual site model has been developed based on the available regional and site-specific information discussed in Section 2.0. The elements of the conceptual site model are discussed below.

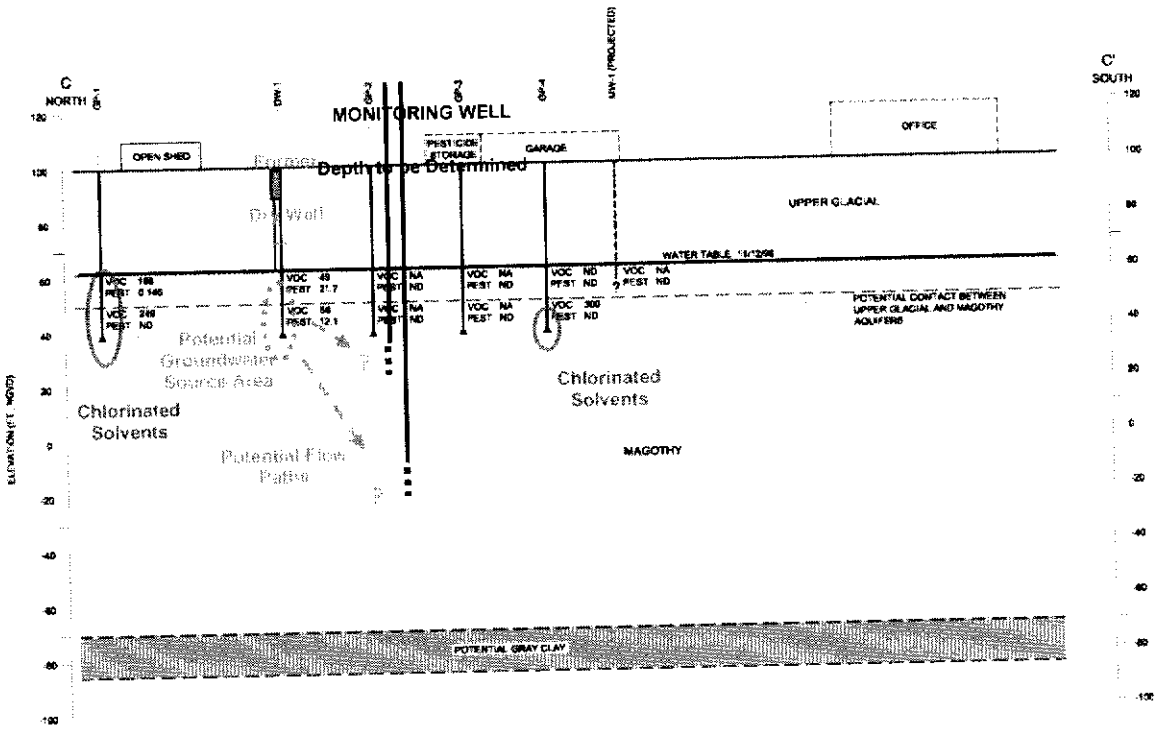

Figure 3-1 - Conceptual Site Model

Hydrogeologic Setting - In the vicinity of the site, the uppermost portion of the Magothy aquifer is unconfined and functions hydraulically as part of the upper glacial aquifer. The water table has been identified approximately 38 feet below surface, in a zone that may be within the upper glacial aquifer. No significant aquitards are anticipated in the upper glacial aquifer under the site. Local driller's logs and the PSA report indicate that intervals of clay and silt are present beneath the water table in the underlying Magothy aquifer. The clay may exist as discontinuous lenses or laterally extensive layers. The black, dense silty layer, possibly about 15 feet below the water table, may be supporting a perched water table with a dry interval of approximately 8-10 feet below the silty layer. Regional groundwater flow is expected to be to the southwest with a significant but unknown downward component. Stratification within the Magothy aquifer and the presence of relatively impermeable layers of silt and clay may cause lateral groundwater flow rates to exceed vertical flow by a factor of 10 or more.

Pesticide/Herbicide Source Area – Water-based pesticide/herbicide suspensions were reportedly released at some time in the past into former Drywell 1. The water-based suspensions typically consisted of water and an emulsion of one or more organic pesticide/herbicide compounds dissolved in relatively small volumes of petroleum distillate carriers. The water-based suspensions would have percolated downward into the unsaturated soils beneath the drywell and, through capillary forces, dispersed laterally a limited distance into

the surrounding unsaturated zone. Turbid groundwater samples collected directly under the drywell contained elevated concentrations of pesticides and herbicides, indicating that the water-based suspensions reached the water table and migrated downward some distance into the saturated zone. The organic pesticide/herbicide compounds are relatively insoluble in water and have a high affinity for silt and clay particles. Therefore, it is anticipated that most of the pesticide/herbicide compounds were adsorbed and retained on the unsaturated and saturated geologic materials in the vicinity of the drywell.

Groundwater Pathway - No observations of non-aqueous phase liquid (NAPL) were reported during the PSA. Aqueous phase migration of pesticide/herbicide compounds from the source area is governed by groundwater advection (i.e., the bulk movement of groundwater) and retardation. Based on regional gradients, groundwater flow in the vicinity of the site is anticipated to be toward the southwest, with an unknown downward component that is governed by vertical gradients and the presence of any relatively impermeable deposits such as the dense, silty layer referenced in the PSA report. Local groundwater flow directions may also be affected by man-made influences such as the 300 gpm pumping well for air conditioning referenced in the PSA report as being located approximately 0.35 miles to the north of the site. Transport of dissolved pesticide/herbicide compounds in groundwater would be retarded by sorption of the compounds onto unconsolidated geologic materials in the aquifer. Retardation may account for the absence of detected pesticides or herbicides in all samples from presumed downgradient groundwater probes. If groundwater flow direction is significantly different from the presumed (i.e., regional) direction, it may be necessary to locate monitoring wells in alternate locations to assess the extent of any dissolved pesticide plume.

Potential Receptors - At this time no potentially completed pathways from the pesticide/herbicide source area to human or ecological receptors have been identified. No pesticide or herbicide compounds were detected in any of the samples from presumed downgradient groundwater probes installed during the PSA or from the monitoring well located on the adjacent, former Union Oil property. It has not been determined if these groundwater samples are representative of conditions in the groundwater flow path leading from the potential pesticide/herbicide source area. Drywell 1 is filled and secured with a cast iron cover. Pavement prevents direct exposure to potentially impacted soils (if any) surrounding the drywell. According to the 1998 PSA report, pesticides had not been detected in the two closest public water supply wells: Westbury Water District wells N-7785 (0.38 miles from site) and N-101 (0.42 miles from site). In addition, pesticides had not been detected in the closest downgradient well: Westbury Water District well N-5654 (0.5 miles from site).

Chlorinated solvents, apparently from one or more offsite sources, were detected in groundwater samples from probes in locations potentially side-gradient to the Bartlett Tree office building. The second floor of the office building is occupied during business hours. It has not been determined whether a plume of chlorinated solvents exists in close enough proximity to this structure to be a source of chlorinated soil vapor under the structure.

4. WORK PLAN RATIONALE

The overall objective of the RI/FS is to define the nature and extent of site-related contamination to the extent necessary to identify a site remedy that is protective of human health and the environment. Based on the site background and the findings of the PSA investigation, a number of unresolved issues pertaining to the nature and extent of site-related impacts have been identified. These issues and the RI components intended to address them are discussed in Section 4.1. Specific data requirements or data quality objectives (DQOs) are identified in Section 4.2.

4.1 Objectives and Technical Approach

The specific objectives of the RI are to resolve uncertainties and data gaps pertaining to the nature and extent of site-related impacts. For each of the following objectives the general investigatory approach is summarized.

Evaluate Other Potential Leaching Structures - The current/former existence of Drywell 2 (reportedly located approximately 112 feet north of the office structure along the west wall of the garage) has not been confirmed. A third drywell (Drywell 3) may be present near the north side of the office building. It has not been determined whether the office restrooms are currently connected to the sanitary sewer or to a drywell/cesspool. A surface geophysical survey will be conducted in accessible areas of the site using electromagnetic (EM) induction and ground penetrating radar (GPR) techniques to attempt to identify if these drywells or any other potential subsurface leaching structures exist on site. Any potential leaching structures, including Drywell 2 and Drywell 3, will be assessed by removing pavement and/or manhole covers and advancing a boring through the structure into the underlying soils. Soil samples will be collected and analyzed for TCL/TAL parameters, including organochlorine pesticides and herbicides. During the RI it will be determined whether the sanitary facilities are connected to the municipal sanitary sewer. If necessary, dye tests will be performed to verify connections (if any) to drywells.

Investigate Possible Existence of Fuel Oil UST - As discussed in Section 2.1, architectural plans obtained from the Westbury Building Department indicate that the construction of a heater room and installation of an underground fuel oil tank (UST) were under consideration in the early 1960s. No information has been identified to indicate that the heater room or UST were actually installed. The potential existence of a UST in the area shown on the architectural plans will be investigated. This effort will include inspection of the first floor of the office building to identify items that might have been associated with an oil-fired furnace (e.g., copper fuel line) and examination of historical aerial photography from 1964 to 1980 for evidence of a structural addition corresponding to the proposed heater room. The area of the potential UST will also be investigated by geophysical techniques. If evidence of a UST is found, the DEC will be notified and recommendations for further investigation (e.g., test pitting, soil sampling) will be provided.

Define Hydrogeologic Stratigraphy - The fate-and-transport of site-related constituents are governed in part by the composition and stratigraphic sequence of the unconsolidated deposits that comprise the upper glacial and Magothy aquifers. With the exception of the log of the single soil boring advanced within the unsaturated zone during the PSA (DW-1) there are no descriptions of the unconsolidated deposits underlying the site. Thus, it is not possible at this time to evaluate the extent or hydrologic influence of the dense silty layer approximately 15 feet below the water table, the reported clay layer at a depth of approximately 100 feet, or the existence of other potential aquitards indicated by driller's logs for nearby supply wells. Borings will be advanced at several locations and soil samples will be collected continuously from surface to the targeted

depths in order to confirm observations made by prior consultants and to develop a greater understanding of the local stratigraphy. Two of the borings will be advanced to a depth of 120 feet, which is below the clay layer referenced in the PSA report, to identify potentially continuous clay/silt layers at or above this depth.

Evaluate Groundwater Flow Paths - The lateral and vertical components of groundwater flow are unknown due to a lack of information regarding horizontal and vertical gradients and aquifer stratification. Therefore it is difficult to design initial monitoring wells with confidence that they will intercept a dissolved pesticide/herbicide plume (if any) originating in the vicinity of the former drywell (Drywell 1). To remedy this uncertainty, monitoring wells will be installed in two phases if necessary.

The first phase of monitoring wells will be installed in locations around the potential source area associated with Drywell 1. The Phase 1 monitoring wells will include two (2) well pairs, both consisting of a shallow (water table) well and a deeper well, in locations presumed to be upgradient and downgradient from Drywell 1. The Phase 1 monitoring wells will also include a fifth, shallow (water table) monitoring well in a presumed side-gradient location. The shallow monitoring wells will be installed above the black, dense silty layer referenced in the PSA report to evaluate the potentiometric surface and groundwater quality above this layer. If necessary for verification of visual indications of perched conditions, samples from immediately above and below the black, dense silty layer will be analyzed for moisture content. The deep monitoring wells will be installed from 62-72 feet bgs in order to provide valid monitoring well data from a depth comparable to the depth at which the deeper groundwater grab samples were collected during the PSA. The Phase 1 monitoring wells will be used to determine horizontal and vertical gradients and groundwater flow paths. In accordance with discussions with the DEC, if the analytical data from the monitoring wells indicate that groundwater quality is not significantly impacted at the depth intervals evaluated during the PSA (i.e., water table and approximately 62-72 feet bgs), and depending on hydrogeologic conditions and vertical groundwater gradients, it may not be necessary to extend the groundwater investigation further.

If soils associated with any other potential leaching structures, including Drywell 2 and Drywell 3, are found to be impacted with constituents that have the potential to adversely impact groundwater quality, one or more wells will be installed at appropriate down gradient locations during a second phase of the investigation.

Delineate Soil Contamination Near Drywell 1 – The DEC has suggested that an interim remedial measure (IRM) be undertaken to excavate and remove a potential contaminant source area in the vicinity of Drywell 1. At this time, the available data are not sufficient to define the extent of soil excavation that would be needed to remove this potential source of groundwater impacts, or to adequately plan the excavation methods (e.g., placement of shoring). Based on historical information, the sand inside Drywell 1 is not a contaminant source. The sand was placed in the drywell after the alleged disposal of pesticides ceased, in order to prevent possible collapse of the structure. The lateral and vertical extent of pesticide/herbicide residues in unsaturated and saturated soils outside of former Drywell 1 is unknown. Similarly, the extent of any adsorbed inorganic pesticides (e.g., copper, arsenic) or constituents of petroleum distillate-based carriers (e.g., BTEX[1], naphthalene) is unknown.

A deep soil boring will be advanced at a confirmed downgradient location approximately 10 feet from the former drywell to further evaluate the vertical extent of impacts. Additional, shallower borings will be advanced adjacent to Drywell 1 to delineate the lateral extent of soil impacts and facilitate evaluation of and planning for a potential IRM.

[1] Benzene, toluene, ethylbenzene, isomers of xylene.

Evaluate Potential Releases to Shallow Soils – The DEC has requested soil sampling in the area of an unspecified former pesticide storage area and in the open shed located at the north end of the property. As discussed in Section 2.2, no information has been identified that indicates the existence of any pesticide storage area other than the locked, fire proof storage structure currently in use, and there is no evidence that the open shed was ever used for pesticide storage. At the request of the DEC, soil samples will be collected beneath the floors of the pesticide storage structure and the open shed.

Delineate Groundwater Impacts - The nature and extent of groundwater impacts have not been delineated due to the lack of information regarding groundwater flow paths and the limitations of the direct-push groundwater sampling techniques employed during the PSA. The chemical affinity for silt and clay exhibited by most pesticides and herbicides requires that groundwater samples be free of excessive turbidity in order to be representative of pore water concentrations and actual groundwater quality. For this reason, it is necessary to properly construct and develop monitoring wells that have minimal silt and clay in the sand pack and formation immediately surrounding the screened interval. Groundwater samples will be collected using "low-flow" techniques in order to minimize stress on the surrounding aquifer and disturbance of silt and clay in the well and surrounding formation. It is also necessary to collect groundwater samples under conditions that are representative of the range of seasonal and man-made variations in groundwater elevations. After evaluating man-made influences (if any) caused by pumping in nearby supply wells, two (2) rounds of groundwater sampling will be conducted at times representative of seasonally high and low water table conditions.

Evaluate Potential Vapor Intrusion Pathway - If VOCs are present in the subsurface media, an exposure assessment will be incomplete without a soil vapor intrusion (SVI) study. At this point, reliable information regarding the potential presence of a chlorinated solvent plume or other VOCs is lacking due to the age of the PSA data and the excessive turbidity of the groundwater grab samples collected and analyzed during the PSA. Furthermore, the existence and location of potential subsurface sources of VOCs such as an underground fuel oil storage tank or suspected Drywells 2 and 3 have not been determined.

A SVI investigation will be conducted during the heating season that ends on or about March 31, 2008, before the other investigation activities specified in this work plan are implemented. The final evaluation of the SVI data will be postponed until the subsurface data from the RI are available.

4.2 Data Requirements

The data obtained during this RI/FS must be sufficient for determining whether a threat to human health and the environment exists, and for developing and evaluating remedial action alternatives (including the no-action alternative).

4.2.1 Analytical Data

Quality Assurance/Quality Control (QA/QC) samples will be collected in accordance with the FSP and QAPP as appropriate for data verification or validation. All laboratory analysis of samples will be conducted by a laboratory certified under the New York Sate Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) for ASP/CLP analytical methods. Analytical results will be reported with Category B deliverables.

To the extent practicable, analytical methods will at a minimum have detection limits that meet standards, criteria and guidance (SCGs) as follows.

5. RI/FS SCOPE

This section describes the activities that will be performed during the RI/FS. Detailed procedures regarding the field investigation activities and the collection of environmental samples are provided in Section 6.1 – Field Sampling Plan. QA/QC procedures are specified in Section 6.2 - QAPP. All field activities will be conducted in accordance with the site-specific Health and Safety Plan (HASP) (Appendix A).

5.1 RI Field Tasks

The field investigation activities will follow a prescribed sequence. The first phase of monitoring wells will provide hydrogeologic information needed to identify the lateral and vertical components of groundwater flow relative to potential source areas. A second phase of monitoring wells will be installed if the initial monitoring wells do not to provide adequate coverage of flow paths from potential source areas. After groundwater flow paths are identified, a soil boring will be advanced for the purpose of evaluating the lateral and vertical extent of soil impacts in the vicinity of former Drywell 1. Table 5-1 provides a summary of proposed soil borings and monitoring wells, including target depths and investigatory objectives. Table 5-2 lists the quantities of environmental and QA/QC samples and required analyses. Figure 5-1 shows the locations of the proposed soil borings and Phase 1 monitoring wells.

5.1.1 SVI Investigation

A SVI investigation will be conducted during the heating season that ends on or about March 31, 2008. The SVI investigation sampling will consist of one sub-slab soil gas sample from within the office building, one indoor air sample collected from within the first floor office space and an ambient air sample taken outside the building on the upwind side, concurrently over an eight (8) hour period. The sampling will be conducted in accordance with "Guidance for Evaluating Soil Vapor Intrusion in New York State" (NYSDOH, October 2006). Samples will be analyzed by USEPA Method TO-15. The analytical data package will be submitted to a qualified data validation subcontractor for preparation of a Data Usability Summary Report (DUSR). Upon completion, the DUSR and analytical data will be provided to the DEC. The final evaluation of the SVI data will be completed after the subsurface data from the RI are available.

Prior to the SVI sampling, a pre-sampling inspection will be performed to identify and minimize conditions that may interfere with the testing. The inspection will evaluate the type of structure, floor layout, air flows and physical conditions of the office building. Potential interference from products or activities releasing volatile organic compounds (VOCs) will be identified. During the inspection, containers will be screened with a photo-ionization detector (PID) to determine whether VOCs are leaking from the container. The information from the inspection will be recorded on a building inventory form similar to the one provided in Appendix B of the above-referenced guidance document.

If practicable, potential sources of VOCs will be removed from the building prior to testing. If appropriate, once interfering conditions are corrected, the building will be ventilated prior to sampling to minimize residual contamination in the indoor air. Ventilation (if any) will be completed 24 hours or more prior to the scheduled sampling time.

5.1.2 Utility Mark-Outs and Clearance

Prior to conducting the intrusive activities described below, the proposed locations of subsurface utilities will be marked in the field. Dig Safely New York will be contacted at least three (3) full working days prior to mobilization to the site to request that the local utility companies (i.e., gas, electric, telephone, cable, water, sewer, etc.) mark-out and provide clearance for their respective utilities. Bartlett Tree personnel will be requested to identify the locations of any known, non-public subsurface utilities or structures on the site. Some of the proposed drilling locations may be adjusted to provide adequate clearance from utilities.

5.1.3 Geophysical Survey

A surface geophysical survey will be conducted in accessible areas of the site using electromagnetic (EM) induction and ground penetrating radar (GPR) techniques to attempt to identify the approximate locations and limits of potential subsurface leaching structures, including Drywell 2 and Drywell 3. The survey will also address the potential existence of a fuel oil UST near the north side of the office building. There may be some features on the site that cause local interference with the measurements made by the geophysical equipment (for example, large metal objects such as the open storage shed and trucks). The survey will be conducted after temporarily parking trucks and automobiles elsewhere.

Findings of the geophysical survey may be used to modify locations of proposed soil borings or add additional borings to further characterize conditions associated with subsurface structures. The DEC will be provided with the results of the geophysical survey and notified in advance of any modifications of or additions to the soil boring program.

5.1.4 Evaluation of Potential Leaching Structures

Potential leaching structures, including Drywell 2, Drywell 3 and any others identified through the geophysical survey, will be assessed by removing pavement and/or manhole covers and advancing a boring through the structure into the underlying soils. The suspected location of former Drywell 2 will be identified in the field by scaling distances from site features depicted on the architectural drawing "Truck Shed Structure for Bartlett Tree Experts, Union Ave. Westbury, NY"; Herman C. Knebel, Arch't; July 25, 1963 (Appendix B). The asphalt pavement over the suspected location of Drywell 2 will be saw-cut and removed by hand to expose the rim of the drywell and the cast iron frame and grating referenced on the drawing, if they exist. The cast iron manhole cover over suspected Drywell 3 will be removed. It will be determined whether the sanitary facilities are connected to the municipal sanitary sewer or any of the drywells. If necessary, dye tests will be performed to verify connections (if any) to drywells/cesspools.

A boring will be advanced using direct-push (GeoProbe®) equipment through the interior of the potential leaching structures and into the underlying soils. If the cast iron grate covering a drywell can not be removed, or the soil boring can not be advanced through the bottom of the drywell, then the boring will be relocated immediately adjacent to the drywell, preferably on its southwest (presumed downgradient) side.

Soils and/or fill materials will be collected continuously and logged in accordance with the Burmister soil classification system and classified using the Unified Soil Classification System (USCS) in accordance with the Field Sampling Plan. Representative soil samples will be collected for laboratory analysis from the following depths:

- Immediately below the identified base of the structure;
- Approximately 5 feet below the base of the structure; and
- Approximately 10 feet below the base of the structure.

Soil samples for laboratory analysis may be collected from alternate depth intervals if indications of contamination are noted (e.g., NAPL, staining, chemical odors, elevated photo ionization detection (PID) readings). The soil samples will be submitted for the following analyses:

- TCL VOCs by USEPA SW-846 Method 8260
- TCL SVOCs by USEPA SW-846 Method 8270C
- TCL Pesticides by USEPA SW-846 Method 8081A
- Organophosphorous Pesticides by USEPA SW-846 Method 8141A
- Chlorinated Herbicides by USEPA SW-846 Method 8151A
- TAL Metals by USEPA SW-846 Method 6010B/7471A
- PCBs by USEPA SW-846 Method 8082

In accordance with discussions with the DEC, if no impacts by leaching pesticides or other substances are identified at the sample depths specified above, the structure will not be considered a contaminant source and deeper sampling will not be required.

5.1.5 Monitoring Wells

Installation of upgradient monitoring wells will require an access agreement with the owner/operator of the parking lot adjacent to the north side of the site. If any other off-site monitoring wells are identified as necessary to Bartlett's investigation of the site, such wells may also require access agreements.

5.1.5.1 Phase 1 Monitoring Wells

The Phase 1 monitoring wells will include two well pairs (MW-1S/1D and MW-2S/2D) consisting of a shallow (water table) well and a deep well, and a fifth, shallow (water table) monitoring well (MW-3S) in a presumed sidegradient location. The single, shallow well (MW-3S) to be installed at the side-gradient location will facilitate defining groundwater flow direction, but a deeper well at the same side-gradient location will not contribute appreciably to achieving this objective.

Deep Wells

The deep wells (MW-1D, MW-2D) will be installed first to permit evaluation of the stratigraphy in these areas, including identification and characterization of the reported black dense silt layer that will govern the depth of the shallow well in each well pair. The deep wells will be installed using Rotosonic® drilling techniques (see FSP for description). The borings for the deep wells will be advanced to a depth of 120 feet to permit identification of the clay layer referred to in the PSA report at approximately 100 feet bgs. The borings for the deep wells will be filled with cement/bentonite grout to approximately 73 feet bgs before installing a well screen from 62-72 feet bgs.

Continuous soil core samples will be collected in the inner barrel of the Rotosonic® drilling apparatus, in lengths ranging from 10 to 20 feet. The geologic characteristics of the soil will be described in detail in

accordance with the FSP. The soil will be screened for volatile organic compounds with a PID in accordance with the FSP. Representative samples of the soil core will be retained for future reference or sieve analyses.

A representative sample of soil for laboratory analysis will be collected in each boring from the interval to be screened by the deep monitoring well (i.e., 62-72 feet bgs). Soil samples for laboratory analysis may also be collected from alternate depth intervals if indications of contamination are noted (e.g., NAPL, staining, elevated PID readings, chemical odors). The soil samples will be submitted for the following analyses:

- TCL VOCs by USEPA SW-846 Method 8260
- TCL SVOCs by USEPA SW-846 Method 8270C
- TCL Pesticides by USEPA SW-846 Method 8081A
- Organophosphorous Pesticides by USEPA SW-846 Method 8141A
- Chlorinated Herbicides by USEPA SW-846 Method 8151A
- TAL Metals by USEPA SW-846 Method 6010B/7471A
- PCBs by USEPA SW-846 Method 8082

Monitoring wells will be installed with a 10-foot well screen set within the interval from approximately 62-72 feet bgs. The wells will be constructed of two-inch diameter, Schedule 40, PVC well casing with 0.010" slot PVC screens with an appropriately-sized sand pack. Prior to installation of the well, any portion of the borehole below the interval to be occupied by the sand pack and well screen will be filled with bentonite pellets or cement/bentonite grout via a tremie pipe. Monitoring well installation procedures are provided in the FSP.

After a minimum period of 24 hours has passed following deep well installation (to allow for the cement/bentonite grout to set), each well will be developed. Well development will be conducted in accordance with procedures in the FSP. The wells will be allowed to rest for a minimum of 10 days before being sampled.

Shallow (Water Table) Wells

Following installation of the deep monitoring wells, the shallow wells (MW-1S, MW-2S, MW-3S) will be installed using conventional hollow-stem auger (HSA) techniques (see FSP for description). The boring for monitoring well MW-3S will be advanced to a depth of 60 feet to permit identification of the black, dense silt layer referred to in the PSA report as being present at approximately 15 feet below the water table. It will not be necessary to advance the borings for monitoring wells MW-1S and MW-2S deeper than needed for well installation because the stratigraphy at these locations will have already been identified in the adjacent deep wells (i.e., MW-1D, MW-2D). Continuous split-spoon soil samples will be collected. The geologic characteristics of the soil will be described in detail in accordance with the FSP. The soil will be screened for volatile organic compounds with a PID in accordance with the FSP. Representative samples of the soil will be retained for future reference or sieve analyses.

A representative sample of soil for laboratory analysis will be collected in each boring from within the saturated interval to be screened by the shallow monitoring well. Soil samples for laboratory analysis may also be collected from alternate depth intervals if indications of contamination are noted (e.g., NAPL, staining, elevated PID readings, chemical odors). The soil samples will be submitted for the following analyses:

5.1.7 Evaluation of Soil Impacts at Drywell No. 1

After horizontal and vertical groundwater gradients are determined by measurement of water levels in the Phase 1 monitoring wells, a deep soil boring (SB-1) will be advanced at a confirmed downgradient location approximately 10 feet from former drywell no. 1. The boring will be advanced using hollow-stem augers to a depth of 80 feet.

Split-spoon samples will be collected continuously and logged in accordance with the Burmister soil classification system and classified using the Unified Soil Classification System (USCS) in accordance with the Field Sampling Plan. Representative soil samples will be collected for laboratory analysis from the following depths (samples may be collected from additional zones based on field evidence of impacts at other depths):

- In the unsaturated zone, within the interval where the highest total pesticide concentrations were identified in soil beneath the drywell (22-34 feet bgs);
- The interval immediately below the water table, where a groundwater grab sample was collected during the PSA (approximately 37 feet bgs);
- Approximately 62 feet bgs, where the deeper groundwater grab sample was collected during the PSA investigation; and
- Approximately 80 feet bgs.

Three shallower soil borings (SB-3, SB-4, SB-5) will be advanced to delineate the lateral extent of potential impacts in the soils surrounding Drywell 1. The borings will be advanced at locations on the three sides of the drywell not covered by the deep soil boring, at a distance of approximately 10 feet from the drywell. The borings will be advanced using direct push (GeoProbe®) methods. Representative soil samples will be collected for laboratory analysis from the following depths (samples may be collected from additional zones based on field evidence of impacts at other depths):

- In the unsaturated zone, within the interval where the highest total pesticide concentrations were identified in soil beneath the drywell (22-34 feet bgs); and
- The interval immediately below the water table, where a groundwater grab sample was collected during the PSA (approximately 37 feet bgs).

Soil samples for laboratory analysis may be collected from alternate depth intervals if indications of contamination are noted (e.g., NAPL, staining, chemical odors, elevated PID readings). The soil samples will be submitted for the following analyses:

- TCL VOCs by USEPA SW-846 Method 8260
- TCL SVOCs by USEPA SW-846 Method 8270C
- TCL Pesticides by USEPA SW-846 Method 8081A
- Organophosphorous Pesticides by USEPA SW-846 Method 8141A
- Chlorinated Herbicides by USEPA SW-846 Method 8151A
- TAL Metals by USEPA SW-846 Method 6010B/7471A

All soil samples collected beneath Drywell 1 during the PSA were analyzed for PCBs. Because no PCBs were detected, the soil samples collected in this location during the RI will not be analyzed for PCBs.

5.1.8 Soil Sampling in Pesticide Storage Area and Open Shed

Soil borings will be advanced in the areas of the pesticide storage shed (SB-6) and the open shed at the north end of the site (SB-7). The borings will be advanced using direct push (GeoProbe®) methods. If the roof of the pesticide storage shed is too low to permit access by the direct-push rig or the shed is otherwise not accessible by the rig, a boring will be advanced with a hand auger, slam bar soil sampler, or similar manual equipment. Representative soil samples will be collected for laboratory analysis from the following depths (as practicable). Samples may be collected from additional zones based on field evidence of impacts at other depths:

- The interval from 0-2 feet immediately below the concrete floor or asphalt paving;
- 5-7 feet bgs; and
- 10-12 feet bgs.

Soil samples for laboratory analysis may be collected from alternate depth intervals if indications of contamination are noted (e.g., NAPL, staining, chemical odors, elevated PID readings). The soil samples will be submitted for the following analyses:

- TCL VOCs by USEPA SW-846 Method 8260
- TCL SVOCs by USEPA SW-846 Method 8270C
- TCL Pesticides by USEPA SW-846 Method 8081A
- Organophosphorous Pesticides by USEPA SW-846 Method 8141A
- Chlorinated Herbicides by USEPA SW-846 Method 8151A
- TAL Metals by USEPA SW-846 Method 6010B/7471A
- PCBs by USEPA SW-846 Method 8082

5.1.9 Slug Tests

In-situ hydraulic conductivity tests (i.e., slug tests) will be performed on each monitoring well installed during the investigation to evaluate the horizontal hydraulic conductivity of the adjacent formation. Rising head slug tests will be conducted in accordance with the procedures described in the FSP and the data generated will be input into AQTESOLV® software for hydraulic conductivity calculations.

5.1.10 Groundwater Monitoring

A site-wide round of groundwater sampling will be conducted after development and slug testing of the monitoring wells. Sampling will be conducted after at least one (1) week has passed following the completion of slug testing to allow for establishment of equilibrium conditions within the monitoring wells. A second round of groundwater sampling will be timed to correspond to contrasting seasonal groundwater conditions (high or low water table and/or seasonal pumping influences, if any).

Depth to water measurements will be conducted prior to groundwater sampling. Based on the findings of the PSA, it is unlikely that non-aqueous phase liquids (NAPL) are present in on-site soils and groundwater. However, if NAPL is noted in the course of installing the monitoring wells, the wells will also be gauged with an interface probe for the presence of NAPL prior to sampling. In the event that NAPL is detected in a monitoring well, a groundwater sample will not be collected from that well. Groundwater samples will be collected according to the USEPA low-flow sampling protocol and in accordance with procedures outlined in the FSP.

The groundwater samples will be submitted for the following analyses:

- TCL VOCs by USEPA SW-846 Method 8260
- TCL SVOCs by USEPA SW-846 Method 8270C
- TCL Pesticides by USEPA SW-846 Method 8081A
- Organophosphorous Pesticides by USEPA SW-846 Method 8141A
- Chlorinated Herbicides by USEPA SW-846 Method 8151A
- TAL Metals by USEPA SW-846 Method 6010B/7471A

All groundwater samples collected during the PSA were analyzed for PCBs. Because no PCBs were detected, the groundwater samples collected during the RI will not be analyzed for PCBs

5.1.11 Groundwater Level Monitoring

Monthly depth to water measurements will be conducted on the monitoring wells for a period of six (6) months. The monthly measurements may be extended if necessary to include both seasonally low and high water table conditions (i.e., late summer/early spring). It is necessary to know whether on-site groundwater levels are subject to short term fluctuations before interpreting monthly water level measurements as being representative of typical conditions during any given time frame. Short-term fluctuations could have a number of potential causes, including the operation of nearby pumping wells or recent precipitation melt events.

Prior to initiating monthly water level measurements, data logging pressure transducers (In-Situ Mini-Trolls™) will be temporarily installed in both wells of a shallow/deep well pair to continuously record water level data. The automatic data loggers will be configured to record water levels for a period of approximately two (2) weeks, after which they will be removed and the data uploaded to an Excel spreadsheet for evaluation and generation of hydrographs.

5.1.12 Investigation-Derived Waste (IDW)

Waste generated during the RI will include soil cuttings, well development water, equipment decontamination water, disposable sampling equipment, and personal protective equipment (PPE). The waste will be temporarily containerized in polyethylene tanks or NYSDOT-approved, 55 gallon drums pending waste characterization and appropriate off-site disposal in a permitted facility. All containers will be properly labeled to identify their contents.

5.2 RI Data Evaluation and Reporting

5.2.1 Data Validation

Laboratory results for the soil and groundwater samples will be forwarded to an independent data validation service for qualitative data validation and preparation of a Data Usability Summary Report (DUSR) in accordance with NYSDEC Guidance for the Development of Data Usability Summary Reports (revised September 1997). The DUSR will present a summary of data usability, including a discussion of qualified and rejected data and provide recommendations for resampling/reanalysis, as applicable. A complete copy of the DUSR, signed by the reviewing validator, will be provided to the NYSDEC.

The criteria for qualitative data validation include the following:

- Data Completeness,
- Sample Temperatures,
- Holding Times,
- Analytical Detection Limits and Sample Quantitation
- Surrogate Recovery,
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Review,
- Laboratory Control Sample (LCS),
- Review of QA/QC Samples,
- Overall Evaluation of Data,
- Gas chromatograph/mass spectrometer/GC/Electron Capture Detector (GC\MS \GC\ECD) Instrument Performance,
- Initial Calibration,
- Continuing Calibration,
- Internal Standards,
- Target Compound Identification,
- System Performance, and
- Serial Dilution.

Target compound identification and GC/MS/GC/ECD instrument performance are both for organic analyses only.

5.2.1.1 Qualitative Data Validation Criteria

Data Completeness

The data completeness criterion incorporates a checklist of what should be found in a data package. It also identifies the types of forms used for certain analyses. A complete data set is considered to have the following: case narrative, data summary, surrogate recovery summary, MS/MSD summary, and LCS summary. In addition to identifying missing components of the data package, the data completeness check

also includes verifying the following criteria: proper analytical method selection and documentation, use of the proper analytical data sheets, appropriate EPH/VPH report formats, sample preservation documentation, and documentation clarity.

Sample Temperatures

Most environmental samples are required to be held within a temperature range of 2-6°C. The rationale for this range is that temperature affects various chemical and biological degradation processes, including solubility. Freezing of samples should be avoided as well.

Holding Times

Various parameter groups have different allowable holding times. Holding times are a function of solubility, rates of decay, evaporation, and other factors that are function of time and potentially affect the concentrations of contaminants. The results of samples that are tested outside of the holding time ranges are considered estimates, since there may have been sufficient time for a constituent loss or a reduction in concentration to have occurred.

Analytical Detection Limits

Various analytes and various concentrations require different detection limits. This review focuses on whether or not the detection limits are sufficiently low to detect relevant concentrations of the samples by comparison to DQOs or project action limits, and examines diluted samples. As a sample is diluted to bring the concentration within the calibration curve the detection limit changes as a multiple of the dilution factor. This elevated detection limit will be avoid to the extent practical, however in some cases the elevated detection limit may not impact the DQOs (e.g., NAPL-impacted soil may make the issue of DQO compliance moot as the soil would clearly be impacted).

Surrogate Recovery

Surrogate recoveries are performed on each organic sample. Surrogate recoveries are one of several ways to examine the potential for matrix interference. Chemicals that are not specifically analyzed for are added (spiked) to the sample matrix in a known quantity, and the laboratory analyzes the sample. The result is weighed against the known quantity added, and the percent difference between the spiked concentration and the analytical result provides a measure of possible matrix interference. Surrogate recovery data are reported as a percentage. The Relative Percent Difference (RPD) may be reported if a surrogate recovery duplicate is performed.

In general, if a lab has recoveries that are too low, then the results for that analysis are considered to be biased low, and if too high, the results are considered to be biased high. In each case the results should be considered an estimate and are qualified as such. In extreme cases where the recoveries are poor, in that they have a zero recovery, the data should be considered for rejection.

MS/MSD

Matrix Spike/Matrix Spike Duplicates (MS/MSDs) are similar to the surrogate recovery in that they are spiked samples performed in the sample matrix. There are several distinct differences, however. One difference is that the chemicals added are the same chemicals that are being analyzed for; moreover, MS/MSDs are performed on each constituent group analyzed in the samples, not just organic compounds. MS/MSDs also address whether or not the matrix interferes with the analysis.

As with surrogate recoveries, low MS/MSD recoveries indicate that the results may be biased low, and high recoveries indicate results that may be biased high. As with surrogate recoveries, MS/MSD data are reported in the form of percentages.

Laboratory Control Sample

Laboratory control samples examine the laboratory's accuracy and precision, where the focus is on the laboratory equipment and procedures. Unlike the MS/MSDs and the surrogate recovery analyses, the LCS analysis is performed with laboratory grade de-ionized water. The LCS results are reported in percentages, with low results indicating that the results may be biased low, while high results indicate the results may be biased high.

Laboratory Case Narrative

The laboratory case narrative describes inconsistencies observed by the laboratory during analysis. The case narrative states what was done differently, if anything, from prescribed methods, identifies holding time violations if any, and outlines other difficulties the lab may have encountered.

Analytical Detection Limits and Sample Quantitation

For organic compounds, the accuracy of the contract-required quantitation limits (CRQL) and the reported quantitation results are calculated through a series of equations. Quantitation results are a function of the mass and area of internal standard ion added, the amount of dilution, the volume of water purged during the process and the relative response factor (RRF). The RRF is a ratio of the internal standard concentration and ion area to the target ion's concentration and ion area. The CRQL is adjusted simply by multiplying by the dilution factor.

For inorganic data, detection limit results are evaluated using a simple guideline. For those results less than twice the instrument detection limit (IDL) a "J" qualifier is added. For those results greater than twice the contract required detection limit (CRDL), no flags are added.

Overall Evaluation of Data

The overall evaluation of the data is a holistic assessment of all the data. The entire data package and data review results are reviewed, and a narrative is prepared outlining concerns and comments about the quality of the data. Rarely are additional qualifications or rejections made based on the overall evaluation.

GC/MS/GC/ECD Instrument Performance

Gas chromatograph/mass spectrometer/GC/Electron Capture Detector (GC/MS/GC/ECD) instrument performance, also referred to as "tuning", is designed to demonstrate accurate mass resolution, identification, and sensitivity of the equipment. Instrument performance is evaluated using standard solutions and rarely results in rejections.

Initial Calibration/Continuing Calibration

Initial and continuing calibrations are standards for instrument calibration ensuring that the instruments are detecting the appropriate concentration ranges and produce a linear calibration curve. The initial calibration demonstrates that the equipment is capable of detecting the appropriate ranges and is producing the proper

calibration curve. The continuing calibration produces 12-hour relative response factors (RRF) and checks the instrument daily throughout its use on the sample delivery groups (SDGs). The RRF is used to calculate quantitation and must be greater than 0.05, and produce percent differences within a range of plus or minus 25%.

Internal Standards

Internal standards evaluate GC/MS sensitivity and responses for stability. The internal standard areas must not vary by greater than a factor of two from the calibration standard, and the retention time within the columns must not vary by more than thirty seconds.

Target Compound Identification

Target compound identification examines the GC/MS results for false readings. The ions are scrutinized for concentration variances; the ions present within the standard mass spectrum with a relative percent intensity greater than 10% must also appear in the sample spectrum. If the ions that have a relative percent intensity greater than 10% are not in the sample spectrum they must be accounted for. Ions that are in both the standard and sample spectrum must have a relative percent intensity that is within 20% of each other.

System Performance

System performance examines the accuracy of the instrumentation. As samples are analyzed, changes may occur that will impair the various instruments ability to accurately analyze data. Sudden, severe shifts in the Reconstructed Ion Chromatogram (RIC) baseline can indicate decreasing resolution of the calibrated zero concentration. Inexplicable peaks, split peaks, or unusually high background readings can all also indicate problems with the instruments, and may lead to inaccurate readings.

Serial Dilution

The serial dilution examines matrix interference from physical or chemical sources. One serial dilution must be performed for each type of sample matrix, concentration level, or SDG, depending on what would be more frequent. Field Blanks must not be used. The dilution must be within 10% of the original concentration if that concentration is greater than 50 times the instrument detection limit (IDL).

5.2.2 Data Summary Report

Prior to completing the RI Report, an RI Data Summary Report will be provided to the DEC. The RI Data Summary Report will include the following:

- All data generated during the field investigation;
- DUSR and tabular and graphic summaries of the analytical results;
- Maps of sampling locations;
- Maps of groundwater elevations and flow directions;
- Hydrogeologic cross-sections.

Accompanying the RI Data Summary Report will be conclusions and recommendations regarding the need (if any) for Phase 2 monitoring wells or other data necessary (if any) to complete the RI and human/ecological exposure assessments.

5.2.3 Qualitative Human Health Exposure Assessment

A Qualitative Human Health Exposure Assessment (HHEA) will be performed to identify potentially exposed human populations. The Assessment will be performed after submittal of the RI Data Summary Report to the DEC, and written concurrence from the NYSDEC and the NYSDOH that the data are sufficient to adequately support the assessment. The assessment will be based on an evaluation of the identified contamination including transport and fate, the presence of potential human receptors (present and future), and potentially completed exposure pathways. No quantitative estimates of potential human health risks (i.e., contaminant toxicity or effect) will be performed.

5.2.4 Assessment of Need for Fish and Wildlife Resources Impact Analysis

Completion of the RI field work and the evaluation of chemical transport and fate are necessary to assess whether or not there may be completed exposure pathways to any fish and wildlife resources. If, after submittal of the RI Data Summary Report, FA Bartlett Tree Experts and the NYSDEC/NYSDOH mutually agree that the data indicate a potential for a completed exposure pathway between the site and significant habitats, then a limited Fish and Wildlife Resource Impact Analysis (FWRIA) focusing on completed pathways will be performed to identify potentially impacted fish and wildlife resources. The pathway analysis will be conducted in general accordance with Section 3.10 of DRAFT DER-10 Technical Guidance for Site Investigation and Remediation.

5.2.5 RI Report

An RI report will be prepared after submittal of the RI Data Summary Report to the DEC, and receipt of written concurrence from the NYSDEC and the NYSDOH that the data are sufficient to adequately support the HHEA and, if needed, the limited FWRIA referenced in the preceding sections.

The Remedial Investigation report will address the following:

- The identity and characteristics of the source(s) of contamination;
- The amount, concentration, environmental fate and transport, phase, location, and other significant characteristics of the substance(s) present;
- Hydrogeologic characteristics, including grain size analysis, soil permeability, depth to saturated zone, hydraulic gradients, proximity to surface water, floodplains, and wetlands;
- Routes of exposure and potential human receptors; and
- Potential routes of exposure (if any) to fish and wildlife.

The Remedial Investigation report will include the following:

- All of the relevant information obtained under Section 5.1 of this work plan;
- Descriptions of the work done under this work plan and the results of that completed work;
- Deviations from this work plan that result from unexpected conditions encountered during the investigation;
- Summary of the overall nature and extent of contamination referencing any exceedances of applicable local, State and federal standards, criteria, and guidance;

- Summary of any ecological assessments conducted;
- Soil boring logs, well construction diagrams, well development data, and field parameter readings from collection of groundwater samples;
- Hydrogeologic cross-sections of the site;
- Sample location maps with sample depth and contaminant concentrations indicated on the maps;
- Groundwater elevation contour maps with flow directions specified; and
- Conclusions which summarize the areas of concern, identify any potentially completed exposure pathways, and recommendations for any future work (e.g., none, additional investigation, or an evaluation of remedial alternatives (i.e., Feasibility Study).

5.3 Feasibility Study

A feasibility study (FS) will be conducted to ensure that an appropriate range of remedial alternatives are developed for all site media requiring remediation. The FS will be conducted in general accordance with the following guidance:

- DRAFT DER-10 Technical Guidance for Site Investigation and Remediation; New York State Department of Environmental Conservation; December 2002.
- DER-15: Presumptive/Proven Remedial Technologies; New York State Department of Environmental Conservation; February 27, 2007.
- Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Interim Final); U.S. Environmental Protection Agency, Office of Emergency and Remedial Response; October 1988.
- A Guide to Developing and Documenting Cost Estimates During the Feasibility Study; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response & U.S. Army Corps of Engineers Hazardous, Toxic, and Radioactive Waste Center of Expertise; July 2000 (supersedes Section 6.2.3.7 of the October 1988 guidance referenced above).

5.3.1 Development of Remedial Action Objectives

Remedial action objectives will be developed based on the results of the RI and SCGs or applicable or relevant and appropriate requirements (ARARs). The remedial action objectives will specify the contaminants and media of interest, exposure pathways, and preliminary remediation goals.

5.3.2 Development of Potential General Response Actions

General response actions will be developed for each medium of interest. These general response actions may include:

- The no-action alternative;
- Institutional actions, such as deed recording, etc.;
- Containment with or without treatment;
- Long-term residual management of untreated waste or residuals;
- Treatment to reduce toxicity, mobility, and/or volume of waste; or
- Monitored natural attenuation.

5.3.3 Identification and Screening of Technologies and Process Options

The technologies applicable to each general response action will be identified. Process options for each of the technologies will also be identified. These process options will be assembled into alternatives that represent a range of potential remedial alternatives.

5.3.4 Detailed Screening of Remedial Alternatives

The remedial alternatives will be evaluated to determine their effectiveness in meeting the remedial action objectives. The alternatives will be evaluated with respect to the following criteria:

- Overall protection of human health and the environment, including the degree to which existing risks are reduced, the time required to reduce the risks, and on-site and off-site risks resulting from implementing the alternative.
- Attainment of the remediation goals and compliance with SCGs or ARARs.
- Long-term effectiveness, including the degree of certainty that the alternative will be successful, long-term reliability, magnitude of residual risks, and the effectiveness of controls required to manage treatment residues of remaining waste.
- Permanent reduction of toxicity, mobility, and volume through treatment, including adequacy of the alternative in treating and managing the hazardous materials, reduction and elimination of hazardous material releases, sources of releases, degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.
- Short-term effectiveness, including protection of human health and the environment during construction and implementation of the alternative prior to attainment of the remediation goals.
- The ability to be implemented, including consideration of whether the alternative is technically feasible; availability of needed off-site facilities services and materials; administrative and regulatory requirements; scheduling; size; complexity; monitoring requirements; access for construction, operations and monitoring; and integration with existing facility operations and other current or potential remedial actions.
- Cost, including consideration of present and future direct and indirect capital, operation, maintenance, and other foreseeable costs.
- Community acceptance.

5.3.5 Current Remedial Alternatives

Based on the findings of the 1998 PSA and an initial review of the available site information, the following remedial options are considered potentially viable at this time:

- No action
- Institutional controls
- Containment
- Excavation and disposal
- Treatment

The FS Report will present the development, screening, and detailed analysis of the range of appropriate alternatives for the site. The report text will be supported with accompanying maps, charts, and tables. The FS Report will be issued as a separate document from the RI Report.

The tentative outline for the FS Report is as follows:

Executive Summary
1.0 Introduction
1.1 Purpose and Organization of Report
1.2 Background Information
1.3 Current Site Conditions
2.0 Identification of Screening Technologies
    2.1 Remedial Action Objectives
    2.2 Technology Types and Process Options
3.0 Development and Screening of Alternatives
4.0 Detailed Analysis of Alternatives
4.1 Introduction
4.2 Individual Analysis of Alternatives
4.3 Comparative Analysis
5.0 Bibliography
Appendices

6. SAMPLING AND ANALYSIS PLAN

This Sampling and Analysis Plan (SAP) has been prepared for use in implementing the remedial investigation of the Bartlett Tree Company Site. The two major components of the SAP are the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP). The FSP provides the detailed procedures for the collection of environmental samples. The QAPP prescribes requirements for ensuring that the investigation is implemented in a manner consistent with the project's quality assurance objectives and to ensure that the technical data generated are of sufficient quality for making informed decisions regarding site groundwater and soil quality.

6.1 Field Sampling Plan

6.1.1 Drilling, Soil Sampling, Well Construction Procedures

6.1.1.1 Conventional Drilling

Before drilling each borehole, the drill rig, augers, drill rods, split-spoon samplers, and any other equipment that will enter the borehole will be steam cleaned (Section 6.1.8).

6.1.1.1.1 Split-Spoon Sampling

Soil sampling with split-spoons will be conducted in accordance with the standard penetration test (ASTM Method D-1586). The split-spoon sampler will be driven by dropping a 140-pound hammer from a height of 30 inches. The number of blows required to advance the sampler over each six-inch interval will be recorded.

Each sample will be described in accordance with the Unified Soil Classification System and the Burmister (1958) Soil Classification System. This information, together with a record of the length of the recovered portion of the sample interval, will be recorded. A representative portion from each sample will be stored in a glass jar for future reference.

6.1.1.1.2 Well Construction

Construction of the monitoring wells will be in accordance with the following installation sequence.

- Advance a borehole through the overburden to the target depth using 4.25-inch inside diameter (ID) hollow-stem augers.
- Collect continuous soil samples from the ground surface to the target depth using a two-inch diameter, two-foot long split-spoon sampler in accordance with the procedures described above.
- Install a two-inch Schedule 40 PVC riser casing and well screen (PVC) with flush-threaded joints in the boring through the augers. The screen will be ten to fifteen feet in length with 0.010-inch wide slots.
- Place a sand pack in the annular space from the bottom of the boring to two feet above the top of the screen. The sand will consist of clean, washed and rounded silica (quartz) sand designed for use with the specified screen slot size. A six-inch filter pack of finer-grained sand (choker sand) above the sand pack will be placed prior to the bentonite seal.

- Place a two-foot thick bentonite seal above the sand pack. In monitoring wells that exhibit a water table above the sand pack, bentonite pellets will be used to form the seal. Where the top of the sand pack is above the water table, a pre-hydrated bentonite slurry will be used to form the seal. Place a six- to twelve-inch thick fine grained filter sand above the bentonite seal.
- Measurements of material depths will be made by frequently sounding the annulus with a weighted tape measure during installation
- Cement/bentonite grout will be tremie-emplaced in the remaining annular space from the top of the bentonite seal and filter sand to approximately ½-foot below ground surface. The grout will consist of one bag (94 pounds) of Portland cement and five pounds of bentonite mixed with six gallons of potable water.
- Install a four-inch diameter stick-up or flush-mount protective casing (with locking cap) set in concrete in the remaining annular space from the top of the cement-bentonite grout seal to ground surface. Complete the surface installation with a concrete pad sloped to encourage surface drainage away from the well installation.

6.1.1.1.3 Well Construction Materials

Screen and Riser Casing

The screen and riser casing will be constructed of two-inch diameter Schedule 40 PVC. The joints will be flush threaded. The openings in the screen will consist of factory cut 0.010-inch wide slots.

Sand Pack and Filter Pack

The sand pack and the filter pack material will consist of clean, washed, and rounded silica (quartz) sand packaged and delivered in sealed bags. The material will contain less than five-percent non-siliceous material by weight. For the sand pack, 90 to 99 percent of the material will be retained by the selected screen, and it will have a uniformity coefficient of less than 2.5. The filter pack will be uniformly graded sand of which 100 percent by weight passes a No. 30 sieve and less than 2 percent by weight passes the No. 200 sieve.

Bentonite

The bentonite will be powdered, granular, or pelletized sodium bentonite furnished in sacks or buckets from a commercial source and free of impurities which could impact the water quality in a monitoring well.

Grout

The grout mixture used for the installation of the monitoring wells will consist of one bag (94 pounds) of Portland Cement and six pounds of bentonite mixed with six gallons of potable water. The grout will be placed by the tremie method.

Protective Casing

Each monitoring well will be completed with a four-inch or larger diameter stick-up or flush-mounted protective casing with a locking cap. The protective casing will be installed as per ASTM standards for monitoring well construction.

6.1.1.1.4 Well Development

Each well will be developed after a minimum period of 24 hours has passed following its construction (to allow for the cement/bentonite grout to set). Development will be conducted by the use of a surge block

and/or a small-diameter electric submersible pump (Grundfos Redi-Flo2® or equivalent), after the grout has set. The purpose of well development is to remove sediment in the well and to produce a surging effect within the sand pack. This surging of water into and out of the sand pack will loosen and remove the finer-sized particles in the pack and develop a natural gradation from the well screen to the formation. Since the development process must be forceful enough to penetrate into the sand pack, an appropriately sized surge block must be used. During the well development process, water quality parameters (pH, temperature, electrical conductivity, and turbidity) will be recorded to document improvement if attainable. Development will be considered complete once stabilization of the field parameters has been achieved and when there is no visible increase in the clarity of the evacuated water.

6.1.1.2 Rotosonic® Drilling

Before drilling each borehole, the drill rig, inner and outer drill pipe and any other equipment that will enter the borehole will be steam cleaned (Section 6.1.8).

6.1.1.2.1 Sonic Drilling Method

Rotosonic® drilling uses a combination of rotary power, hydraulic pull down pressure, and mechanically generated oscillations to advance a dual line of drill pipe. The top-mounted, hydraulically powered drill head transmits the rotary power, hydraulic down pressure and vibratory power directly to the dual line of pipe. The inner drill pipe, measuring from 3-inches to 9.5-inches inside diameter, contains a core bit and functions as the core barrel sampler, while the outer pipe, measuring 4-inches to 12-inches, is used to prevent the collapse of the borehole and in the construction of monitoring wells.

The above combination of forces advances the inner core barrel sampler through unconsolidated deposits and most consolidated formations without the use of water, mud, or air at rates equal to or greater than other conventional rotary methods when they include some method of continuous sampling. The inner drill pipe is always advanced in front of the outer drill pipe. Continuous core samples of 1 to 20 feet in length can be completed depending on job specifications and site conditions. Samples range from 3-inches to 9-inches in diameter.

The first step is to advance the inner drill pipe and core bit about 5 to 10 feet into the ground. Once the inner drill pipe is set, the outer drill pipe is advanced down over the inner drill pipe to hold the boring open. The inner drill pipe is mechanically lifted by the drill head to the surface for core sample recovery and the core sample is vibrated out of the inner drill pipe into plastic sheath or a stainless steel sample tray. Following extrusion of the core sample, the inner drill pipe is advanced to the next sample interval. These steps are repeated until the desired depth is reached.

The technique is capable of collecting highly representative, high quality soil samples that are suitable for field screening and laboratory analysis. The sonic core sampling technique does not introduce air or mud and little, if any water into the formation. The continuous core, over the full depth interval of each boring allows for the completion of an accurate description of the lithology and stratigraphy. Additional benefits of sonic drilling are the significantly lower volume of drill cuttings that are produced compared to conventional drilling methods and drilling rates that are usually greater than conventional methods under typical field conditions.

Each core sample will be described in accordance with the Unified Soil Classification System and the Burmister (1958) Soil Classification System. This information, together with a record of the length of the recovered portion of the sample interval, will be recorded. Representative portions of the core sample will be retained for future reference. In addition, field screening of the soil core will be performed with the use of a PID.

6.1.1.2.2 Well Construction

Construction of the monitoring wells will be in accordance with the following installation sequence.

- Advance a borehole through the overburden to the target depth using the sonic drilling method. A 4-inch diameter outer drill pipe and 3-inch diameter inner drill pipe (core sampler) will be used for the purposes of advancing each borehole.
- Collect continuous soil samples from the ground surface to the target depth using a 3-inch diameter core sampler.
- A flush-threaded, two-inch diameter, Schedule 40 PVC well screen (ten feet in length) and riser casing, will be placed to the bottom of the borehole within the outer drill pipe. Installation procedures for placement of well materials in the annular space between the well casing and borehole are provided in Section 6.1.1.1.2.

6.1.1.2.3 Well Development

Well development procedures are provided in Section 6.1.1.1.4.

6.1.2 Field Screening of Soil Samples

Each soil sample will be field screened for VOCs using a photoionization detector (PID). A PID is a non-specific vapor/gas detector that uses photoionization to detect various chemical compounds, both organic and inorganic, in air. Since it is nonspecific, it cannot identify substances, it can only roughly quantify them.

The PID site will be equipped with a 10.6 eV lamp. This type of lamp is capable of ionizing and detecting a broad range of volatile organic compounds. More information regarding the use of the PID for monitoring working conditions and determining the appropriateness of personal protection levels can be found in the Site Specific Health and Safety Plan (HASP).

Calibrating:

- The PID will be calibrated in accordance with the procedures outlined in the owner's manual and the battery will be checked for proper voltage at the beginning of each day before use
- Before calibrating; the instrument will be allowed to equilibrate with its surroundings temperature for about five minutes
- The instrument will be turned on and set on measurement mode
- The calibration result and background readings will be recorded in the field book
- If the PID shows erratic readings, additional calibration will be performed

Sampling:

1. The acetate liner or split spoon will be opened to access the soil sample
2. Next, "pockets" will be burrowed in the soil with a clean sampling spoon or a gloved hand
3. The probe/tip of the PID will be placed in the pocket and "enclosed" with a gloved cupped hand
4. Conditions will be allowed to stabilize and the reading recorded in the field book
5. The portion of the soil column registering the highest PID reading above background will be collected for laboratory analysis

Because the PID is sensitive to wind, high humidity and moisture, all efforts will be taken to limit the impact of these elements on the soil screening process.

For head-space screening, immediately transfer a representative subsample of the material to a clean glass jar and seal its lid with aluminum foil. Allow the sample to equilibrate for 15 to 30 minutes, then insert tip of the PID through the foil and record the maximum instrument reading.

6.1.3 Soil Sample Containerization and Shipping

All soil sample handling will be in accordance with the procedures specified in the QAPP (Section 6.2.7).

Soil to be analyzed for VOCs will not be homogenized. Soils to be analyzed for other parameters will be homogenized and containerized in the sample jars. The subject soils will be transferred into the sample jar using a laboratory-decontaminated plastic trowel or spoon or directly by gloved hand. The sample containers will be placed in a cooler that will be maintained at 4°C. The samples will be packaged so as to minimize the potential for breakage. All glass jars will be wrapped with protective packaging prior to placement in the cooler for transport. Plastic bags filled with ice and sealed, or blue ice containers will be placed inside each cooler with the samples to ensure that the preservation temperature is maintained. The sample coolers will be transferred, in accordance with the chain-of-custody procedures, to a courier for next-day delivery to the analytical laboratory.

6.1.4 Low-Flow Groundwater Sampling

6.1.4.1 Objectives

The objective of the low-flow groundwater procedure is to collect samples from monitoring wells while exerting minimum stress on the water-bearing formation and minimizing the disturbance of sediment in the well. The low-flow purging and sample collection technique follows the technique described within the USEPA documents titled "Ground Water Sampling Procedure, Low Stress (Low Flow) Purging and Sampling", (USEPA, Region 2, March 16, 1998) and "EPA Ground Water Issue: Low-flow (Minimal Drawdown) Ground-water Sampling Procedures" (EPA/540/S-95/504, April 1996). The general approach is to minimize the drawdown in the well during purging, thereby reducing disturbance prior to and during sampling. Typically this is accomplished by limiting the flow rate during purging and sampling to rates in the 100 to 500 ml/min range. The intended advantage of this procedure is the reduction in the turbidity and aeration of the samples, thereby producing samples which are more representative of the natural groundwater conditions. If well sampling or purging results do not meet the low-flow criteria (such that drawdown enters the screened zone or exceeds 0.3 feet) it will be noted in the field data sheets.

6.1.4.2 Equipment

- A submersible bladder pump or small-diameter electric submersible pump (e.g., Grundfos Redi-Flo2® or equivalent) is preferred when increased levels of dissolved oxygen (D.O.) is a concern in the collected groundwater sample.
- The discharge tubing will be laboratory- or food grade- polyethylene.
- Monitoring equipment during purging shall include a flow through cell equipped with field measuring devices for pH, turbidity, specific conductance, temperature, oxidation-reduction potential (ORP), and/or D.O.
- Water level measuring device, accurate to ±0.01 foot.
- Flow-rate measurement supplies such as graduated cylinders and stopwatch.

- Decontamination equipment and supplies.
- Well construction data.

6.1.4.3 Preliminary Site Activities

- Remove well cap and identify the pre-established elevation reference point on top of inside well casing.
- Measure and record the depth to groundwater (static water level) to within the nearest 0.01 foot from the reference point. Take care to minimize disturbance to the water column and avoid dislodging particulates attached to the sides of the well casing.
- In no case should any well be sounded prior to sampling as this may mobilize sediment in the bottom of the well.
- If dedicated equipment such as bladder pumps are not used, consideration should be given to placing the pump in the well 24 hours prior to sampling to allow any sediments in the well to settle.

6.1.4.4 Sampling Procedure

- **Install Pump** - Slowly lower the pump and downhole measuring device, as applicable into the well to a depth corresponding to the center of the screened interval. The intake should be kept within the well screen but no deeper than two feet below the top of the screen to prevent mobilization of sediment from the bottom. If less than two feet of water is present in the well prior to sampling, the intake shall be centered in the water column. For problematic monitoring wells, consideration should be given to installing the pump approximately 24 hours before initiating purging.
- **Re-Measure Groundwater Level** - Before starting the pump, measure the water level again with the pump in the well. Do not proceed until the water level has returned to within approximately 0.3 feet of the static level.
- **Purging** - Start pumping the well at approximately 200 to 500 milliliters per minute. The water level should be monitored as frequently as feasible immediately after the start of purging and then at least as frequent as every three to five minutes once the level has generally stabilized. Ideally, a steady flow rate should be maintained which results in a stabilized water level. The goal should be to not induce a drawdown in excess of approximately 0.3 feet (or approximately 2 percent of saturated thickness in low permeability formations). Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to effect stabilization of the water level. However, care should be taken to maintain pump suction and to avoid entrainment of air in the tubing. If the recharge rate of the well is very low, care should be taken to avoid loss of pressure in the tubing line, cascading through the sand pack, or pumping the well dry. Record each adjustment made to the pumping rate, observation of changes in appearance of the water collected (e.g., increased turbidity or color) and the water level measured immediately after each adjustment.
- **Monitor Indicator Parameters** - During purging of the well, monitor the following field indicator parameters at the frequencies stated above; turbidity, temperature, specific conductance, pH, ORP and/or D.O. In-line analyzers and continuous readout displays are recommended for all parameters so that the sample is not exposed to air prior to the measurement. However, if this is not feasible, temperature and/or ORP may be omitted from the list of in-line parameters. The well is considered stabilized and ready for sample collection when three consecutive readings are within a maximum range (from minimum to maximum measurements) as follows: $\pm$0.1 for pH, 3% for specific conductance, $\pm$10% for D.O., $\pm$10 mV for ORP, and $\pm$10% for turbidity. Measurement of the indicator parameters should continue every three to five minutes until these measurements indicate stability in the water quality. If the parameters have not stabilized after about an hour, purge the well until a minimum of 3 well volumes have been removed and proceed to collect the samples. This alternate procedure should be noted on the field data sheet.

- **Collect Samples** - Samples should be collected at flow rates of between 100 and 250 ml/min, or under flow conditions such that drawdown of the water level within the well is not induced beyond the tolerances specified above. If volatile organic compounds (VOCs) are to be analyzed, they should be collected first and discharged directly from the pump discharge tubing into pre-preserved sample containers. Sample containers should be filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence.
- **Remove Pump and Tubing** - After collection of the samples, the pump's tubing shall be properly decontaminated or discarded.
- **Well Depth** - Measure and record well depth.
- **Close Down** - Secure the well.
- **Decontamination** - The sampling equipment will be decontaminated between use at each well, as described in section 6.1.8.

6.1.5 Chain-of-Custody Procedures

All samples will be subject to complete custody documentation in accordance with the requirements in the QAPP (Section 6.2.8).

In the field, samples will be in physical possession or in view of the sampler/custody holder (typically the field sampling team leader). The sample may also be placed in a (designated) secure area by the custody holder.

Before sending samples to the analytical laboratory (typically by lab courier pick up), all appropriate sections of the Chain-of-Custody (COC) will be filled out. Sample containers will be labeled and must contain at least the following information: sample ID, sample date and time, and requested analysis. The COC will accompany the samples to the analytical laboratory, a copy of the COC stays in custody of the sampler.

The laboratory personnel will be responsible for the care and custody of samples from the time of receipt until the sample is exhausted or disposed. Custody rules will apply throughout the life of the sample in the laboratory. All documentation of sample custody within the laboratory will become a permanent part of the laboratory project files. The laboratory will submit an analytical report to Brown and Caldwell, including all custody documentation.

6.1.6 In-Situ Hydraulic Conductivity Test (Slug Test)

In order to determine the in-place hydraulic conductivity of the geologic material screened by the monitoring wells, rising head slug tests will be performed. These tests involve lowering the water level in the well and measuring the change in head with respect to time as the well is allowed to recover. In wells which are slow to recover the water level will be bailed down as described below. The measurements in these wells will be taken manually. Wells which recover too quickly for this method will be tested by removing only one bailer of water and the recovery measured by means of a pressure transducer system.

The rising head slug tests for fast recovery wells are conducted as follows:

- The static water level in the well to be tested is measured and recorded.
- The pressure transducer is placed in the well to a minimum depth of three feet below the static water level.

- Readings are made using the data logger until three consecutive readings are the same (static conditions).
- The data logger is then calibrated to read 0.00 feet at static conditions. Following the installation and calibration of the pressure transducer, a disposable bailer is lowered into the well and placed just below the water surface.
- Depth to water measurements are then recorded until the water level returns to static conditions following introduction of the bailer. If static conditions are not reached within 15 minutes following introduction of the bailer or slug, the well will be tested using the procedures described below for slow recovery wells.
- Once static conditions are re-established, the bailer will be rapidly removed from the water column, thus creating a virtually instantaneous decline of the water level in the well. Coincident with the withdrawal of the bailer, automatic logging of the water levels will be initiated using the data logger.
- The water level measurements will continue until water levels recover to within a minimum of 10 percent of the original static level (90 percent recovery), or an elapsed time of one hour. If after one hour the well has not recovered to the above criteria, at the discretion of the hydrogeologist, the transducer will be removed and the well will be re-tested at a later date using the procedures described below for slow recovery wells.
- Data stored in the data loggers will be uploaded to a portable computer and will be manipulated at a later date.

For slow recovery wells the following procedure is used:

- The static water level is measured and recorded.
- A disposable bailer is lowered into the well and placed just below the water surface. Depth to water measurements are then recorded until the water level returns to static conditions following introduction of the bailer
- The bailer is then removed and water level measurements are collected by hand (measuring tape or electronic water level indicator) at a frequency which will provide approximately 15 to 20 data points during recovery to within 10 percent of the total drawdown, if feasible.
- The data will be evaluated using the Bouwer and Rice method (1976) for unconfined aquifers and Cooper et. al., (1967) for confined aquifers.

6.1.7 Water Level Monitoring

The depth to groundwater will be measured with an electronic depth indicating sounder. The probe will be lowered into the well until the meter indicates water is reached. The probe will be raised above the water level and slowly lowered again until water is indicated. The cable will be held against the side of the inner protective casing at the point designated for water level measurements and a depth reading taken. The value will be recorded to the nearest 0.01 feet in a field notebook. The probe will be raised to the surface and together with the amount of cable that was wetted in the well, will be decontaminated with a distilled water rinse.

6.1.8 Decontamination

Field decontamination will be accomplished using the methods described below.

6.1.8.1 Drilling Equipment

All down-hole drilling equipment will be decontaminated before beginning drilling activities at the site, and after completion of each boring or monitoring well. Decontamination of the drilling equipment will be conducted over a decontamination pad using a high pressure steam cleaner. Rinsate accumulated in the decontamination pad will be pumped into DOT-approved 55 gallon steel drums pending waste characterization and appropriate off-site disposal.

6.1.8.2 Water Level Indicators

Upon completion of the water level measurements, the probe will be raised to the surface and along with the wetted portion of the tape will be decontaminated with the following procedure:

- Wash in potable water and laboratory detergent
- Rinse with potable water
- Rinse with deionized water

6.1.8.3 Submersible Pumps

When a submersible pump is used for well purging and/or sampling, it will be cleaned prior to and between each use. (Pump tubing will be discarded after each use.) The cleaning process will consist of the following:

- Wash the exterior of the pump with a detergent solution.
- Flush laboratory detergent solution through the pump by placing the pump in a bucket filled with the detergent solution.
- Flush potable water through the pump by placing the pump in a bucket filled with potable water.
- Rinse the packer with potable water.
- Rinse the internal and external portions of the pump with deionized water.

The power leads to the pump will be decontaminated in a similar fashion.

6.2 Quality Assurance Project Plan (QAPP)

The RI activities will be conducted in accordance with the quality assurance procedures specified in this QAPP to ensure that suitable and verifiable sampling and analytical results are obtained. The QAPP includes the items specified in Section 2.2 of DRAFT DER-10 Technical Guidance for Site Investigation and Remediation; NYSDEC; December 2002.

6.2.1 Project Scope and Goals

The goals and technical approach of the RI/FS are described in Section 4.1 of this work plan. The scope of the RI/FS activities is specified in Section 5.0.

6.2.2 Project Organization

Key project personnel and subcontractors, including the Project Manager, Quality Assurance Officer are identified in Section 7.2 and Figure 7-1 Project Organization.

6.2.3 Sampling and Equipment Decontamination

Sampling procedures and equipment decontamination procedures are specifies in Section 6.1 - Field Sampling Plan (FSP).

6.2.4 Site Map with Sample Locations

The locations of all proposed soil borings and monitoring wells are shown on Figure 5-1.

6.2.5 Analytical Methods

Table 5-2 provides specifications for all environmental media samples and quality control samples, including:

- Matrix type;
- Number of samples to be collected per matrix;
- Number of equipment and trip blanks per matrix;
- Analytical methods to be measured per matrix;
- Number and type of matrix spike and matrix spike duplicate samples to be collected;
- Number and type of duplicate samples to be collected.

Soil samples will be reported on a dry weight basis. Data will be reported in Category B format along with the required quality assurance data on the required forms and with all raw data including calibration data, blank data, chromatograms, quant reports, sample prep logs, sample run logs and percent moisture work sheets and will be provided in electronic format.

6.2.6 Field Quality Assurance/Quality Control Samples

Quality control procedures will be followed so that laboratory preparation, sampling, and transport activities do not bias the results of the chemical analysis. Trip blanks and field blanks will be prepared and analyzed as described below to provide a quantitative basis for validating the analytical data.

6.2.6.1 Trip Blanks

Trip blanks will be prepared only when aqueous sampling is performed, and only when that sampling involves VOC analysis; trip blanks will not be prepared for non-aqueous samples. A trip blank will consist of an analyte-free water sample prepared by the laboratory and will accompany the sample container shipment from the laboratory to the field and back. Trip blanks will be subject only to volatile organic analysis. Trip blanks will be collected at a rate of one per sample shipment or one per two day sampling event, whichever is greater.

6.2.6.2 Field (Equipment) Blanks

Field blanks, also referred to as equipment blanks, are used to determine if the sampling equipment used in the field might contribute appreciable concentrations of constituents to the samples. Laboratory grade deionized water is run over, or through, the sampling equipment and collected in the same type of sample jars as other samples. Ideally, the results for this analysis will show non-detects for the constituents analyzed. One Field Blank will be collected every day that samples are collected, or one per 20 samples, which ever is greater.

6.2.6.3 Duplicate Samples

Field duplicates are a second aliquot of a field sample. Variations in the sample and duplicate can be indicative of possible inaccuracy or imprecision of laboratory methodologies. One Field Duplicate will be collected for every 20 samples.

Field duplicates will be collected in one of two ways, depending on the analysis to be performed. For each analyte, with the exception of VOCs, the sample volume will be homogenized in plastic bowls with plastic spoons, or by kneading the material in a plastic bag (e.g., Ziploc© bag). Once homogenized, the material will be evenly distributed into the sample containers. Sample collection materials (bowls, spoons, plastic bags, gloves) will be laboratory decontaminated or single use.

Homogenization of sample material that will be analyzed for VOCs is inappropriate given the volatile nature of these constituents; homogenization would only provide a greater opportunity for constituent loss due to exposure to the atmosphere.

6.2.6.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples

Additional sample volumes will be collected for MS/MSD analyses to evaluate the effect of the sample matrix on the analytical method. Additional sample volumes for MS/MSD analyses will be collected at a frequency of one pair per sample batch, or at least 1 per 20 samples. The MS/MSD samples will be collected at the same time the primary sample is collected and should be collected from a sample location that contains concentrations of the constituent of concern.

6.2.7 Sample Handling Requirements

6.2.7.1 Sample Containers and Preservatives

The appropriate sample containers and associated preservatives must be obtained following the applicable NYSDEC and USEPA guidance. The containers and preservatives will be supplied by the laboratory that will conduct the analyses. It is crucial that the sample containers be carefully organized and inventoried prior to the initiation of the sampling program in order to provide sufficient time to rectify problems, should they occur. Finally, pre-printed sample labels will be placed on the sample containers.

The various required preservation methods, container types, and maximum sample holding times are listed on Table 6-1.

6.2.7.2 Sample Labels and Nomenclature

Sample labels are required on sample containers for the primary purpose of sample identification. Specific field data need not be recorded on the labels, since such information will be recorded on field data sheets. The sample labels will contain the following information:

- Sample ID Number
- Location identification number (i.e., well number, boring designation)
- Analysis to be performed
- Preservative (optional)
- Project name and number
- Date and time of sample collection
- Initials of sampler

Each sample collected will receive a distinct sample identifier. The sample identifier will consist of three parts; the first part will identify the area the sample was collected from within, the second part will identify the sample matrix, the third part will identify the specific sample. A complete list below identifies the different area and matrix identifiers. As an example, a soil sample collected using a split-spoon or a macro-core in Area A from Boring 1 would be designated A-B-001. The "A" designates the area, "B" identifies the sample as a soil boring, and "001" identifies the specific boring number. Each boring identifier will additionally have the depth interval added to the end of the identifier. In the example above, if the sample was collected from the 1-2 foot interval the sample identifier would be "A-B-001-01-02".

The Quality Assurance/Quality Control (QA/QC) samples will also be identified in three parts; sample type, date, and a unique number if more than one type is collected in a single day. For example, a duplicate would be identified as "DUP-mmddyy" and a second duplicate collected on the same day would be "DUP-mmddyy-1".

Below are the matrix/sample codes:

- "SB" indicates a soil boring
- "TP" indicates a test pit sample
- "SD" indicates a sediment sample
- "MW" indicates a groundwater (monitoring well) sample
- "FB" indicates a field blank
- "TB" indicates a trip blank
- "DUP" indicates a duplicate

6.2.7.3 Field Sample Storage

Sample containers will be held on-site for a period not exceeding two (2) calendar days. Sample shipments to the laboratory will be by overnight courier. When practicable, the sample containers will arrive back at the laboratory within four (4) days of their initial shipment to the field.

6.2.7.4 Sample Shipment

Shipment of samples to an analytical laboratory is usually required upon completion of sample collection. Proper packaging is necessary in order to protect the sample containers, to maintain the samples at a temperature of 4°C, and to comply with applicable transportation regulations.

In general, samples are shipped using packaging that is supplied by the analytical laboratory. The packaging normally includes a shippable insulated box such as an ice cooler and contains protective internal packaging materials such as foam sleeves. Some laboratories use proprietary sample packaging with integral internal packaging. In either case, provisions need to be made for maintaining the temperature of the samples with the use of re-freezable ice packs.

Regulations must be observed regarding the shipment of Dangerous Goods. Sample containers and certain field equipment may be defined as Dangerous Goods such that special requirements must be followed for their shipment. Air shipment of Dangerous Goods is regulated by the International Air Transport Association (IATA) as described in "Dangerous Goods Regulations" (IATA, current year). IATA Regulations are updated annually. Shipment by ground is regulated by the U.S. Department of Transportation (DOT; 49 CFR). Furthermore, individual shippers (e.g., Federal Express) or other countries (international shipments) may have additional requirements for dangerous goods shipment.

Environmental samples, (e.g., groundwater, surface water, or soil samples) containing relatively low concentrations of contaminants, (regulated under 40 CFR) are currently exempt from Hazardous Goods regulations. 40 CFR 261.40(d) states, "A sample of solid waste or a sample of water, soil, or air which is collected for the sole purpose of testing to determine its characteristics or composition is not subject to this Part or Parts 262 through 267 or Part 124 of this chapter or to the notification requirements of Section 3010 of RCRA". Sample containers must be properly packed such that inadvertent spillage does not occur during shipment.

Environmental samples which are known or suspected to be toxic, corrosive, flammable, or those which emit a noxious odor or create an anesthetic annoyance or discomfort to passengers and/or flight crews when shipped by air, must be packed, labeled, and shipped in accordance with current IATA regulations. Refer to "Dangerous Good Regulations" (current year), Section 3 - Classification.

Specific regulations exist (Shipment in Excepted Quantities) for the shipment of many reagents that are commonly used as preservatives and decontamination agents. Consequently, the shipment to the field site of "empty" sample containers containing small quantities of preservatives must be conducted in accordance with the regulations. The most significant limitations for the shipment of preservatives (IATA, current year) involve those for nitric acid in which only small quantities (<0.5L) of low concentration (<20 percent) nitric acid can be shipped in a given sample shipment.

6.2.8 Chain-of-Custody

Chain-of-custody procedures are designed to trace the sample from the time that it is collected until it, or its derived data, are used. Samples would be considered to be "in custody" under the following conditions:

- It is in personal possession.
- It is in personal view after being in personal possession.

- It was in personal possession when it was properly secured.
- It is in a designated secure area.

A chain-of-custody form (to be supplied by the specific laboratory providing service) is to be initiated at the time that the sample containers leave the site at which they are prepared, usually that of the analytical laboratory supplying the containers. It is important that the field personnel completely fill out the applicable sections of the form. The chain-of-custody forms will be placed in shipping containers, protected from moisture using plastic bags (e.g., Ziploc®) and will accompany the containers during shipment to the laboratory. The field personnel collecting the samples will be responsible for the custody of the samples until transportation to the laboratory. Sample transfer requires the individuals relinquishing and receiving the samples to sign, date, and note the time of transfer on the chain-of-custody forms. The chain-of-custody is considered to be complete after it has been received and signed in by the analytical laboratory. A copy of the chain-of-custody record will be maintained by the field personnel along with the other field records.

Common carriers (i.e., Federal Express) are not expected to sign the chain-of-custody form. However, the bill of lading or airbill becomes part of the chain-of-custody record when a common carrier is used to transport the samples.

6.2.9 Analytical Laboratory QA/QC

The analytical laboratory shall have systems and procedures to ensure and document that the data provided meets the requirements for precision, accuracy, representativeness, completeness, and comparability.

6.2.9.1 Quality Assurance Management Plan

The laboratory shall submit a current, controlled, and signed copy of the Quality Assurance Management Plan. The Plan shall be in general accordance with the requirements set forth in the draft National Environmental Laboratory Accreditation Program guidelines (Federal Register, December 2, 1994). These include:

All laboratories shall prepare and have available for review a written description of the laboratory's quality assurance activities, i.e., a QA plan. The QA plan must be an independent document that may incorporate by reference, already available standard operating procedures (SOPs) or other material, e.g., methods, guidance documents, etc., that are approved by the laboratory management. Analysts in the laboratory should either have copies of the document or easy access to the document. The items listed below constitute essential requirements of a Quality System. All laboratories should be encouraged to add any additional items thought to improve the analytical data. The following items shall be included:

- General QC procedures
- Performance evaluation samples
- Staff
- Equipment
- Test methods and standard operating procedures (SOPs)
- Physical facilities
- Sample acceptance policy and sample receipt
- Sample tracking

- Record keeping, data review and reporting
- Corrective action policy and procedures
- Definition of terms
- Bibliography

Substantive changes, modifications, or revisions to the document shall be provided within fifteen (15) days of implementation.

6.2.9.2 Standard Operating Procedures

The laboratory shall maintain for all procedures written, practical, operating procedures. The laboratory's Quality Assurance Manager shall maintain the SOPs and a current copy must be available at the location where the analysis is performed.

The laboratory SOP must provide directions for the step-by-step execution of all analyses and tasks performed by the laboratory. The SOP must reference the source of the procedure (US EPA Method, ASTM, Standard Methods, etc.). The SOP must:

- Be uniquely identified as to version or revision.
- Be consistent with the instrument manufacturer specifications and instructions
- Be available for auditing purposes
- Be reviewed and updated to reflect the current practices and facility requirements
- Be archived for future reference in usability reviews and evidentiary situations
- Be subject to procedures which prevent the use of outdated versions.

6.2.9.3 Quality Assurance Measurements

The laboratory must perform all applicable quality assurance measurements indicated in the cited procedure. At a minimum, each sample preparation and analysis batch must include a method blank, a blank spike (or laboratory control standard), a matrix spike, and a duplicate (or matrix spike duplicate for organic analyses). The method blank and LCS results shall be reported in the same units as the client samples. A batch will be defined as no more than twenty samples (excluding QC samples) of a similar matrix, prepared and/or analyzed together.

6.2.9.3.1 Precision and Accuracy

Precision measures the reproducibility of measurements. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions. Total precision is the measurement of the variability associated with the entire sampling process. It is determined by analysis of duplicate or replicate field samples and measures variability introduced by both the laboratory and field operations. Duplicate samples and matrix duplicate spiked samples are analyzed where applicable, to assess field and analytical precision, and the precision measurement is determined using the relative percent difference (RPD) between the duplicate results.

Accuracy is a statistical measurement of correctness and includes components of random error (variability due to imprecision) and systemic error. It therefore reflects the total error associated with the measurement. Analytical accuracy is measured by comparing the percent recovery of analytes spiked into a Laboratory

Control Sample (LCS), also known as a blank spike. For some organic compounds, surrogate recoveries can also be used to assess accuracy and method performance for each sample analyzed.

Accuracy of matrix spike recoveries is used to evaluate matrix effects in individual samples for a specific site. Matrix spike data is not used as the primary accuracy determination for laboratory QC purposes. Specific methods do have very wide "recommended" limits for controlling laboratory data.

Statistical Determination of Precision and Accuracy

Accuracy is evaluated by analyzing matrix spike data.

For measurements where matrix spikes are used, the percent recovery will be calculated as follows:

$$\%R = 100\% \times \left[\frac{S-U}{C_{sa}}\right]$$

Where: %R = percent recovery
S = measured concentration in spiked aliquot
U = measured concentration in unspiked aliquot
C_{sa} = actual concentration of spike added.

When a standard reference material (SRM) is used:

$$\%R = 100\% \times \left[\frac{C_m}{C_{srm}}\right]$$

Where: %R = percent recovery
C_m = measured concentration of SRM
C_{srm} = actual concentration of SRM

If calculated from duplicate measurements, relative percent difference (RPD) is the normal measure of precision as defined by the following equation:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{\frac{(C_1 + C_2)}{2}}$$

Where: RPD = relative percent difference
C_1 = larger of the two observed values
C_2 = smaller of the two observed values

If calculated from three or more replicates, the relative standard deviation (RSD) will be used rather than RPD in accordance with the following equation:

$$RSD = (s / \bar{y}) \times 100\%$$

Where: RSD = relative standard deviation
s = standard deviation
$\bar{y}$ = mean of replicate analyses

Standard deviation is defined as follows:

$$S = \sqrt{\frac{\sum_{i=1}^{n}(y_i - \bar{y})^2}{n-1}}$$

Where: s = standard deviation
y_i = measured value of the *i*th replicate
$\bar{y}$ = mean of replicate measurements
n = number of replicates

The method detection limit is the laboratory established smallest amount of analyte that can be measured and reported with 99% confidence that the concentration is greater than zero.

MDL is defined as follows for all measurements:

$$MDL = t_{(n-1,\ 1-a\ =\ 0.99)}\ (S)$$

Where: MDL = method detection limit
S = standard deviation of the replicate analyses
$t_{(n-1,\ 1-a\ =\ 0.99)}$ = student's t-value for a one-sided 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom

The precision and accuracy of each measured parameter shall be within the guidelines set forth in the published method. LCS recovery acceptance criteria shall be based on control charts and must include the last twenty (20) measurements. In the absence of 20 measurements, the default acceptance criteria may be no greater than 75-125%. Matrix spike and surrogate recovery criteria must be established in accordance with the published method.

Corrective action for LCS, surrogate, and matrix spike failures must be specified in the Laboratory Quality Assurance Manual or in the Laboratory SOP for the given method. Discussion of the application of the corrective action shall be provided in the analysis case narrative.

6.2.9.3.2 Representativeness

Samples collected in the filed shall be representative of the conditions that are being measured. The lab will take steps to ensure that subsamples of the samples submitted are representative of the container as a whole.

6.2.9.3.3 Comparability

All measurements made by the laboratory must be comparable to applicable reference standards. The lab must participate in interlaboratory comparisons as necessary to maintain the state certifications. The lab must provide copies of results of performance in interlaboratory programs upon request.

6.2.9.3.4 Completeness

Completeness is defined as the number of analyses considered to be valid compared to the number of analyses that were considered necessary for accomplishing the task. Typically, studies are designed with extra sampling so that the loss of a few samples (perhaps 10 percent) would still leave enough data to achieve the

desired objectives. For the purpose of estimating completeness, the total number of analyses required for accomplishing the objectives requiring analytical laboratory data is 90 percent of the non-QC samples submitted for analysis.

All samples submitted to the lab and all analyses requested will be intended to fulfill project requirements. Results submitted which are not in compliance with method requirements or quality assurance measurements may be rejected.

6.2.9.4 Sample Management

Samples shall be checked upon receipt for thermal preservation (if applicable). The results of the check shall be recorded on the chain-of-custody submitted with the samples. Chemical preservation (e.g., appropriate pH) shall be checked upon receipt or prior to sample preparation/analyses. The results of such checks shall be recorded. Data from any samples that do not meet the criteria must be discussed in the report case narrative.

The samples shall be properly preserved and stored in approved containers specified by the laboratory quality assurance program and the applicable methods. Where samples must be split in the laboratory, the laboratory will perform the required tasks in a manner that insures that all subsamples are representative of the original sample. Samples shall be stored in a secure area.

The laboratory shall assign a unique identification (ID) code to each sample received in the laboratory. The laboratory shall design a system to unequivocally identify all samples, subsamples and subsequent extracts and/or digestates so that each aliquot is uniquely identified. This laboratory code shall maintain an unequivocal link with the unique field ID assigned each container. The laboratory ID number shall be placed on the sample container as a durable label. The laboratory ID number shall be entered into the laboratory records and shall be the link that associates the sample with related laboratory activities (i.e., sample preparation, calibration, etc.).

6.2.10 Laboratory Reporting

Laboratory analytical reports shall consist of three deliverables:

- Summary Data Report
- Raw Data Validation Package
- Electronic Data Deliverable (EDD)

The Summary Data report will consist of the following information:

- **Cover letter** - a statement signed by both the responsible corporate individual and the Project Manager indicating that the report meets the technical specifications and applicable requirements of the contract.
- **Case narrative** - A brief statement of the condition of sample receipt, compliance with holding times, a discussion of conditions encountered, organized by analytical procedures performed, which will affect the interpretation of results. If any quality assurance measurements did not meet the specifications of the procedure, the narrative will indicate why the data is reportable.
- Cross reference of Sample Identification with laboratory identification.

- **Sample Results** - The results of the analysis shall include the sample preparation and analytical methods, dates of sample preparation and analysis, method detection limit or reporting limit, concentration of analyte, units of concentration, sample matrix.
- Blank results.
- Blank spike or Laboratory Control Standard results. (Analyte, amount spiked, amount recovered, percent recovery, acceptance criteria.)
- Surrogate analysis results.
- Matrix spike/duplicate matrix spike results.

The Raw Data Validation Package report will consist of the following information (as applicable):

- Initial calibration data (including raw data, chromatograms, instrument response data, standard preparation logs, standard source records)
- Instrument performance checks (continuing calibration verification, blank verification, etc.)
- Internal standard measurements.
- Quantitation reports.
- Mass spectra for each reported analyte.
- Copies of sample preparation worksheets, bench worksheets, run logs, cleanup procedure checks (GPS, flourisil, etc.)
- Standard addition results, serial dilution results.
- Applicable Method Detection Limit (MDL) study results and dates of MDL studies.

Electronic Data Deliverable (EDD) will consist of the following information in the following format (as applicable):

Content of Electronic Deliverables

Field Name	Description
SAMPLE_ID	Brown and Caldwell sample identification, as shown on COC
LAB_ID	Laboratory Sample Identification
REPORT_ID	Numerical identifier of hard copy report
ANALYTE	Analyte name
ANALYTE_ID	Chemical Abstract Service number, for non-specific analyte names (petroleum hydrocarbons, etc.), a valid value will be supplied.
PREP_CODE	Method of sample preparation
ANAL_CODE	Method of sample analysis
RESULT	Reported result or reporting limit if result is non-detect
ERROR	For radiochemical analysis only
UNITS	Result units
RESULT_TYPE	Identifies sample or blank
PREP_BATCH	Unique preparation batch identifier
ANAL_BATCH	Unique analysis batch identifier
DILUTION_FACTOR	Factor required to bring sample concentration into calibration range
QUALIFIER	CLP defined result flag

Content of Electronic Deliverables

Field Name	Description
RET_TIME	For GC/MS Tentatively Identified Compounds only
SAMPLE_DATE	Date sample collected from chain-of-custody.
PREP_DATE	Date sample prepared or extracted.
PREP_TIME	Time sample prepared or extracted (24 hour clock HH:MM)
ANAL_DATE	Date sample analyzed
ANAL_TIME	Time sample analyzed (24 hour clock HH:MM)
REPORT_LIMIT	Detection limit of analysis, corrected for moisture, dilution, etc.
REPORT_LIMIT_UNITS	Units for detection limit.

6.2.11 Data Documentation and Management

6.2.11.1 Field Notebook

A field note book will be dedicated to the Bartlett Tree Company Site RI field project. All note books and any original forms will become part of the permanent project file. The following daily information will be recorded in the field notebook:

- Date;
- Weather conditions;
- Personnel;
- All site visitors;
- Chronological, general description of all field activities that day;
- Records of all field measurements;
- Descriptions of any modifications to the RI/FS Work Plan;
- Record of equipment calibration;
- Sample collection data.

6.2.11.2 Laboratory Records

The laboratory shall implement protocols that will produce unequivocal, accurate records which document all laboratory activities associated with sample receipt, preparation, analysis, review and reporting. These records will be held a minimum of seven (7) years.

The activities documented shall include but are not limited to:

- Sample preservation including appropriate sample container and compliance with holding time;
- Sample identification, receipt, acceptance or rejection and log-in;
- Sample storage and tracking (includes shipping receipts, transmittal forms, and internal routing and assignment records);
- Sample preparation (includes cleanup and separation protocols, ID #s, volumes, weights, instrument printouts, meter readings, calculations, reagents, etc.);

- Sample analysis;
- Standard and reagent origin, receipt, preparation, and use;
- Equipment receipt, use, specification, operating conditions and preventative maintenance;
- Calibration criteria, frequency and acceptance criteria;
- Data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions;
- Method performance criteria including expected quality control requirements;
- Quality control protocols and assessment;
- Electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries;
- All automated sample handling systems;
- Records storage and retention; and
- Sample disposal including the date of sample or subsample disposal and name of the responsible person.

In addition to documenting all the above-mentioned activities, the following shall be retained:

- All original raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts work sheets and data output records (chromatograms, strip charts, and other instrument response readout records);
- Copies of final reports;
- Archived standard operating procedures;
- Correspondence relating to laboratory activities for a specific project;
- All corrective action reports, audits and audit responses;
- Performance evaluation results and raw data; and
- Data review and cross checking.

6.2.12 Field Instrumentation

All field analytical instrumentation will be calibrated and maintained per the following chart:

Field Analytical Instrument Maintenance and Calibration Protocols

Equipment	Calibration	Frequency
pH meter	Calibrate with two pH buffer solutions	Every 10 samples
Sp. Conductance/Salinity	Calibrate with one calibration solution	Before and after use.
Dissolved oxygen meter	Calibration according to manufacturer's recommendations with ambient air	At the beginning of each day and every two hours
Temperature	Check against a mercury thermometer	Start and end of each day
Conductivity	Calibrate with one calibration solution	Start, middle, and end of each day
Rechargeable equipment batteries	Charge	After use as required

Field Analytical Instrument Maintenance and Calibration Protocols

Equipment	Calibration	Frequency
Sampling Accessories (tubing, submersible pump)	Periodic maintenance performed and recorded in equipment log	As required
Photoionization Detector (PID)	Calibrate per manufacturer's specification with appropriate gas.	Start of each day being used.
Oil-Water Interface Probe	Clean with soap and water and rinse with clean water to remove any product buildup.	Beginning of each day or whenever buildup occurs.

7. PROJECT MANAGEMENT

The management approach and identification of key project personnel and subcontractors for the execution of the RI/FS are detailed in the following sections.

7.1 Management Approach

Brown and Caldwell Associates, on behalf of F.A. Bartlett Tree Expert Company (Bartlett), will execute and report the results of the RI/FS. The RI/FS will be conducted in accordance with the April 2007 Order on Consent and Administrative Settlement between Bartlett and the DEC, and applicable regulations. Regular updates on progress will be provided to the NYSDEC. Any significant variations from the RI/FS Work Plan will be reported and discussed accordingly.

7.2 Personnel and Contractors

Key project personnel and subcontractors and their role in the RI/FS are shown in Figure 7-1 Project Organization. Brown and Caldwell is a 58-year old national firm with a staff of over 1,400 including experts in environmental consulting, engineering and construction management. The firm does business in New York State through its affiliate known as Brown and Caldwell Associates. Personnel with the appropriate qualifications, training and experience will be assigned to each project task. Subcontractors will be employed for the specific tasks of drilling, laboratory analysis, data validation and surveying. Only subcontractors possessing the required licenses and certifications will be used for the project.

8. SCHEDULE

The RI/FS will be conducted in accordance with the scheduling requirements specified in the April 2007 Order on Consent. The initial RI activities through submittal to the DEC of the RI Data Summary Report and recommendations for any additional activities will be conducted in accordance with the schedule outlined below. Completion of the RI/FS will depend on the need for any additional investigatory activities needed to 1) complete the evaluation of the nature and extent of site related contamination, and 2) assess human and ecological exposure pathways. Field conditions and other factors may also affect the schedule of the RI/FS. The NYSDEC will be notified if any schedule revisions are necessary.

Action/Deliverable	Date
SVI Investigation	Upon approval of the RI/FS Work Plan and before the end of the heating season that ends on or about March 31, 2008
Subcontractor Selection	2 weeks after approval of RI/FS Work Plan by NYSDEC and NYSDOH.
Implement non-SVI Field Investigation Activities	5 weeks after approval of RI/FS Work Plan by NYSDEC and NYSDOH, depending on subcontractor availability.
Conduct Geophysical Survey, Drilling, Phase 1 Well Installation and Groundwater Sampling	Approximately 7 weeks.
Receipt of Laboratory Analytical Results, Completion of DUSR	Approximately 8 weeks after collection of groundwater samples.
Submittal of Data Summary Report and Recommendations for Additional Investigation	Approximately 4 weeks after receipt of DUSR.

9. HEALTH AND SAFETY

All field activities will be performed in accordance with the site-specific Health and Safety Plan (HASP) included in Appendix A.

9.1 Community Air Monitoring Plan

Community air monitoring will be performed during RI field activities in accordance with the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan, included in Appendix C. Air monitoring readings will be recorded in a logbook and will be available for review by the NYSDEC and NYSDOH. Real-time air monitoring will be conducted during work activities for VOCs and particulates (i.e., dust) at the downwind perimeter of each designated work area. Air monitoring will be performed and recorded at up to 15-minute intervals.

The Community Air Monitoring Plan (CAMP) is not intended for use in establishing action levels for worker respiratory protection.

CAMP VOC Action Levels

The following action levels for VOCs are in accordance with the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan:

Action Level	Response
Below 5 ppm above background for the 15-minute average	Continue and/or resume work activities
> 5 ppm above background for the 15-minute average	Temporarily halt work and continue monitoring
5 to < 25 ppm	Work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions and continue monitoring
> 25 ppm	Cease operations. Contact PM and BC Director of Health and Safety or designee immediately.

CAMP Particulate Action Levels

The following action levels for particulates less than 10 micrometers in size (PM-10) are in accordance with the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan:

Action Level	Response
> 0.1 mg/m^3 above background for the 15-minute average or if airborne dust is observed leaving the work area	Employ dust suppression techniques
0.1 to 0.15 mg/m^3	Work may continue with dust suppression techniques provided downwind PM-10 particulate levels do not exceed 0.15 mg/m^3 above background for the 15-minute average and airborne dust is not observed leaving the work area
> 0.15 mg/m^3 with dust suppression techniques implemented	Cease operations. Contact PM and BC Director of Health and Safety or designee immediately.

10. CITIZEN PARTICIPATION PLAN

10.1 Introduction

F.A. Bartlett Tree Experts (Bartlett), in cooperation with the New York State Department of Environmental Conservation (DEC), and the New York State Department of Health (NYSDOH), is investigating potential historic releases of pesticides and herbicides at the Bartlett Tree Company Site (the site), located at 345 Union Ave. in the Village of Westbury, Nassau County, New York.

This citizen participation plan (CPP) provides summary information about the type of contamination that has been identified; an overview of the planned investigation; opportunities for public participation; primary contact information for various state, local and private agencies; and information on where project-related documents are available.

During the remediation process, Bartlett and the DEC will keep the public informed of planned or ongoing actions; environmental conditions; public health threats (if any) posed by contamination and responses under consideration; and project status. Bartlett and the DEC will also provide opportunities for the public to give information, opinions and perspectives on technical decisions about the site.

10.2 Authorizing Agencies

New York State Department of Environmental Conservation

The DEC has authority over the investigation and remediation of the Site. The DEC's web site can be reached at: http://www.dec.state.ny.us.

New York State Department of Health (NYSDOH)

The New York State Department of Health will address specific human exposures to site contaminants as well as community concerns about associated health issues. The NYSDOH's web site can be reached at:

http://www.health.state.ny.us

10.3 Background

The Bartlett Tree Company Site is a narrow parcel of land totaling approximately 0.4 acres and located in an urban, mixed-use neighborhood of commercial and industrial facilities and residences. The site has been occupied since the mid-1950s by Bartlett, a nationwide tree care company. Prior to occupancy by Bartlett, the site was reportedly occupied by E. J. Christ Wagon Works & Auto Repairs.

Since the 1950s the site has been used by Bartlett as an operational base for tree maintenance services. Currently, small amounts of plant health care materials are stored in a locked, fire proof storage structure that meets or exceeds all relevant state and federal regulations for the storage of such materials. Bartlett prepares spray solutions of plant health care materials in truck-mounted tanks in quantities only as large as needed for immediate, individual applications.

On May 5, 1987, Bartlett investigated a May 1987 report that an abandoned "cistern" (Drywell 1) at the Westbury facility allegedly held empty pesticide containers. Bartlett found that Drywell 1 was partially filled with water, which was sampled, and Bartlett also recovered two Sevin containers (empty, crushed 5-gallon metal pails). After the inspection, Drywell 1 was backfilled with sand out of concern that it could cave in due to the heavy traffic in the driveway. The sample of the standing water in Drywell 1 was submitted to an independent laboratory for testing. The herbicide diazinon was detected at 0.61 ppm. Bartlett submitted a letter report to the Nassau County Department of Health in October 1990 describing the inspection and closure of Drywell 1, and including a copy of the analytical results. The County never responded and Bartlett therefore concluded that the procedure had been acceptable to the County.

In April 1990, an anonymous caller to the DEC alleged that pesticides and herbicides were periodically placed into Drywell 1 prior to abandonment of the drywell in 1983. Specific pesticides were named, including malathion, DDT, Sevin, chlordane and lead spray for fruit trees.

In 1996-1998, a contractor to the DEC performed a Preliminary Site Assessment (PSA) to determine if a potential source of soil and/or groundwater contamination existed at the site. Soil samples from directly beneath the drywell and groundwater samples from five on-site locations were collected and analyzed for pesticides, herbicides, volatile and semi-volatile organic compounds (VOCs and SVOCs), polychlorinated biphenyl compounds (PCBs), cyanide and inorganic constituents.

A number of pesticides were detected in the soil samples in excess of recommended soil cleanup objectives in effect at the time. The (VOCs) benzene, ethylbenzene and xylene, as well as several semi-VOCs were also found in the soil levels exceeding recommended soil cleanup objectives in effect at the time. No PCBs or cyanide were detected. Turbid groundwater samples collected from directly beneath the drywell contained elevated levels of pesticides, but because most organic pesticides are relatively insoluble in water and have a high affinity for silt and clay particles, the concentrations of the pesticides actually dissolved and able to migrate in groundwater is unknown. No pesticides were detected in the downgradient samples. Two pesticides were detected in one upgradient sample. The VOCs ethylbenzene and total xylenes were detected above standards in groundwater samples collected directly beneath the drywell. The chlorinated solvents tetrachloroethene (PCE), trichloroethene (TCE), and cis & trans 1,2-dichloroethene (DCE) were detected in groundwater. The DEC concluded that the evidence suggests that the chlorinated solvents were originating at an off-site source. No significant levels of semi-VOCs or inorganics were detected. No PCBs or cyanide were detected.

At this time no completed exposure pathways from the alleged pesticide/herbicide source area to humans or ecological resources have been identified. No pesticide or herbicide compounds were detected in any of the samples from downgradient groundwater probes installed during the PSA or in a monitoring well located on an adjacent property. The drywell is filled and secured with a cast iron cover. Pavement prevents direct exposure to potentially impacted soils (if any) surrounding the drywell. At the conclusion of the 1996-1998 PSA the investigators reported that pesticides had not been detected in the two closest public water supply wells (Westbury Water District wells N-7785 and N-101) or the closest downgradient well (Westbury Water District well N-5654).

10.4 Project Description

Under the authority and supervision of the DEC and NYSDOH, Bartlett will conduct a remedial investigation (RI) to evaluate the nature and extent of contamination associated with the site. The RI will identify whether humans or ecological resources are potentially exposed to the contamination. Bartlett will

also conduct a feasibility study (FS) to evaluate appropriate options for remediating (cleaning up) contamination associated with the site as necessary to protect human health and the environment. The RI and FS will be conducted pursuant to the RI/FS Work Plan approved by the DEC and NYSDOH.

The RI will include the collection and analysis of soil samples in the vicinity of the previously identified drywell and in an area of a recently identified, second drywell that was shown on architectural plans recently provided by the Village of Westbury building department. In addition, a system of shallow and deep monitoring wells will be installed to evaluate groundwater flow directions and the extent of any contaminant plume associated with the former drywells.

The field investigation activities are anticipated to begin in March of 2008. If upon completion of the planned investigatory activities the DEC agrees that sufficient data have been obtained to evaluate potential impacts to human health and the environment, Bartlett will complete the RI and FS reports. It is possible that the investigatory activities specified in the approved RI/FS Work Plan will demonstrate the need for further investigation, such as the installation and sampling of additional groundwater monitoring wells to adequately target and evaluate a contaminant plume.

10.5 Citizen Participation

Citizen participation activities are designed to address public concerns about environmental investigation and remediation activities. Bartlett and the DEC are committed to informing and involving the public in the process of accomplishing comprehensive environmental remediation of the site. In order to do this, it is important for Bartlett and the DEC to receive public input.

The following citizen participation activities will be performed.

Fact Sheets and Public Information Session Announcements

Bartlett and the DEC will provide project updates called "fact sheets" or "public information session announcements" during the RI/FS project. These documents will summarize information about the status of findings at the site and announce public information sessions or the release of reports and proposed work plans. At this time, it is anticipated that a fact sheet will be provided before commencing RI field activities, and upon completion of the RI/FS. Fact sheets will be mailed to individuals on the site contact list, and made available on the DEC's web site and at the document repository listed below.

Public Meetings

Public meetings represent a formal presentation and exchange of information. Public meetings may be held to explain, and to offer an opportunity to comment on, proposed final remedy selections for the site. The public will be notified in advance of meetings through news releases to regional news media and direct mail to the site contact list.

Public Information Sessions

Public information sessions, which are less formal than public meetings, help maintain contact with the community and will be held as needed. Information updates on various activities will be made available at these sessions.

10.6 Document Repository (Library)

The document repository for this project is the:

Westbury Memorial Public Library
445 Jefferson Street
Westbury, NY 11590
Tel: 516/333-0176
Fax: 516/333-1752
Hours: Mon. 11-9, Tues. – Fri. 9 – 9, Sat. 9 – 5 (except July and August 9 -1). Sunday 1 – 5 mid-Sept. to mid-May.
contactus@westburylibrary.org
http://www.westburylibrary.org/index.html

Complete project records are also kept at:

Department of Environmental Conservation
625 Broadway
Albany, NY 12233
Hours: 8:30-4:45
(518) 402-8000, Please call ahead.

Department of Environmental Conservation - Region 1
SUNY @ Stony Brook
50 Circle Road
Stony Brook, NY 11790-3409
Hours: 8:30-4:45
(631) 444-0204, Please call ahead.

10.7 Project Contacts

For more information about the Bartlett Tree Company site, the public is encouraged to contact any of the following:

New York State Department of Environmental Conservation:

Jamie Ascher, Project Manager
SUNY @ Stony Brook
50 Circle Road
Stony Brook, NY 11790-3409
(631) 444-0246
jxascher@gw.dec.state.ny.us

New York State Department of Health:

Gary Litwin
Center for Environmental Health
547 River Street
Troy, NY 12180-2216
(800) 458-1158, ext. 27860
BEEI@health.state.ny.us

Nassau County Department of Health

David M. Ackman, M.D., M.P.H.
Commissioner of Health
240 Old Country Road, Mincola, New York 11501
Voice: (5165713410
Fax: (516) 5713369
nchealthdept@nassaucountyny.gov

Town of North Hempstead

Jon Kaiman
Town Supervisor
Town Hall
220 Plandome Road
Manhasset, NY 11030
(516) 869-7700
http://www.northhempstead.com/

Village of Westbury

Ernest J. Strada, Mayor
Village Hall
235 Lincoln Place
Westbury, NY 11590
Monday - Friday, 9:00 a.m. to 4:30 p.m.
(516) 334-1700
Fax (516) 334-7563
http://www.villageofwestbury.org

F.A. Bartlett Tree Experts

David G. Marren, Esq., Vice President, Safety and Regulatory Affairs
13768 Hamilton Road
Charlotte, North Carolina 28278
(704) 588-1150 x 132

and

Yvonne E. Marciano, Esq.
The West Firm, PLLC
677 Broadway – 8th Floor
Albany, New York 12207
(518) 641-0500

10.7 Public Contact List

To help keep the community informed and involved in the remediation of the site, Bartlett and the DEC have developed a list of interested and affected parties. The list includes nearby property owners; local news media; citizens groups; civic, business and environmental organizations; local, state, and federal officials, and others. The contact list will be reviewed periodically and updated as appropriate.

Bartlett and the DEC encourage interested and affected parties to ask to be included on the contact list. This list is used for all mailings, notices and fact sheets. If you wish to be added to the list, contact the DEC project manager listed in Section 10.6.

Written comments on this citizen participation plan should be addressed to:

William Fonda, Citizen Participation Specialist 3
New York State Department of Environmental Conservation
SUNY @ Stony Brook
50 Circle Road
Stony Brook, NY 11790-3409
(631) 444-0249
bmfonda@gw.dec.state.ny.us

11. REFERENCES

Busciolano, R. "Water-Table and Potentiometric-Surface Altitudes of the Upper Glacial, Magothy, and Lloyd Aquifers on Long Island, New York, in March-April 2000, with a Summary of Hydrogeologic Conditions." U.S. Geological Survey. 2002.

Doriski, T.P. and Wilde-Katz, F. "Geology of the '20-Foot' Clay and Gardiners Clay in Southern Nassau and Southwestern Suffolk Counties, Long Island, New York." U.S. Geological Survey. 1983.

Dvirka and Bartilucci. "Preliminary Site Assessment, Bartlett Tree Company, Westbury, Nassau County, New York. NYSDEC Registry No. 130074." April 1998.

Knebel, H C, Architect. Architectural plan titled "Truck Shed Structure for Bartlett Tree Experts, Union Ave., Westbury, N.Y."; July 25, 1963; drawing no. 1 of 2.

Knebel, H C, Architect. Architectural plan titled "Alteration to Building for Bartlett Tree Experts, Union Ave., Westbury, L.I., N.Y."; August 21, 1964; drawing no. 1 of 1.

Knebel, H C, Architect. Architectural plan titled "Alteration to Building for Bartlett Tree Experts, Union Ave., Westbury, L.I., N.Y."; July 6, 1966, revised August 2, 1966; drawing nos. 1-3 of 3.

USGS. "Record of wells in Nassau County, N. Y. exclusive of those published in U.S. Geological Survey Profession paper 44" prepared by the United States Geological Survey in cooperation with the Water Power and Control Commission and with Nassau County. 1958

Village of Westbury Building Department. Application for Building Permit (permit no. 6859, to construct addition and alterations); November 25, 1966 (with attached 5 page description of work).

Village of Westbury Building Department. Application for Plumbing Alteration Permit (permit no. 6859, to install ladies' and men's restrooms on second floor); December 19, 1966.

TABLES

TABLE 5-1
PROPOSED INVESTIGATORY LOCATIONS AND OBJECTIVES
REMEDIAL INVESTIGATION
BARTLETT TREE COMPANY SITE
NASSAU COUNTY, NEW YORK

ID	Location	Boring Depth / Screened Interval	Objectives
SOIL BORINGS			
SB-1	Approximately 10 feet from former Drywell 1 in confirmed down-gradient location.	Approximately 80 feet bgs.	Delineate vertical extent of soils impacted by pesticide/herbicide and petroleum-based carriers. Assess potential for these constituents to have dispersed laterally in unsaturated and saturated zones.
SB-2	In or immediately adjacent to potential second dry well (Drywell 2).	10 feet below base of structure.	Evaluate potential for soil to have been impacted by unknown past releases of pesticide/herbicide solutions into dry well.
SB-3	Approximately 10 feet west of Drywell 1	To water table, approximately 37 feet.	Delineate the lateral extent of potential impacts in the soils surrounding Drywell 1 and facilitate evaluation of and planning for a potential IRM.
SB-4	Approximately 10 feet north of Drywell 1	To water table, approximately 37 feet.	Delineate the lateral extent of potential impacts in the soils surrounding Drywell 1 and facilitate evaluation of and planning for a potential IRM.
SB-5	Approximately 10 feet east of Drywell 1	To water table, approximately 37 feet.	Delineate the lateral extent of potential impacts in the soils surrounding Drywell 1 and facilitate evaluation of and planning for a potential IRM.
SB-6	Approximate center of interior of pesticide storage shed.	12 feet.	Evaluate poetntial releases of pesticides/herbicides and other substances to soils underlying concrete floor.
SB-7	Approximate center of interior of open shed.	12 feet.	Evaluate poetntial releases of pesticides/herbicides and other substances to soils underlying paving.
SB-8	In or immediately adjacent to potential third dry well (Drywell 3).	10 feet below base of structure.	Evaluate potential for soil to have been impacted by unknown past releases of pesticide/herbicide solutions into dry well.
MONITORING WELLS			
MW-1S	Adjacent to northern property line, in location presumed to be upgradient from former Drywell 1	Approximately 48 feet bgs, with 15 foot well screen set to straddle water table (i.e. approximately 32-47 feet bgs).	Evaluate potentiometric surface of shallow aquifer, identify potentially perched water table. Monitor shallow groundwater quality above reported black, dense silt layer, in presumably upgradient location.
MW-1D	Adjacent to northern property line, in location presumed to be upgradient from former Drywell 1	Drill and sample soils to 120 feet bgs. Grout back to 73 feet bgs. Set 10-foot well screen from 62-72 feet bgs.	Evaluate hydrogeologic stratigraphy. Evaluate potentiometric surface of deeper aquifer. Obtain valid monitoring well data from a depth comparable to the depth at which the deeper groundwater grab samples were collected during the PSA, in presumably upgradient location.

TABLE 5-1
PROPOSED INVESTIGATORY LOCATIONS AND OBJECTIVES
REMEDIAL INVESTIGATION
BARTLETT TREE COMPANY SITE
NASSAU COUNTY, NEW YORK

ID	Location	Boring Depth / Screened Interval	Objectives
MW-2S	Adjacent to western property line, in location presumed to be down-gradient from Drywell 1	Approximately 48 feet bgs, with 15 foot well screen set to straddle water table (i.e. approximately 32 47 feet bgs).	Evaluate potentiometric surface of shallow aquifer, identify potentially perched water table. Monitor shallow groundwater quality above reported black, dense silt layer, in presumably down-gradient location.
MW-2D	Adjacent to western property line, in location presumed to be down-gradient from Drywell 1	Drill and sample soils to 120 feet bgs. Grout back to 73 feet bgs. Set 10-foot well screen from 62-72 feet bgs.	Evaluate hydrogeologic stratigraphy. Evaluate potentiometric surface of deeper aquifer. Obtain valid monitoring well data from a depth comparable to the depth at which the deeper groundwater grab samples were collected during the PSA, in presumably downgradient location.
MW-3S	Adjacent to eastern property line, east of MW-2S/2D	Drill and sample soils to 60 feet bgs to identify dense, black silt layer reported at 15 feet below water table. Backfill with bentonite as needed to set 15 foot well screen straddling water table (i.e. approximately 32-47 feet bgs).	Evaluate potentiometric surface of shallow aquifer, identify potentially perched water table. Monitor shallow groundwater quality above reported black, dense silt layer, in presumably side-gradient location.

TABLE 5-2
SUMMARY OF LABORATORY ANALYSES
Remedial Investigation
Bartlett Tree Company Site
Westbury, New York

Laboratory Analysis	Subsurface Soil					
	SB-1 (Drywell 1) 4 depth intervals	SB-2 (Drywell 2) 3 depth intervals	SB-3 (Drywell 1) 2 depth intervals	SB-4 (Drywell 1) 2 depth intervals	SB-5 (Drywell 1) 2 depth intervals	SB-6 (Pesticide Storage Shed) 3 depth intervals
Parameters						
TCL VOCs Method 8260	4	3	2	2	2	3
TCL SVOCs Method 8270C	4	3	2	2	2	3
TCL Pesticides Method 8081A	4	3	2	2	2	3
Organophosphorous Pesticides Method 8141A	4	3	2	2	2	3
Chlorinated Herbicides Method 8151A	4	3	2	2	2	3
TAL Metals Method 6010B/7471A	4	3	2	2	2	3
PCBs Method 8082	--	3	--	--	--	3
Total Environmental Media Samples	24	21	12	12	12	21
Duplicates				3		
MS/MSD				3		
Trip Blanks				3		
Equipment Blanks				3		
Total QA/QC Samples				12		

Notes:
All analytical methods NYSDEC ASP and/or USEPA SW 846

TABLE 5-2
SUMMARY OF LABORATORY ANALYSES
Remedial Investigation
Bartlett Tree Company Site
Westbury, New York

Laboratory Analysis	Subsurface Soil			Groundwater	Total
	SB-7 (Open Shed) 3 depth intervals	SB-8 (Drywell 3) 3 depth intervals	Monitoring well borings 1 sample / boring	Phase 1 Monitoring Wells (2 rounds)	
Parameters					
TCL VOCs Method 8260	3	3	5	10	37
TCL SVOCs Method 8270C	3	3	5	10	37
TCL Pesticides Method 8081A	3	3	5	10	37
Organophosphorous Pesticides Method 8141A	3	3	5	10	37
Chlorinated Herbicides Method 8151A	3	3	5	10	37
TAL Metals Method 6010B/7471A	3	3	5	10	37
PCBs Method 8082	3	3	5	--	17
Total Environmental Media Samples	21	21	35	60	239
Duplicates	see previous page for soil QA/QC samples			2	5
MS/MSD				2	5
Trip Blanks				4	7
Equipment Blanks				2	5
Total QA/QC Samples				10	22

Notes:
All analytical methods NYSDEC ASP and/or USEPA

TABLE 6-1

SAMPLE CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

Remedial Investigation
Bartlett Tree Company Site
Westbury, New York

Analytical Parameter	Typical[a,e] Volume Required (mL)	Container[a]	Preservative	Maximum Holding Time
Volatile organic compounds (VOCs)	25-120	G/vial Teflon®-lined septum	Cool, 4°C & HCl to pH<2[c,d]	14 days[c]
Extractable organic compounds (B/N/A)	1000-2000	G/Teflon®-lined cap	Cool, 4°C	7 days/extraction +40 days/analysis
Pesticides, herbicides, and total organic halogens (TOX)	1000-4000	G/Teflon®-lined cap	Cool, 4°C	7 days/extraction +40 days/analysis
Metals[b] (except Hg and Cr^{+6})	1000-2000	P/G (special acid cleaning)	HNO_3 to pH<2	6 months
Mercury[b]	300-500	P/G (special acid cleaning)	HNO_3 to pH<2 & 0.05% $K_2Cr_2O_7$	28 days
Chromium $^{+6}$[b]	300-500	P/G	Cool, 4°C	24 hours
Miscellaneous				
Biological Oxygen Demand (BOD)	1000	P/G	Cool, 4°C	24 hours
Chemical Oxygen Demand (COD)	50	P/G	H_2SO_4 to pH <2	28 days
Chloride	50-500	P/G	None required	28 days
Coliform[d]	100	P/G	Cool, 4°C	on site/24 hours

TABLE 6-1 (CONTINUED)

SAMPLE CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

Remedial Investigation
Bartlett Tree Company Site
Westbury, New York

Analytical Parameter	Typical[a,e] Volume Required (mL)	Container[a]	Preservative	Maximum Holding Time
Bicarbonate	500	P/G	Cool, 4°C	14 days
Carbonate	500	P/G	Cool, 4°C	14 days
Conductivity	100	P/G	Cool, 4°C	on site/28 days
Fluoride	100-500	P	None required	28 days
Hardness	100	P/G	HNO_3 to pH <2	6 months
Nitrate/Nitrite	100-250	P/G	Cool, 4°C & H_2SO_4 to pH<2	28 days
PH	100	P/G	Cool, 4°C	On site
Phenolics	500-1000	G	Cool, 4°C & H_2SO_4 to pH<2	28 days
Sulfate	100-500	P/G	Cool, 4°C	28 days
Total Dissolved Solids (TDS)	200-500	P/G	Cool, 4°C	7 days
Total organic carbon (TOC)	25-100	P/G	Cool, 4°C & H_2SO_4 or H_2SO_4 to pH <2	28 days
Total Suspended Solids (TSS)	200-500	P/G	Cool, 4°C	7 dyas
Turbidity	100	P/G	Cool, 4°C, Dark	48 hours
Radioactivity (alpha/beta/radium)	4000	P/G (special acid cleaning)	HNO_3 to pH<2	6 months

NOTES:

Sources: EPA
ASTM D-4448-85

a. Polyethylene (P) or Glass (G) or Amber Glass (AG).
b. "Dissolved" (or filtered) metals samples should be field filtered prior to preservation.
c. Samples receiving no pH adjustment must be analyzed within 7 days.
d. 0.008 percent $Na_2S_2O_6$ should be added in the presence of residual chlorine.
e. Analytical laboratory should be consulted for specific volume requirements.

FIGURES

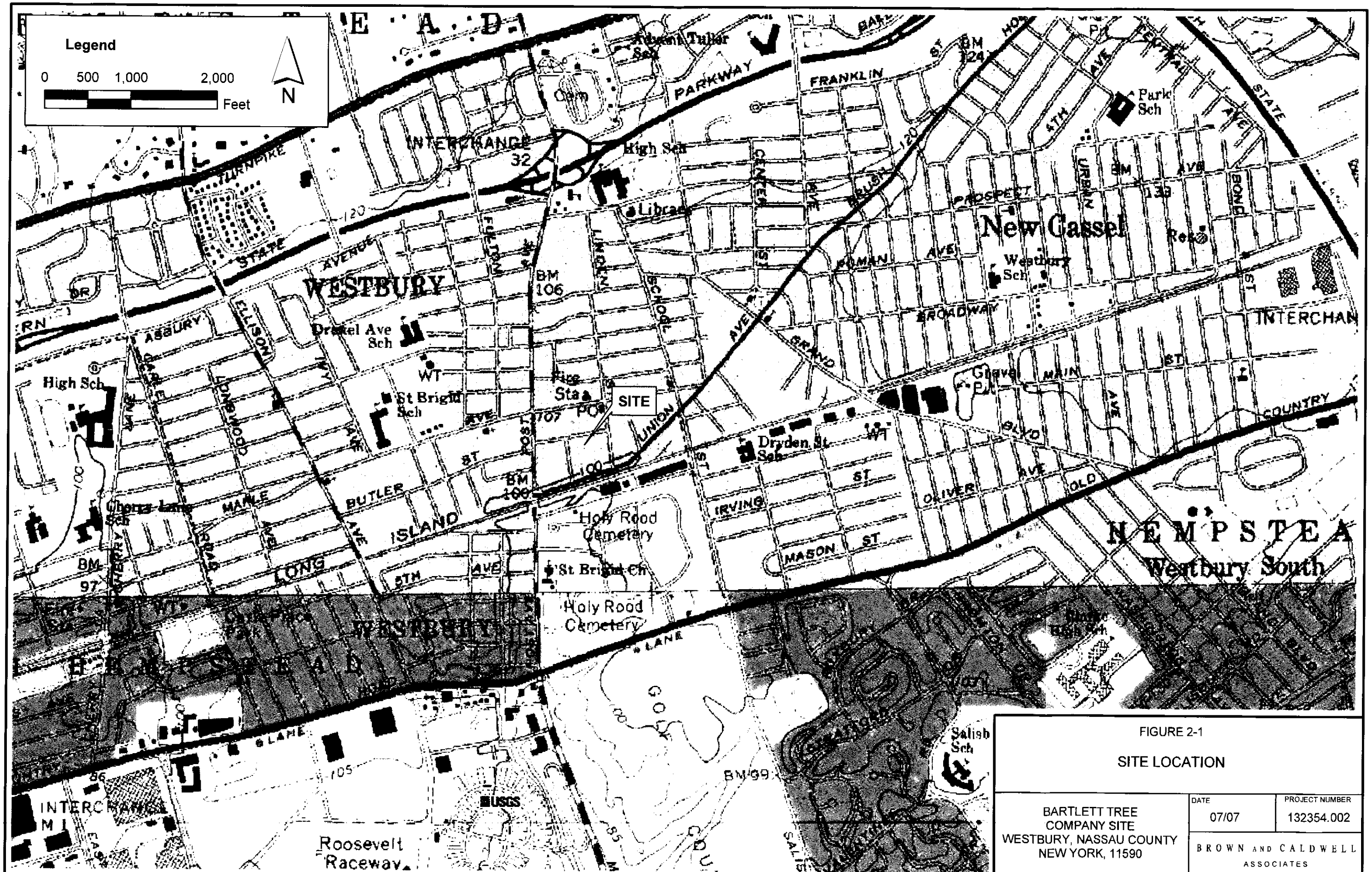

FIGURE 2-1

SITE LOCATION

BARTLETT TREE
COMPANY SITE
WESTBURY, NASSAU COUNTY
NEW YORK, 11590

DATE	PROJECT NUMBER
07/07	132354.002

BROWN AND CALDWELL
ASSOCIATES

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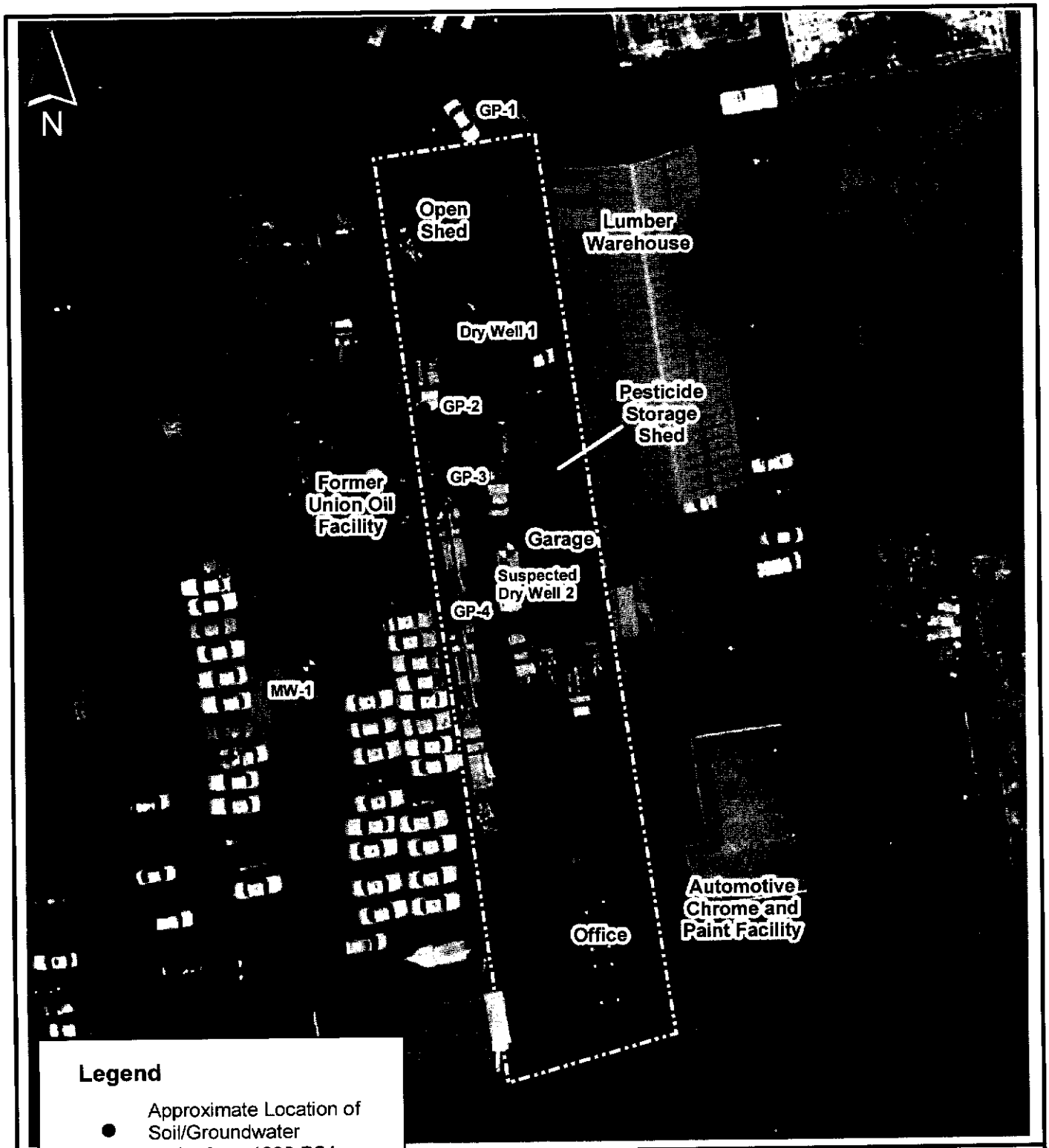


FIGURE 2-2

SITE PLAN

BARTLETT TREE COMPANY SITE WESTBURY, NASSAU COUNTY NEW YORK, 11590	DATE 07/07	PROJECT NUMBER 132354.002
	BROWN AND CALDWELL ASSOCIATES	

P:/GIS/Bartlett_Tree/Site_Plan.mxd

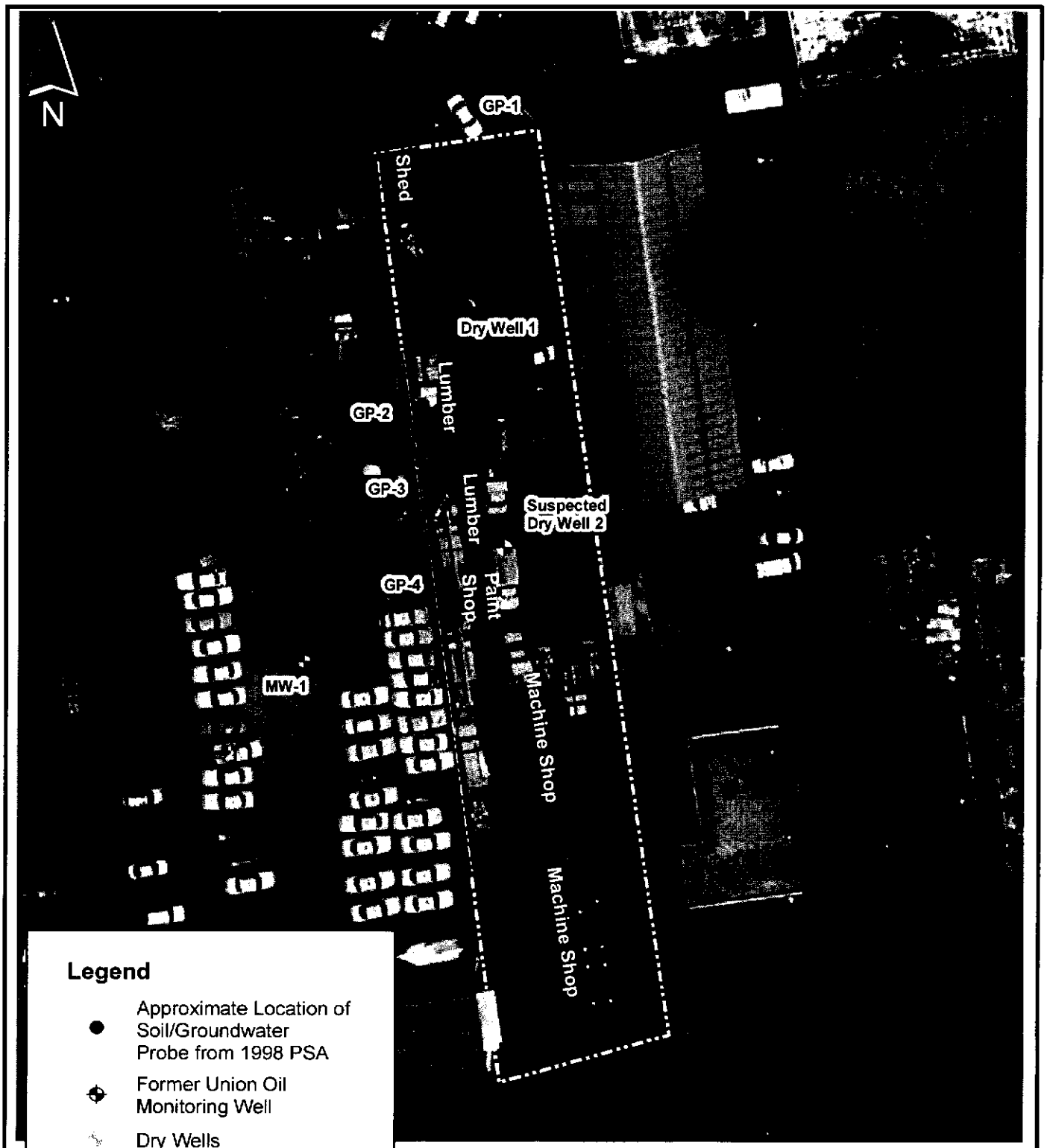


FIGURE 2-2A

APPROXIMATE LOCATIONS OF HISTORIC STRUCTURES

BARTLETT TREE COMPANY SITE
WESTBURY, NASSAU COUNTY
NEW YORK, 11590

DATE	PROJECT NUMBER
11/07	132354.002

BROWN AND CALDWELL ASSOCIATES

P:/GIS/Bartlett_Tree/Site_Plan.mxd

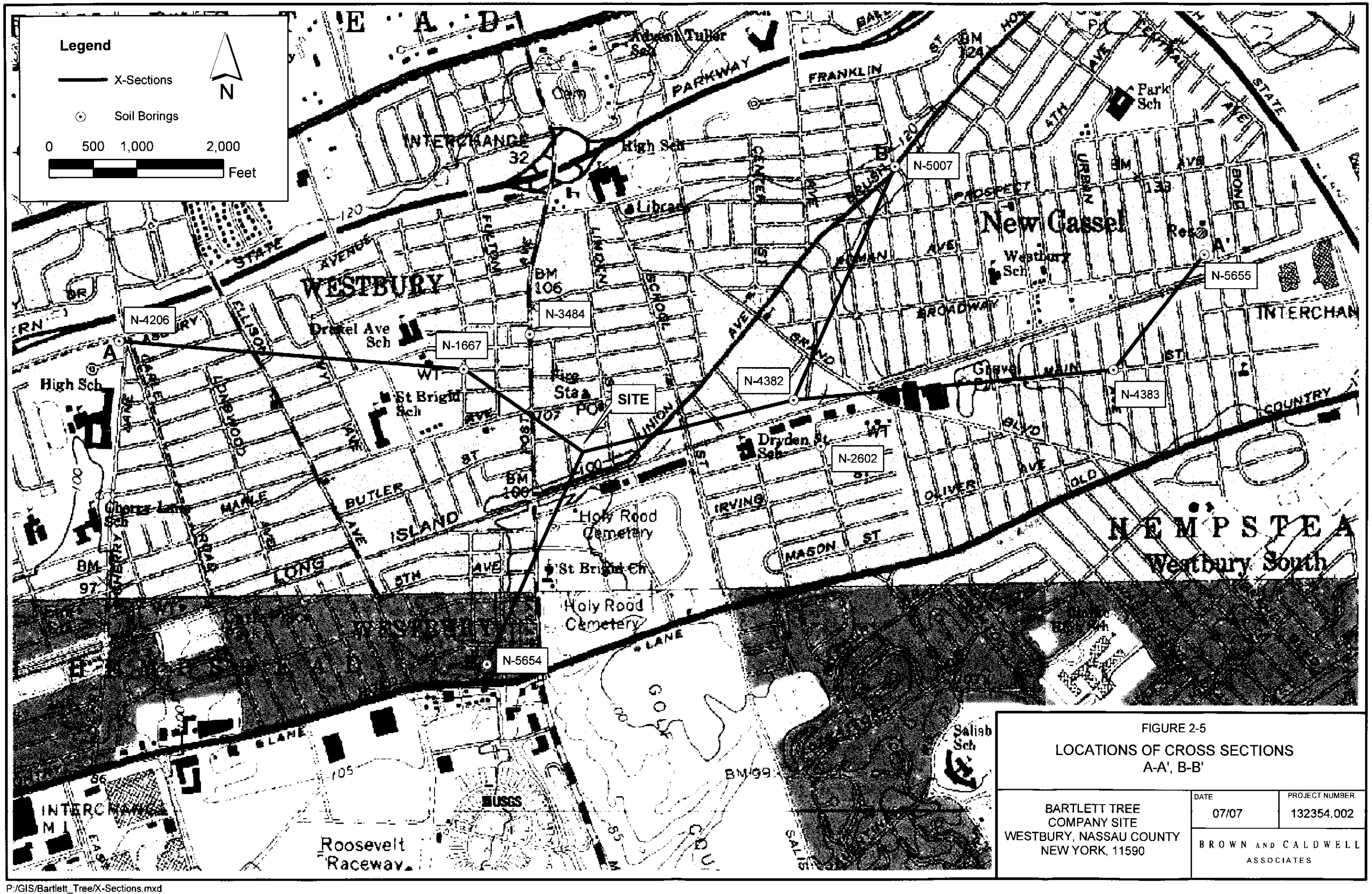
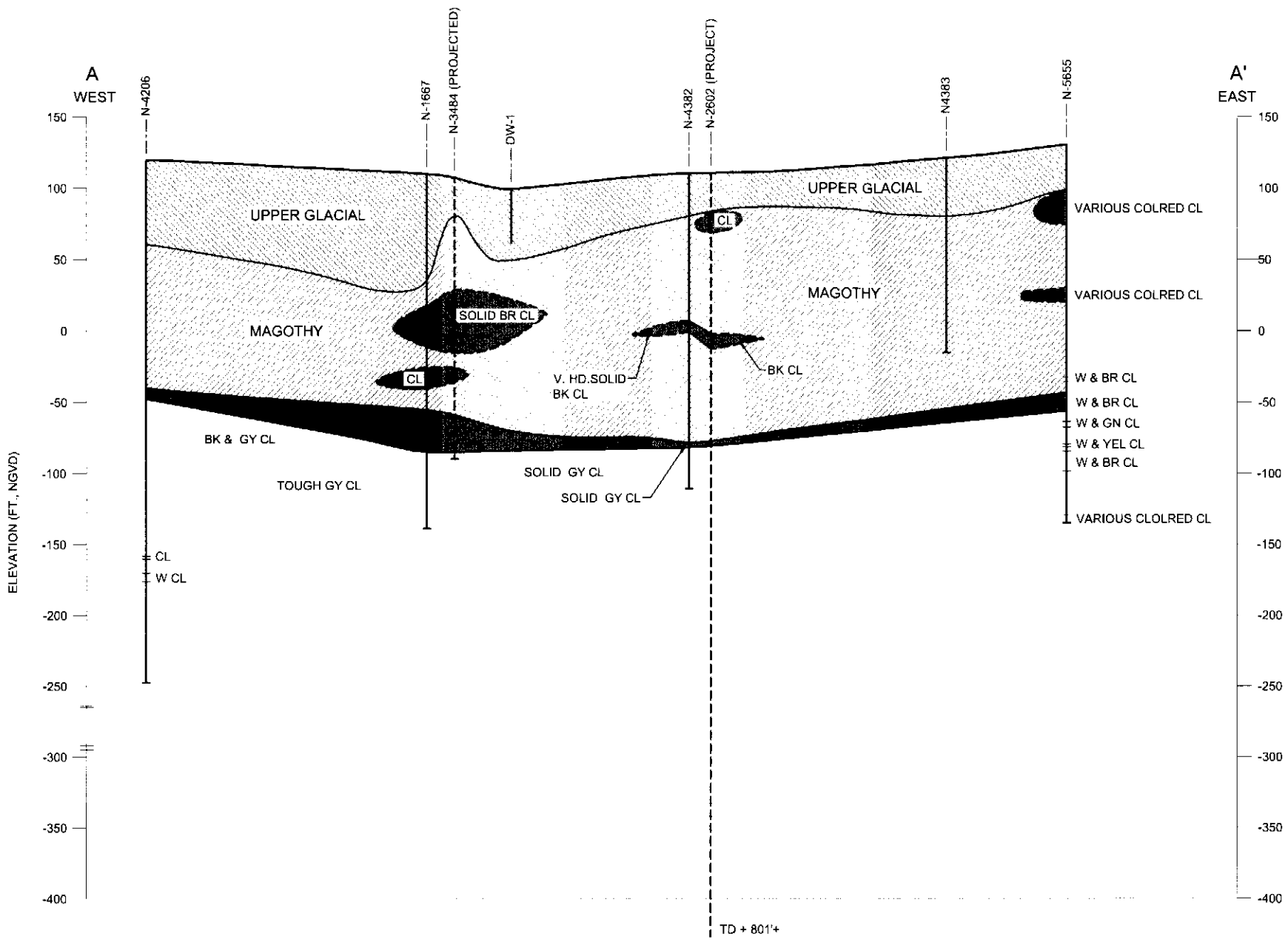


FIGURE 2-5

LOCATIONS OF CROSS SECTIONS
A-A', B-B'

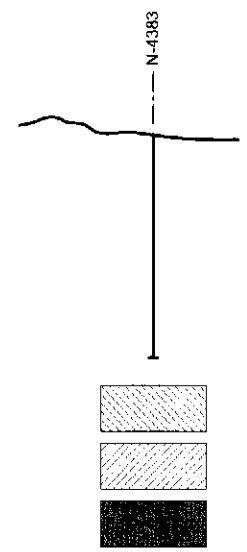
BARTLETT TREE COMPANY SITE WESTBURY, NASSAU COUNTY NEW YORK, 11590	DATE 07/07	PROJECT NUMBER 132354.002
	BROWN AND CALDWELL ASSOCIATES	

P:/GIS/Bartlett_Tree/X-Sections.mxd



CROSS-SECTION A-A'

LEGEND:



1000 0 1000 2000
scale HORIZONTAL feet

50 0 50 100
scale VERTICAL feet

PLaw
Jul 02, 2007 - 8:46am
P:\DRAFTING\FA_BARLETT_TREE\CROSS-SECTION A-A'.dwg

BROWN AND CALDWELL ASSOCIATES
ALBANY, NEW YORK

SUBMITTED: _____ DATE: _____ PROJECT MANAGER
APPROVED: _____ DATE: _____ BROWN AND CALDWELL

LINE IS 2 INCHES AT FULL SIZE (IF NOT 2" - SCALE ACCORDINGLY)
DESIGNED: -
DRAWN: PL
CHECKED: FJW
CHECKED: -
APPROVED: FJW

EXTERNAL REFERENCES

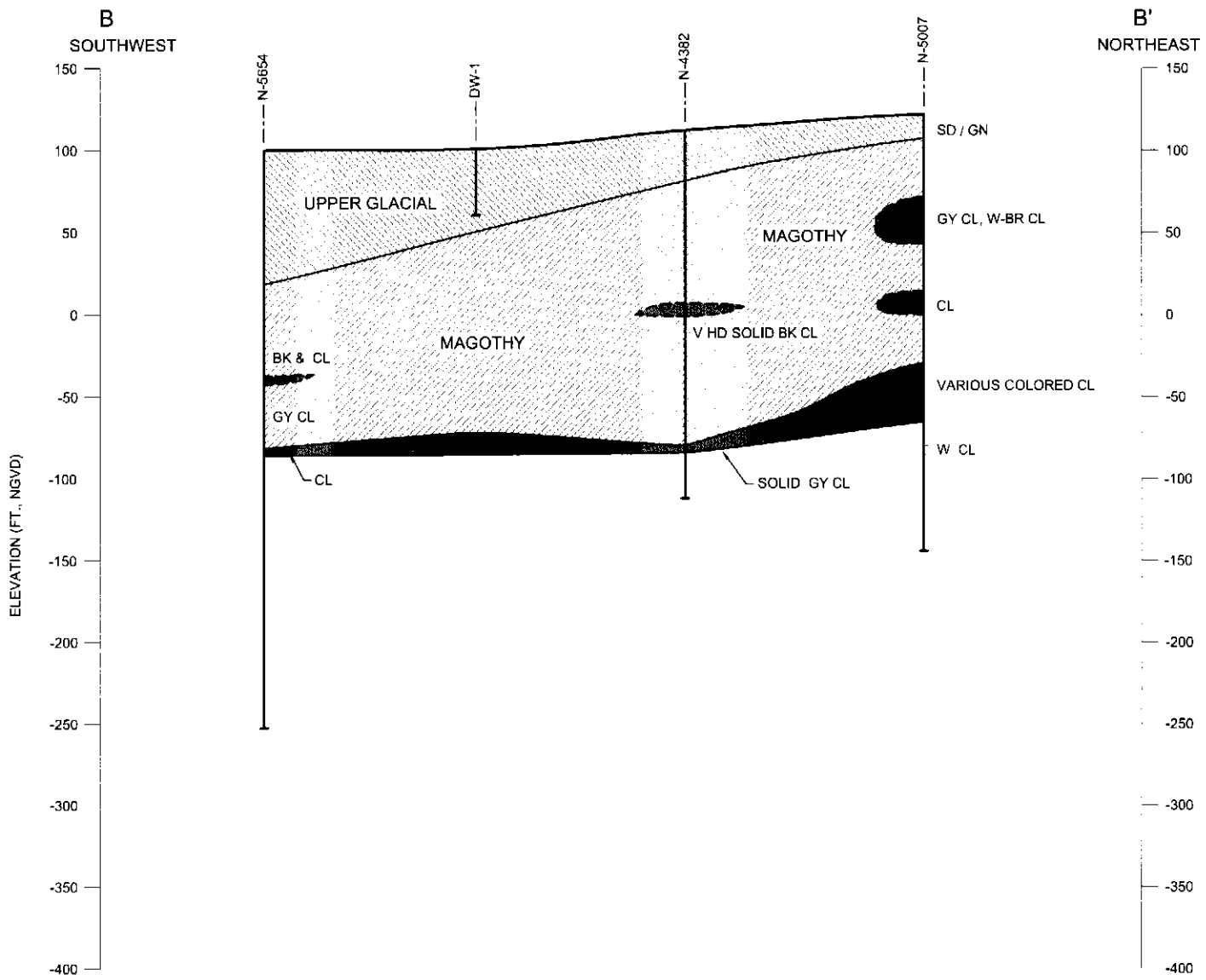
ENGINEER NAME DATE
PROFESSIONAL ENGINEER
N.Y. LICENSE NO. ??????

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.

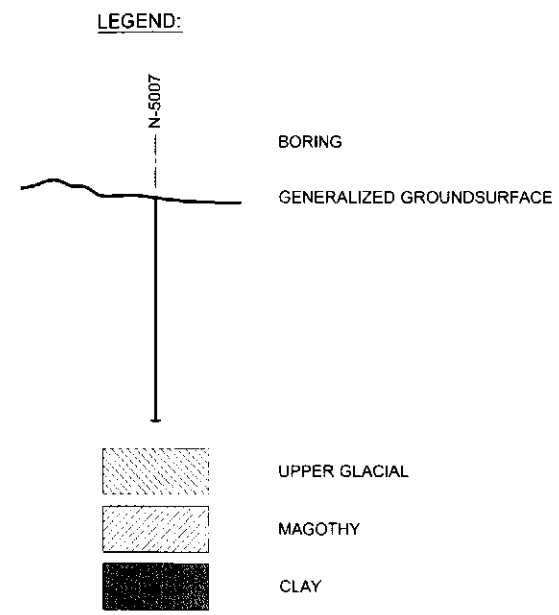
FIGURE 2-6

HYDROGEOLOGIC
CROSS SECTION A-A'
FA BARTLETT TREE EXPERT COMPANY
BARTLETT TREE COMPANY SITE
345 UNION AVENUE
WESTBURY, NASSAU COUNTY, N.Y. 11590

FILENAME -
BC PROJECT NUMBER 132354
CLIENT PROJECT NUMBER -
DRAWING NUMBER -
SHEET NUMBER OF



CROSS-SECTION B-B'



1000 0 1000 2000
scale HORIZONTAL feet

50 0 50 100
scale VERTICAL feet

BROWN AND CALDWELL ASSOCIATES
ALBANY, NEW YORK

SUBMITTED: _____ DATE: _____ PROJECT MANAGER
APPROVED: _____ DATE: _____ BROWN AND CALDWELL

LINE IS 2 INCHES AT FULL SIZE (IF NOT 2" - SCALE ACCORDINGLY)

DESIGNED: -
DRAWN: PL
CHECKED: FJW
CHECKED: -
APPROVED: FJW

EXTERNAL REFERENCES

ENGINEER NAME
PROFESSIONAL ENGINEER
N.Y. LICENSE NO. 777777
DATE

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.

FIGURE 2-7

HYDROGEOLOGIC
CROSS SECTION B-B'
FA BARTLETT TREE EXPERT COMPANY
BARTLETT TREE COMPANY SITE
345 UNION AVENUE
WESTBURY, NASSAU COUNTY, N.Y. 11590

FILENAME -
BC PROJECT NUMBER 132354
CLIENT PROJECT NUMBER -
DRAWING NUMBER -
SHEET NUMBER OF

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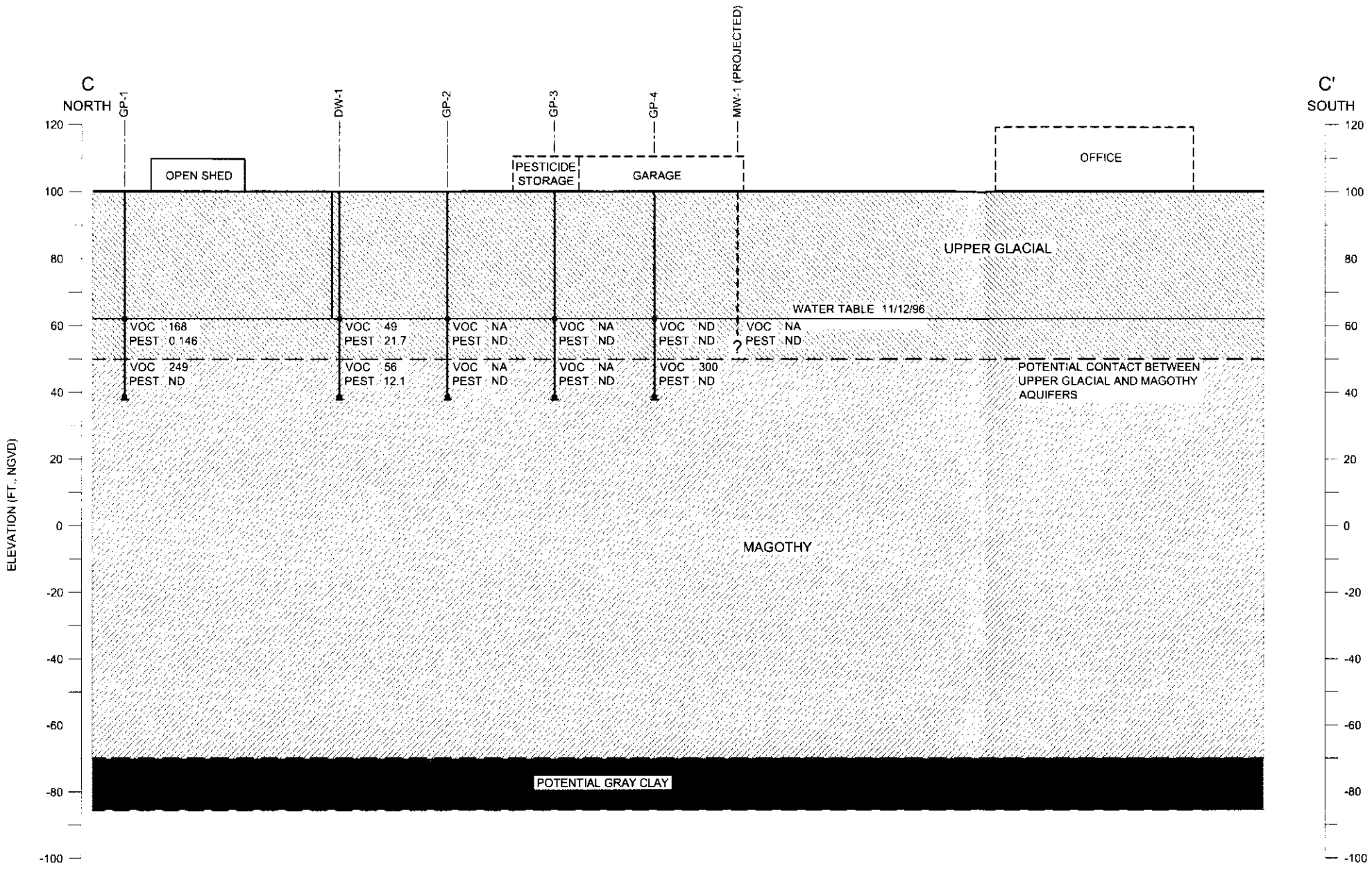
PLaw



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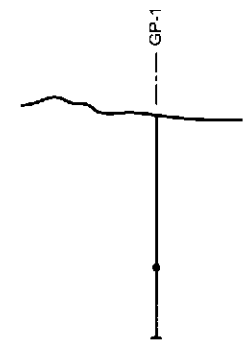


DIRECT PUSH BORING / GROUNDWATER PROBE

GENERALIZED GROUNDSURFACE

GROUNDWATER SAMPLE
VOC 168 *
PEST 0.146 *

UPPER GLACIAL

MAGOTHY

CLAY

* TOTAL CONCENTRATION OF PARAMETERS DETECTED ABOVE NYS GROUNDWATER STANDARD (ug/L)

CROSS-SECTION C-C'

20 0 20 40
scale HORIZONTAL feet

20 0 20 40
scale VERTICAL feet

BROWN AND CALDWELL ASSOCIATES
ALBANY, NEW YORK

SUBMITTED: _____ DATE: _____ PROJECT MANAGER

APPROVED: _____ DATE: _____ BROWN AND CALDWELL

LINE IS 2 INCHES AT FULL SIZE (IF NOT 2" - SCALE ACCORDINGLY)

DESIGNED: -
DRAWN: PL
CHECKED: FJW
CHECKED: -
APPROVED: FJW

EXTERNAL REFERENCES

ENGINEER NAME
PROFESSIONAL ENGINEER
N.Y. LICENSE NO. ??????
DATE

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.

FIGURE 2-8

HYDROGEOLOGIC
CROSS SECTION C-C'
FA BARTLETT TREE EXPERT COMPANY
BARTLETT TREE COMPANY SITE
345 UNION AVENUE
WESTBURY, NASSAU COUNTY, N.Y. 11590

FILENAME -
BC PROJECT NUMBER 132354
CLIENT PROJECT NUMBER -
DRAWING NUMBER -
SHEET NUMBER OF

Jul 02, 2007 - 8:48am
P:\DRAFTING\FA_BARLETT_TREE\CROSS-SECTION C-C' .dwg
PLaw

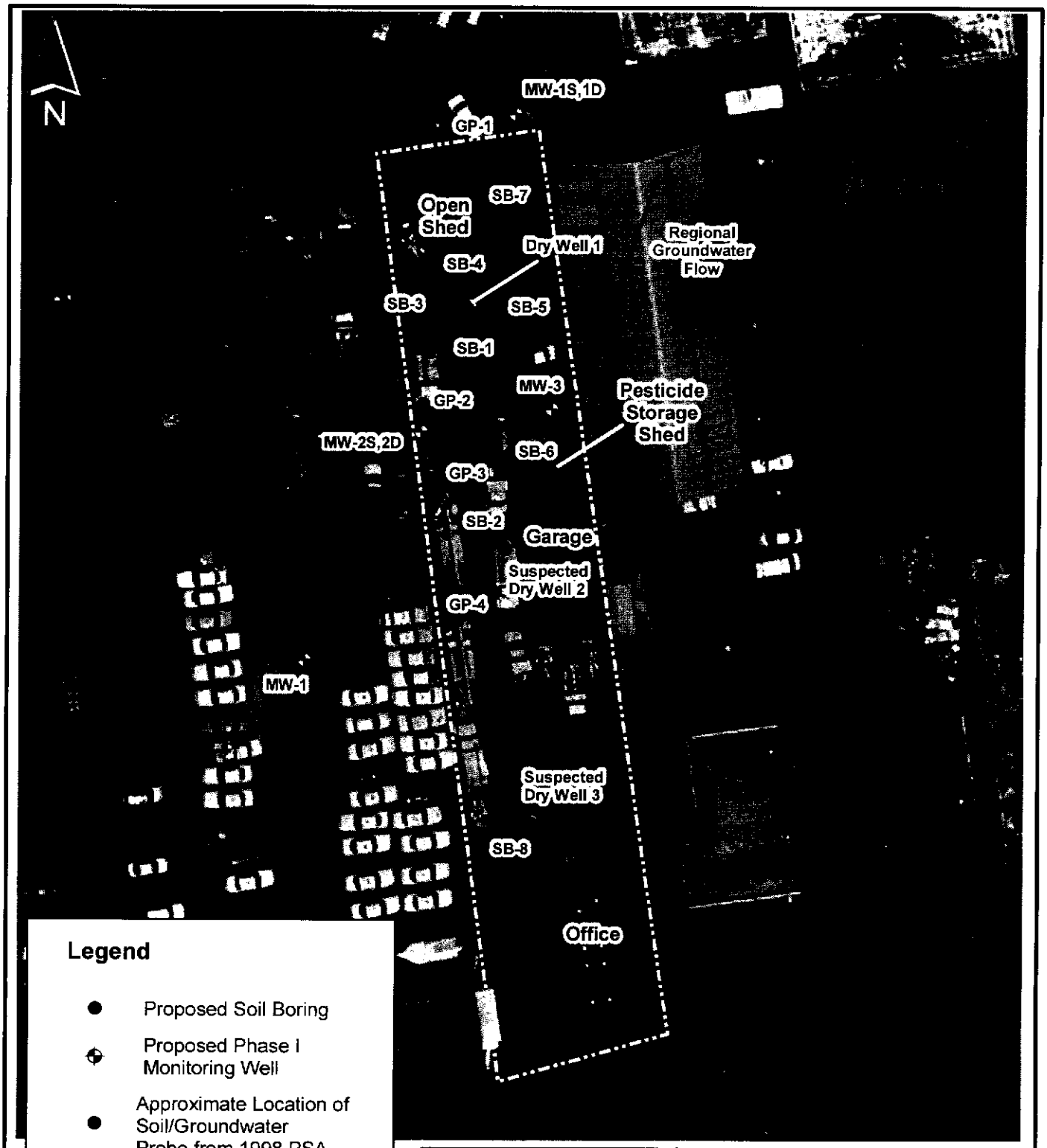


FIGURE 5-1

PROPOSED SOIL BORINGS AND MONITORING WELLS

BARTLETT TREE COMPANY SITE
WESTBURY, NASSAU COUNTY
NEW YORK, 11590

DATE	PROJECT NUMBER
01/08	132354.002

BROWN AND CALDWELL ASSOCIATES

P:/GIS/Bartlett_Tree/Site_Plan.mxd

132354

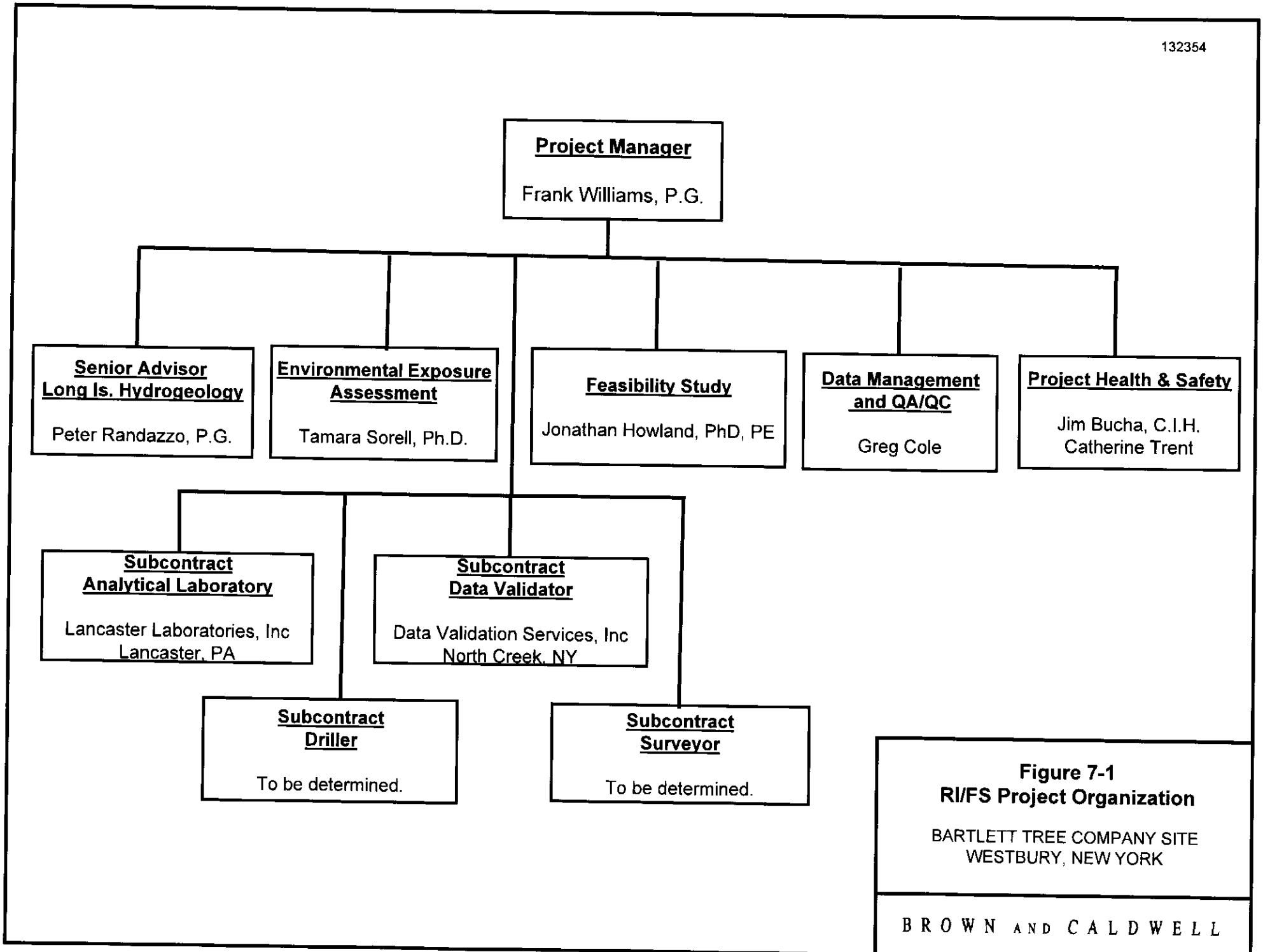


Figure 7-1
RI/FS Project Organization

BARTLETT TREE COMPANY SITE
WESTBURY, NEW YORK

BROWN AND CALDWELL

APPENDIX A

Health and Safety Plan

HEALTH AND SAFETY PLAN
REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
BARTLETT TREE COMPANY SITE
345 UNION AVENUE, WESTBURY
NASSAU COUNTY, NEW YORK

JULY 2007

BC Project Number: 132354.002

Prepared by:

BROWN AND CALDWELL

234 Hudson Avenue

Albany, New York 12210

Prepared for:

FA Bartlett Tree Expert Company

13768 Hamilton Road

Charlotte, North Carolina 28278

Approval Page

This Health and Safety Plan (HASP) has been prepared and reviewed by the following Brown and Caldwell (BC) personnel.

	Name	Signature	Title	Date
Prepared By:	James Marolda		Hydrogeologist	
Reviewed By:	Catie Mino		Site Safety Officer	
Reviewed By:	Frank Williams		Project Manager	
Reviewed By:	Lydia Crabtree		Regional Safety Unit Manager	
Effective Dates:	July 2007	through	July 2008	

TABLE OF CONTENTS

LIST OF APPENDICES

CRITICAL PROJECT INFORMATION

Primary Known Compounds of Concern:

- Benzene
- Ethyl Benzene
- Xylene
- Naphthalene
- 2-methylnaphthalene
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- 1,2-dichloroethene (DCE)
- Pesticides (Lindane and other isomers of BHC, Dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, Methoxychlor, and Chlordane)
- Arsenic
- Beryllium
- Copper
- Iron
- Zinc

Minimum Level of Respiratory Protection: ☒ Level D ☐ Level C

Additional PPE:

Level D includes hardhat, steel toes, and safety glasses. Additional PPE that may be required is as follows:

- Safety goggles with side shields
- Plastic face shield or splash-proof goggles for use during heavy equipment decontamination
- Overboots
- Tyvek Coveralls, as necessary
- Ear plugs on an as needed basis
- Nitrile,latex, or neoprene gloves as needed for sample collection
- Full face air purifying respirators with organic vapor/HEPA filter cartridges if upgrade to Level C is required.

SEE SECTION 10 FOR SITE EMERGENCY CONTINGENCY PROCEDURES

Do not endanger your own life. Survey the situation before taking any action.

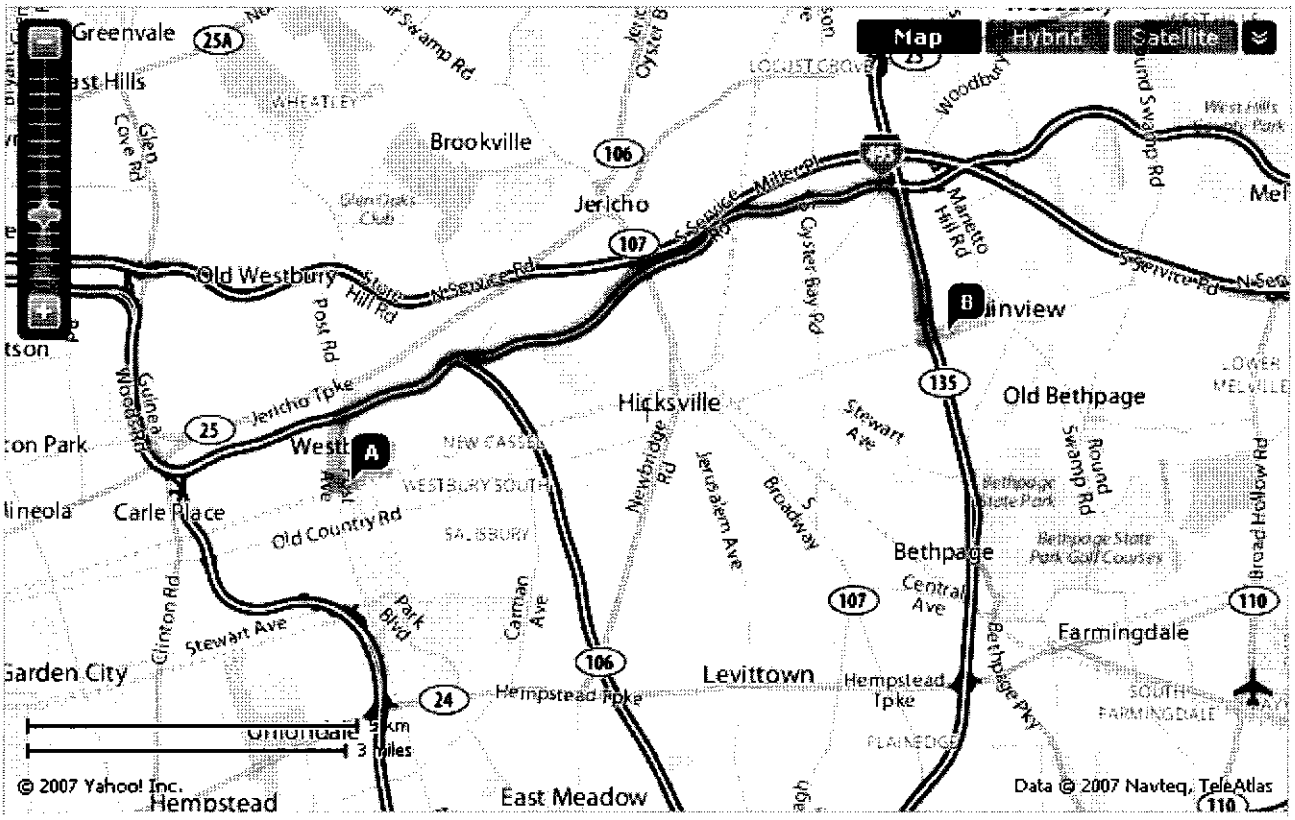
BC Office Telephone	**518-472-1988**
Albany Office **234 Hudson Avenue** **Albany, NY 12210**	

Site Location Address	**345 Union Avenue** **Westbury, New York**

EMERGENCY PHONE NUMBERS: In the event of emergency, contact the Project Manager and/or Regional Safety Unit Manager.

Emergency Services (Ambulance, Fire, Police)	**911**
Poison Control	**(800) 876-4766 or (800) 222-1222**
National Response Center	**(800) 424-8802**
NYSDEC Spill Hotline	**(800) 457-7362**
Dig Safely New York	**(800) 962-7962**
Hospital Name	**North Shore University Hospital of Plainview**
Hospital Phone Number	**516-719-3000**
BC Project Manager (PM; Frank Williams)	**Office: 518-472-1988** **Cell: 518-339-7454**
BC Site Safety Officer (SSO; Catie Mino)	**Office: 201-574-4744** **Cell: 201-841-1108**
BC Regional Safety Unit Manager (Lydia Crabtree)	**Office: 615-250-1236** **Cell: 615-202-1311**
Corporate Risk Management	**Property Loss** **Blythe Buetzow: (925) 210-2470** **Injury** **Angela Hernandez: (925) 210-2218**
Subcontractor Contact (David Maher) **Boart Longyear** **71 Concord St.** **North Reading, MA 01864**	**Office: 781-933-3210**
Client Contact (David Marren, Esq.) **FA Bartlett Tree Expert Company** **13768 Hamilton Road** **Charlotte, NC 28278**	**Office: 704-588-1150**

HOSPITAL LOCATION MAP



HOSPITAL DIRECTIONS:

1. Start at 345 UNION AVE, WESTBURY - go 0.1 mi
2. Bear right on POST AVE - go 0.7 mi
3. Bear right to take ramp onto NORTHERN PKY E towards NORTHERN PARKWAY EAST – go 5.8 mi
4. Take exit #36A/SEAFORD onto RT-135 S – go 1.4 mi
5. Take exit #10/PLAINVIEW/HICKSVILLE/OLD COUNTRY RD – go 0.2 mi
6. Turn left on OLD COUNTRY RD – go 0.2 mi
7. Arrive at 888 OLD COUNTRY RD, PLAINVIEW

HOSPITAL INFORMATION:

North Shore University Hospital of Plainview
888 Old Country Road
Plainview, NY 11803

Phone: 516-719-3000

EMERGENCY FIRST AID PROCEDURES

THE RESPONDER SHOULD HAVE APPROPRIATE TRAINING TO ADMINISTER FIRST AID OR CPR

1. Survey the situation. Do not endanger your own life. DO NOT ENTER A CONFINED SPACE TO RESCUE SOMEONE WHO HAS BEEN OVERCOME. ENSURE ALL PROTOCOLS ARE FOLLOWED INCLUDING THAT A STANDBY PERSON IS PRESENT. IF APPLICABLE, REVIEW MSDSs TO EVALUATE RESPONSE ACTIONS FOR CHEMICAL EXPOSURES.
2. Call 911 (if available) or the fire department **IMMEDIATELY**. Explain the physical injury, chemical exposure, fire, or release.
3. Decontaminate the victim if it can be done without delaying life-saving procedures or causing further injury to the victim.
4. If the victim's condition appears to be non-critical, but seems to be more severe than minor cuts, he/she should be transported to the nearest hospital by the SSO or designated personnel: let the doctor assume the responsibility for determining the severity and extent of the injury. If the condition is obviously serious, contact emergency medical services (EMS) for transport or appropriate actions.

Notify the PM and Regional Safety Unit Manager immediately and complete the appropriate accident/incident investigation reports as soon as possible.

STOP BLEEDING AND CPR GUIDELINES	
To Stop Bleeding	**CPR**
1. Give medical statement. 2. Assure: airway, breathing and circulation. 3. Use **DIRECT PRESSURE** over the wound with clean dressing or your hand (use non-permeable gloves). Direct pressure will control most bleeding. 4. Bleeding from an artery or several injury sites may require **DIRECT PRESSURE** on a **PRESSURE POINT**. Use pressure points for 30 -60 seconds to help control severe bleeding. 5. Continue primary care and seek medical aid as needed.	1. Give medical statement. 2. Arousal: Check for consciousness – "Are you okay?" 3. No response, call 911. 4. Open airway with chin-lift. 5. Look, listen and feel for breathing. 6. If breathing is absent, give 2 slow, full rescue breaths. 7. If air does not enter, re-tilt and repeat breaths. 8. If chest does not rise, initiate CPR; 30 compressions for each two breaths.

1. INTRODUCTION

Brown and Caldwell (BC) has prepared this Health and Safety Plan (HASP) for use during the Remedial Investigation and Feasibility Study activities to be conducted at the Bartlett Tree Company Site located at 345 Union Avenue, Westbury, Nassau County, New York ("the Site"). Activities conducted under BC's direction at the Site will be in compliance with applicable Occupational Safety and Health Administration (OSHA) regulations, particularly those in Title 29 of the Code of Federal Regulations, Part 1910.120 (29 CFR 1910.120), and other applicable federal, state, and local laws, regulations, and statutes. A copy of this HASP will be kept on site during scheduled field activities.

The field activities for which this HASP applies to are described below in Section 1.3 and are provided in further detail in the document entitled "Remedial Investigation/Feasibility Study Work Plan, Bartlett Tree Company Site", (Brown and Caldwell, July 2007).

This HASP addresses the identified hazards associated with planned field activities at the Site. It presents the minimum health and safety requirements for establishing and maintaining a safe working environment during the course of work. In the event of conflicting requirements, the procedures or practices that provide the highest degree of personnel protection will be implemented. If scheduled activities change or if site conditions encountered during the course of the work are found to differ substantially from those anticipated, the Regional Safety Manager and Project Manager will be informed immediately upon discovery, and appropriate changes will be made to this HASP.

BC's health and safety programs and procedures, including medical monitoring, respiratory protection, injury and illness prevention, hazard communication, and personal protective equipment (PPE), are documented in the BC Health & Safety Manual. The Health & Safety Manual is readily accessible to BC employees via the BC Pipeline. These health and safety procedures are incorporated herein by reference, and BC employees will adhere to the procedures specified in the manual.

BC's HASP has been prepared specifically for this project and is intended to address health and safety issues solely with respect to the activities of BC's own employees at the site. A copy of BC's HASP may be provided to subcontractors in an effort to help them identify expected conditions at the site and general site hazards. The subcontractor shall remain responsible for identifying and evaluating hazards at the site as they pertain to their activities and for taking appropriate precautions. For example, BC's HASP does not address specific hazards associated with tasks and equipment that are particular to the subcontractor's scope of work and site activities (e.g., operation of a drill rig, excavator, crane or other equipment). Subcontractors are not to rely on BC's HASP to identify all hazards that may be present at the Site.

Subcontractors are responsible for developing, maintaining, and implementing their own health and safety programs, policies, procedures and equipment as necessary to protect their workers, and others, from their activities. Subcontractors shall operate equipment in accordance with their

standard operating procedures as well as manufacturer's specifications. Any project monitoring activities conducted by BC at the Site shall not in any way relieve subcontractors of their critical obligation to monitor their operations and employees for the determination of exposure to hazards that may be present at the Site and to provide required guidance and protection. If requested, subcontractors will provide BC with a copy of their own HASP for this project or other health and safety program documents for review.

1.1 Site History

Since the 1950s the site has been used by Bartlett as a base for tree maintenance services, including applications of pesticides and herbicides. In the 1960s and 1970s, excess (unused) pesticide spray solutions were typically re-tanked for applications on the following day. Since the early 1980s, pesticide and herbicide spray solutions have been prepared in truck-mounted tanks in quantities only as large as needed for immediate, individual applications. Thus, no unused spray solution is left over to be disposed. Empty, plastic pesticide containers are triple rinsed, bagged and stored on site pending recycling as plastic. Rinse water is placed in spray tanks for mixing with new spray solutions.

On May 5, 1987, Bartlett investigated a May 1987 report that an abandoned "cistern" at the Westbury facility (Dry Well 1) allegedly held empty pesticide containers. Bartlett found that Dry Well 1 was partially filled with water, which was sampled, and Bartlett also recovered two Sevin containers (empty, crushed 5-gallon metal pails). After the inspection, Dry Well 1 was backfilled with sand out of concern that it could cave in due to the heavy traffic in the driveway. The sample of the standing water in Dry Well 1 was submitted to an independent laboratory for testing. The herbicide diazinon was detected at 0.61 ppm.

Bartlett submitted a letter report to the Nassau County Department of Health (County) on October 3, 1990 in response to the County's inspection of the Westbury facility at about that time. During the inspection, the County requested background information on Dry Well 1. Bartlett's letter report to the County described the May 1987 inspection and closure of Dry Well 1, and including a copy of the analytical results. The County never responded and Bartlett therefore concluded that the procedure had been acceptable to the County.

In April 1990, an anonymous caller to the DEC alleged that pesticides and herbicides were periodically placed into Dry Well 1 prior to abandonment of the dry well in 1983. Specific pesticides were named, including malathion, DDT, Sevin, chlordane and lead spray for fruit trees.

1.2 Site Description

The site is located on Long Island, at 345 Union Avenue in Westbury, Nassau County, New York. The site is located in an urban, mixed-use neighborhood of commercial and industrial facilities and residences. The site consists of a narrow parcel of land measuring approximately 340 feet in length by 60 feet wide, totaling approximately 0.4 acres. It is bordered on the north by a municipal parking lot; on the east by a lumber warehouse and automotive paint and chrome shop; on the south by Union Avenue, followed by a railroad, parking lot and cemetery; and on the west by a taxi fleet maintenance facility and construction contractor's storage yard.

A preliminary site assessment was performed in 1996-1998 by a contractor to the DEC to determine if a potential source of soil and/or groundwater contamination existed at the site (Dvirka and Bartilucci, 1998). Continuous soil samples from the unsaturated zone directly beneath the dry well (8'-37' bgs) were collected by direct-push (Geoprobe) methods. Groundwater samples were

collected with a Geoprobe groundwater sampling probe at five (5) locations (one presumed upgradient ("upgradient"), one in the location of the dry well, and three presumed downgradient ("downgradient")). At each location groundwater was sampled at 37' bgs (water table) and 62' bgs. An existing monitoring well on adjacent property at 333 Union Avenue was also tested.

All samples were analyzed for the Target Compound List (TCL) pesticides, organochlorine pesticides (USEPA SW846 Method 8141) and herbicides (USEPA SW846 Method 8150). A subset of samples were also analyzed for the full list of TCL parameters, including volatile and semi-volatile organic compounds, polychlorinated biphenyl compounds (PCBs), cyanide and inorganic constituents.

Soil Quality

Pesticides were detected in soil samples in excess of TAGM 4046 recommended soil cleanup objectives in effect at the time for unrestricted use (RSCOs) throughout the entire soil column beneath the dry well. The herbicides 2, 4, 5-TP (Silvex) and Dicamba were detected; Silvex did not exceed its RSCO. No RSCO was established for Dicamba. VOCs (primarily benzene, ethylbenzene and xylene) and SVOCs (naphthalene, 2-methylnapthelene and various PAHs) were also found in levels exceeding RSCOs. Some of these non-chlorinated compounds may be constituents of the petroleum distillates used as pesticide carriers. Inorganic constituents found in excess of RSCOs included arsenic, beryllium, copper, iron and zinc. No site-specific information regarding background levels of these inorganic constituents has been identified. No PCBs or cyanide were detected.

Groundwater Quality

Groundwater samples collected from directly beneath the dry well contained elevated levels of pesticides. The turbidity of the groundwater samples was generally very high, usually in excess of 999 NTUs, indicating that the samples contained high levels of suspended silt and clay. Most organic pesticides are relatively insoluble in water and have a high affinity for silt and clay particles. Therefore, the groundwater analytical results for pesticides may reflect elevated levels of adsorbed phase constituents as opposed to dissolved concentrations.

No pesticides were detected in the downgradient samples. Two pesticides were detected in one upgradient sample. The VOCs ethylbenzene and total xylenes were detected above standards in groundwater samples collected directly beneath the dry well.

The chlorinated solvents tetrachloroethene (PCE), trichloroethene (TCE), and cis & trans 1,2-dichloroethene (DCE) were detected in groundwater. TCE and DCE can be produced in certain environments through biodegradation of PCE. TCE and DCE were found in the deeper groundwater samples (62') from both upgradient and downgradient locations, but not in the sample from directly beneath the dry well. PCE was detected in the shallower upgradient sample at 180 ug/L and in the deeper upgradient sample at 6 ug/L. Low levels of PCE were also detected in the samples from directly beneath the dry well, but not in the downgradient samples. Dvirka and Bartilucci and the DEC concluded that these findings suggest an off-site source for PCE, TCE and DCE. No significant levels of SVOCs or inorganics were detected. No PCBs or cyanide were detected.

1.3 Scope of Work

Field activities associated with the Remedial Investigation/Feasibility Study are as follows:

- Soil borings: Soil borings will be advanced using hollow-stem augers through and adjacent to former dry wells. Split spoon samples will be collected continuously and logged. Representative soil samples will be collected for laboratory analysis. Drilling-related services will be provided by a subcontractor.

- Monitoring well installation and development: Approximately five (5) two-inch diameter PVC monitoring wells (3 shallow, 2 deep) will be installed in the overburden to depths up to approximately 60 feet for the shallow wells and approximately 120 feet for the deeper wells. The shallow wells will be installed using a hollow-stem auger drilling rig, whereas the deep wells will be installed using Rotosonic® drilling techniques. Following installation the wells will be developed by pumping and/or bailing water from them. One or more contingency monitoring wells will be installed if hydrogeologic and chemical-analytical data indicate that the initial monitoring wells do not adequately intercept groundwater flow paths from identified source areas. Drilling-related services will be provided by a subcontractor.

- Slug testing: Slug tests will be conducted on each monitoring well installed during the investigation. Water (approximately one bailer volume) will be removed from the monitoring well. Water levels will then be measured frequently following the water removal until the water level has stabilized.

- Groundwater Monitoring: A site-wide round of groundwater sampling will be conducted after development and slug testing of the monitoring wells. Sampling will be conducted after at least one week has passed since slug testing to allow for establishment of equilibrium conditions within the monitoring wells.

- Groundwater Level Monitoring: Monthly depth to water measurements will be conducted on the monitoring wells for a period of six (6) months.

- Survey: Each of the new borings and monitoring wells will be surveyed. The survey will include location coordinates, ground surface elevation and, in the case of the monitoring wells, top of casing elevation data. A boundary line survey of the parcel(s) owned by Bartlett Tree Experts will also be performed. The survey will be performed by a New York State licensed surveyor subcontracted to BC.

- Investigation-derived waste management: Waste generated during the remedial investigation will include soil cuttings, well development water, equipment decontamination water, disposable sampling equipment, and personal protective equipment (PPE). The waste will be temporarily containerized in polyethylene tanks or NYSDOT-approved, 55 gallon drums pending waste characterization and appropriate off-site disposal in a permitted facility. All containers will be properly labeled to identify their contents.

2. KEY BC PROJECT PERSONNEL AND RESPONSIBILITES

Frank Williams is the Project Manager (PM). Lydia Crabtree is the Regional Safety Unit Manager (RSUM). Catie Mino has been designated as the BC Site Safety Officer (SSO) for this project. The BC project manager and project field staff have completed 40 hours of comprehensive health and safety training, which meets the requirements of 29 CFR 1910.120.

The responsibilities of key BC project personnel are presented below.

2.1 Project Manager

The PM is responsible for evaluating hazards anticipated at the Site and working with designated field staff and the RSUM to prepare this HASP to address the identified hazards. The PM is also responsible for the following.

- Informing project participants of safety and health hazards identified at the Site
- Providing a copy of this HASP to BC project participants and a copy to each BC subcontractor prior to the start of field activities.
- Ensuring that the BC project team is adequately trained and perform safety briefings in accordance with this HASP.
- Providing the resources necessary for maintaining a safe and healthy work environment for BC personnel.
- Communicating project safety concerns to the RSUM for determining corrective actions.

2.2 Site Safety Officer

The SSO has on-Site responsibility for verifying that BC team members, including subcontractors, comply with the provisions of this HASP. The SSO has the authority to monitor and correct health and safety issues as noted on-Site. The SSO is responsible for the following.

- Reporting unforeseen or unsafe conditions or work practices at the Site to the PM or RSUM.
- Stopping operations that threaten the health and safety of BC field team or members of the surrounding community.
- Monitoring the safety performance of Site personnel to evaluate the effectiveness of health and safety procedures.
- Performing air monitoring, as necessary, as prescribed in this HASP.
- Documenting field team compliance with this HASP by completing the appropriate BC forms contained in the Appendices of this document.
- Conducting daily tailgate safety meetings and assuring that project personnel understand the requirements of this HASP (as documented by each BC field team member's signature on the Signature Page).

- Limiting access to BC work areas on the Site to BC field team members and authorized personnel.
- Enforcing the "buddy system" as appropriate for Site activities.
- Performing periodic inspections to evaluate safety practices at the Site.
- Identifying the location and route to nearby medical facility and emergency contact information and coordinating appropriate responses in the event of emergency.

2.3 Regional Safety Unit Manager

The RSUM is responsible for final review and modification of this HASP. Modifications to this HASP that result in less protective measures than those specified may not be employed by the PM or SSO without the approval of the RSUM. In addition, the RSUM has the following responsibilities.

- Developing and coordinating the overall BC health and safety program.
- Advising the PM and SSO on matters relating to health and safety on this project.
- Recommending appropriate safeguards and procedures.
- Modifying this HASP, if necessary, and approving changes in health and safety procedures at the Site.

2.4 BC Team Members

BC employees and subcontractors are responsible for familiarizing themselves with health and safety aspects of the project and for conducting their activities in a safe manner. This includes attending site briefings, communicating health and safety observations and concerns to the SSO, maintaining current medical and training status and maintaining and using proper tools, equipment and PPE. Proper work practices are part of ensuring a safe and healthful working environment. Safe work practices are essential and it is the responsibility of BC employees and team members to follow safe work practices when conducting scheduled activities. Safe work practices to be employed during the entire duration of fieldwork include, but are not limited to, the following.

- Following the provisions of this HASP, company health and safety procedures and regulatory requirements.
- Inspecting personal protective equipment (PPE) before on-site use, using only intact protective clothing and related gear, and changing suits, gloves, etc. if they are damaged or beyond their useful service life.
- Set up, assemble, and check out all equipment and tools for integrity and proper function before starting work activities.
- Assisting in and evaluating the effectiveness of Site procedures (including decontamination) for personnel, protective equipment, sampling equipment and containers, and heavy equipment and vehicles.
- Practice the "buddy system" as appropriate for site activities.
- Do not use faulty or suspect equipment.

- Do not use hands to wipe sweat away from face. Use a clean towel or paper towels.
- Practice contamination avoidance whenever possible.
- Do not smoke, eat, drink, or apply cosmetics while in chemically-affected areas of the site or before proper decontamination.
- Wash hands, face and arms before taking rest and lunch breaks and before leaving the site and the end of the workday.
- Check in and out with the SSO upon arrival and departure from the site.
- Perform decontamination procedures as specified in this HASP.
- Notify the SSO immediately if there is an incident that causes an injury, illness or property loss. Incidents that could have resulted in injury, illness or property loss (close call) will also be reported to the SSO.
- Do no approach or enter an area where a hazardous environment (i.e., oxygen deficiency, toxic or explosive) may exist without employing necessary engineering controls, proper PPE and appropriate support personnel.
- Use respirators correctly and as required for the Site; check the fit of the respirator with a negative or positive pressure test; do not wear respirator with facial hair or other conditions that prevent a face-to-facepiece seal; do not wear contact lenses when the use of a respirator is required.
- Confined spaces will not be entered without appropriate evaluation, equipment, training and support personnel.

2.5 Subcontractors

Subcontractor personnel are expected to comply fully with subcontractor's HASP and to observe the minimum safety guidelines applicable to their activities which may be identified in the BC HASP. Failure to do so may result in the removal of the subcontractor or any of the subcontractor's workers from the job site. A copy of their written program must be submitted for review to BC, if requested.

3. HAZARD ANALYSIS

Hazards at the Site may include physical hazards, chemical hazards or biological hazards. Each type of identified hazard is addressed in the following sections. Hazards that are the specialty of a subcontractor (i.e., operation of a drill rig or excavator) are not addressed in this HASP. Subcontractors are responsible for identifying potential hazards associated with their activities and implementing proper controls.

3.1 Chemical Hazards

The following table lists all chemical compounds and metals that have been reported in groundwater or soil samples at concentrations exceeding New York State groundwater standards/guidelines or NYSDEC TAGM 4046 Recommended Soil Cleanup Objectives for unrestricted use. Exposure pathways of concern for chemical compounds that may be present at the Site are inhalation of airborne contaminants, direct skin contact with contaminated materials, and incidental ingestion of affected media. Wearing protective equipment and following decontamination procedures listed in Section 9 can minimize dermal contact and incidental ingestion. To minimize inhalation hazards, dust or vapor control measures will be implemented, where necessary, and action levels will be observed during scheduled activities. Site-specific action levels and air monitoring requirements are presented in Section 5.

Known or Suspected Compounds	Source (soil/water/sludge, etc.)	Known Concentration Range (ppm, mg/kg, mg/l)	
		Lowest	Highest
Benzene	Soil	ND	86 µg/Kg
	Groundwater	ND	ND
Ethylbenzene	Soil	8 mg/Kg	49000 µg/Kg
	Groundwater	ND	7 µg/L
Xylenes, Total	Soil	67 mg/Kg	444000 µg/Kg
	Groundwater	ND	37 µg/L
Naphthalene	Soil	ND	81000 µg/Kg
	Groundwater	ND	3 µg/L
2-methlynaphthalene	Soil	150 mg/Kg	290000 µg/Kg
	Groundwater	ND	5 µg/L
Polycyclic Aromatic Hydrocarbons (PAHs)	Soil	ND	82483 µg/Kg
	Groundwater	ND	3 µg/L
Tetrachloroethene (PCE)	Soil	ND	840 µg/Kg
	Groundwater	ND	160 µg/L

Trichloroethene (TCE)	Soil	ND	ND
	Groundwater	ND	170 µg/L
1,2-dichloroethene (DCE)	Soil	ND	ND
	Groundwater	ND	140 µg/L
Pesticides, Total	Soil	124400 µg/Kg	11680000 µg/Kg
	Groundwater	ND	27.8 µg/L
delta-BHC	Soil	ND	ND
	Groundwater	ND	0.049 µg/L
gamma-BHC (Lindane)	Soil	ND	3400 µg/Kg
	Groundwater	ND	3.2 µg/L
Dieldrin	Soil	ND	29000 µg/Kg
	Groundwater	ND	0.59 µg/L
4-4'-DDE	Soil	ND	25000 µg/Kg
	Groundwater	ND	0.19 µg/L
Endrin	Soil	ND	ND
	Groundwater	ND	0.098 µg/L
4-4'-DDD	Soil	110000 µg/Kg	680000 µg/Kg
	Groundwater	ND	6 µg/L
4-4'-DDT	Soil	ND	11000000 µg/Kg
	Groundwater	ND	19 µg/L
Methoxychlor	Soil	ND	560000 µg/Kg
	Groundwater	ND	4.9 µg/L
alpha-Chlordane	Soil	ND	1900 µg/Kg
	Groundwater	ND	0.11 µg/L
gamma-Chlordane	Soil	ND	1400 µg/Kg
	Groundwater	ND	0.086 µg/L
Arsenic	Soil	1.1 mg/Kg	8.9 mg/Kg
	Groundwater	ND	159 µg/L
Beryllium	Soil	0.04 mg/Kg	0.27 mg/Kg
	Groundwater	1.7 µg/L	10.3 µg/L
Copper	Soil	2.2 mg/Kg	74.3 mg/Kg
	Groundwater	5.9 µg/L	166 µg/L
Iron	Soil	1470 mg/Kg	11600 mg/Kg
	Groundwater	1070 µg/L	539000 µg/L
Zinc	Soil	11.1 mg/Kg	530 mg/Kg
	Groundwater	90.8 µg/L	1110 µg/L

Chemical descriptions of chemicals of concern, including health effects and exposure limits, are presented in the following paragraphs. Each chemical description includes physical and odor recognition characteristics, the health effects associated with exposure, and exposure limits expressed as an 8-hour time-weighted average (TWA). Provided are federal OSHA (OSHA) permissible exposure limits (PELs; located in 29 CFR 1910.1000); California OSHA (Cal/OSHA) PELs (located in 8 CCR 5155); and the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLVs). For sites outside California, Cal/OSHA PELs are included as an additional reference.

3.1.1 Benzene

Benzene is a clear, volatile liquid. It is colorless, highly flammable, and toxic, with a characteristic odor. It is a severe eye and moderate skin irritant. Human effects by inhalation and ingestion include euphoria, changes in sleep and motor activity, nausea and vomiting, other blood effects, dermatitis, and fever. In industry, inhalation is the primary route of chronic benzene poisoning. If the liquid is aspirated into the lung it may cause pulmonary edema. Poisoning by skin contact has also been reported. Exposure to high concentrations (3,000 ppm) may result in acute poisoning, which is characterized by the narcotic action of benzene on the central nervous system. Chronic poisoning occurs most commonly through inhalation and dermal absorption. Benzene is a known human carcinogen that can cause leukemia.

- The OSHA PEL is listed as 1 ppm.
- The TLV is listed as 0.5 ppm.
- The Cal/OSHA PEL is listed as 1 ppm.

Note: Published exposure limits designate a skin notation indicating that dermal contact can contribute to the overall exposure.

3.1.2 Ethylbenzene

Ethylbenzene is a clear, colorless liquid. It is mildly toxic by inhalation and skin contact. Inhalation can cause eye, sleep, and pulmonary changes. It is an eye and skin irritant at levels as low as 0.1% (1,000 ppm) of the vapor in air. At higher concentrations, it is extremely irritating at first, then can cause dizziness, irritation of the nose and throat, and a sense of constriction in the chest. Exposure to high concentrations of ethylbenzene vapor may result in irritation of the skin and mucous membranes, dizziness, irritation of the nose and throat, and a sense of constriction of the chest.

- The OSHA PEL is listed as 100 ppm.
- The TLV is listed as 100 ppm.
- The Cal/OSHA PEL is listed as 100 ppm.

3.1.3 Xylene

Xylene is a clear, colorless liquid. It exhibits the general hydrocarbon central nervous system effects, olfactory (smell) changes, eye irritation and pulmonary changes. It is a severe skin irritant. There are

three isomers: ortho, meta, and para. Exposure to high concentrations of xylene vapor may result in eye and skin irritation. Eye irritation may occur at concentrations of about 200 ppm.

- The OSHA PEL is listed as 100 ppm.
- The TLV is listed as 100 ppm.
- The Cal/OSHA PEL is listed as 100 ppm.

3.1.4 Naphthalene

Naphthalene is a colorless to brown solid with an odor of mothballs. Poisoning may occur by inhalation, ingestion, or skin absorption. Naphthalene can cause nausea, headache, fever, anemia, liver damage, vomiting, convulsions, and coma. It is an experimental teratogen and a questionable carcinogen.

Naphthalene is flammable when exposed to heat or flame and reacts with oxidizing materials. It is explosive in the form of vapor or dust when exposed to heat or flame. When heated to decomposition, it emits acrid smoke and irritating fumes.

- The OSHA PEL is listed as 10 ppm.
- The Cal/OSHA PEL is listed as 10 ppm.
- The TLV is listed as 10 ppm.

Note: Published exposure limits designate a skin notation indicating that dermal contact can contribute to the overall exposure.

3.1.5 Polycyclic Aromatic Hydrocarbons

Coal tar, asphalt, residues of gasoline and diesel fuels may contain polycyclic aromatic hydrocarbons (PAHs). Most of these coal tar derivatives and products of combustion are known as human carcinogens. Routes of entry include inhalation, gastrointestinal and skin contact. They are not usually very volatile. Therefore, unless they are known to be present at significant concentrations, high odors of fuels are evident, or dust clouds are present, the primary method of protection is by avoiding skin contact. Components of coal tar include naphthalene, pyrene, phenanthrene, anthracene, chrysene, fluoranthene, and acenaphthene.

PAHs constitute a class of materials of which benzo[a]pyrene (BaP) is one of the most common and also the most hazardous. In general, PAHs can be formed in any hydrocarbon combustion process. The less efficient the combustion process, the higher the PAH emission factor is likely to be. The major sources are stationary sources, such as heat and power generation, refuse burning, industrial activity, such as coke ovens, and coal refuse heaps. PAHs may also be released from oil spills. Because of the large number of sources, people are exposed to very low levels of PAHs every day.

Certain PAHs, such as the more common BaP, have been demonstrated to be carcinogenic at relatively high exposure levels in laboratory animals. BaP is a yellowish crystalline solid that consists

of five benzene rings joined together. It is highly soluble in fat tissue and has been shown to produce tumors in the stomachs of laboratory mice. In addition, skin cancers have been induced in a variety of animals at very low levels and unspecified lengths of application.

It is important to recognize the PAHs' ability to adhere to soil and other particulates. Therefore, good particulate emission controls and the use of air purifying respirators with particulate filters are required for protection against airborne PAH hazards.

- The OSHA PEL is listed as 0.2 mg/m^3 (as coal tar pitch volatiles).
- The Cal/OSHA PEL is listed as 0.2 mg/m^3 (as coal tar pitch volatiles).
- The TLV is listed as 0.2 mg/m3 (coal tar pitch volatiles, as benzene soluble aerosol).

3.1.6 Tetrachloroethene (PCE)

PCE (also known as tetrachloroethene) is a colorless liquid with an ether-like odor. Short-term exposure to PCE may cause headaches, nausea, drowsiness, dizziness, incoordination, unconsciousness, irritation of the eyes, nose, and throat, and flushing of the face and neck. In addition, it may cause liver damage with such findings as yellow jaundice and dark urine. Liver damage may become evident several weeks after exposure. Skin contact may create a dry, scaly, itchy dermatitis. PCE is Classified by the U.S. Environmental Protection Agency as a Group B2 probable human carcinogen.

- The OSHA PEL is listed as 100 ppm.
- The Cal/OSHA PEL is listed as 25 ppm.
- The TLV is listed as 25 ppm.

3.1.7 Trichloroethene (TCE)

TCE is a clear, colorless liquid with a characteristic chloroform odor. It is a mildly toxic VOC that is also an experimental carcinogen, tumorigen, and teratogen. It can cause eye effects, hallucinations and distorted perceptions when inhaled. TCE is an eye and severe skin irritant. Exposure to vapors may cause eye, nose and throat irritation. Prolonged inhalation of moderate concentrations of vapor may cause headaches and drowsiness. Inhalation of high concentrations may cause narcosis and anesthesia. Severe, acute exposure can result in cardiac failure. Significant chronic exposure may damage the liver and other organs. Prolonged repeated skin contact with the liquid may cause irritation and dermatitis.

- The OSHA PEL is listed as 100 ppm.
- The Cal/OSHA PEL is listed as 25 ppm.
- The TLV is listed as 50 ppm (a value of 10 ppm is proposed).

3.1.8 1,2-Dichloroethene (DCE)

1,2-Dichloroethylene (1,2-DCE), a mixture of the cis and trans isomers, is a liquid with a slightly acrid odor. Available data conflict on whether there is significant difference in the toxicity from short-term exposure to trans-1,2-DCE versus cis-1,2-DCE. Narcosis has been identified as the important effect of inhalation.

- The OSHA PEL is listed as 200 ppm.
- The Cal/OSHA PEL is listed as 200 ppm.
- The TLV is listed as 200 ppm.

3.1.9 Benzene Hexachloride (BHC)

Benzene hexachloride (also known as BHC) is a white, crystalline powder. Technical grade BHC contains 68.7% α-BHC, 6.5% β-BHC, and 13.5% γ-BHC. It is a toxic organochlorine pesticide that is persistent in the environment and accumulates in mammalian tissues. BHC is a confirmed carcinogen with experimental tumorigenic and neoplastigenic data by ingestion and skin contact. The various isomers have different actions; the γ (lindane) and α isomers are central nervous system stimulants, and the β and Δ are central nervous system depressants. It is a poison by ingestion and inhalation. Human systemic effects by inhalation include headache, nausea, vomiting, and fever. Lindane is more toxic than DDT or dieldrin. When heated to decomposition, it emits very toxic fumes of Cl-, HCl, and phosgene.

3.1.10 Lindane

Lindane, the gamma isomer of BHC, is a colorless solid with a musty odor (pure material is odorless). Exposure to lindane may cause vomiting, restlessness, muscle spasms, convulsions, respiratory failure, severe breathing difficulties that may be delayed in onset, headaches, irritation of the eyes, nose, and throat, and skin rash. Lindane is moderately toxic by dermal absorption.

- The OSHA PEL is listed as 0.5 mg/m3.
- The Cal/OSHA PEL is listed as 0.5 mg/m3.
- The TLV is listed as 0.5 mg/m3.

Note: Published exposure limits designate a skin notation indicating that dermal contact can contribute to the overall exposure.

3.1.11 Dieldrin

Dieldrin is a light brown crystal with a mild chemical odor. Short-term exposure to dieldrin can cause hyperirritability, headaches, dizziness, nausea, vomiting, blood in the urine, tremors, convulsions, and coma.

- The OSHA PEL is listed as 0.25 mg/m3.
- The Cal/OSHA PEL is listed as 0.25 mg/m3.
- The TLV is listed as 0.25 mg/m3.

Note: Published exposure limits designate a skin notation indicating that dermal contact can contribute to the overall exposure.

3.1.12 4,4'-DDE

DDE is a suspected carcinogen with experimental carcinogenic, reproductive, and neoplastigenic data. It is an insecticide and is a poison by ingestion. When heated to decomposition, it emits very toxic fumes of Cl⁻.

- No OSHA PEL, Cal/OSHA PEL, or TLV is listed for DDE.

3.1.13 4,4'-DDD

DDD is a crystalline solid used as an insecticide. It is a confirmed carcinogen with experimental carcinogenic, neoplastigenic, and tumorigenic data. It is a poison by ingestion and is moderately toxic by skin contact. When heated to decomposition, it emits very toxic fumes of Cl⁻.

- No OSHA PEL, Cal/OSHA PEL, or TLV is listed for DDD.

3.1.14 4,4'-DDT

DDT is a confirmed carcinogen with experimental carcinogenic, neoplastigenic, tumorigenic, and teratogenic data. It is an insecticide and is a human poison by ingestion. It is an experimental poison by skin contact and subcutaneous routes. Human systemic effects include anesthesia, convulsions, headache, cardiac arrhythmia, nausea, vomiting, sweating, and pulmonary changes. When heated to decomposition, it emits very toxic fumes of Cl⁻.

- The OSHA PEL is listed as 1 mg/m3.
- The Cal/OSHA PEL is listed as 1 mg/m3.
- The TLV is listed as 1 mg/m3.

Note: Published exposure limits designate a skin notation indicating that dermal contact can contribute to the overall exposure.

3.1.15 Endrin

Endrin is a colorless to tan solid with a mild chemical odor. Exposure to endrin may cause sudden convulsions that may occur from 30 minutes to 10 hours after exposure. Headaches, dizziness, drowsiness, weakness, and loss of appetite may occur two to four weeks after exposure.

- The OSHA PEL is listed as 0.1 mg/m3.
- The Cal/OSHA PEL is listed as 0.1 mg/m3.
- The TLV is listed as 0.1 mg/m3.

Note: Published exposure limits designate a skin notation indicating that dermal contact can contribute to the overall exposure.

WARNING: This chemical is known to the State of California to cause birth defects or other reproductive harm.

3.1.16 Chlordane

Chlordane is a colorless to amber, odorless, viscous liquid. It is a confirmed carcinogen and is a poison to humans by ingestion and possibly other routes. It is moderately toxic by skin contact. Human systemic effects by ingestion or skin contact include tremors, convulsions, excitement, loss of muscle coordination, and gastritis. When heated to decomposition, chlordane emits toxic fumes of Cl^-.

- The OSHA PEL is listed as 0.5 mg/m3.
- The Cal/OSHA PEL is listed as 0.5 mg/m3.
- The TLV is listed as 0.5 mg/m3.

Note: Published exposure limits designate a skin notation indicating that dermal contact can contribute to the overall exposure.

3.1.17 Methoxychlor

Methoxychlor is a man-made colorless chemical that looks like a pale yellow powder and has a fruity or musty odor. It is used to kill insects and also used on food crops and animal livestock/pets as an insecticide. The primary routes of exposure for methoxychlor are inhalation and ingestion. EPA has set a reference dose (RfD) of 0.005 mg/day via ingestion and 0.04 ppm via ingestion through water. EPA recommends for adults not to drink water containing 0.2ppm methoxychlor daily for more than 7 years, and children should not drink water containing more than 0.05 ppm for more than 1 day. Toxicology data dealing with symptoms of exposure and health effects is referenced to animals. Symptoms of exposure to methoxchlor may consist of fasciculation, trembling, convulsions; kidney, and liver damage. Target organs may be the central nervous system, liver, and kidneys.

- The OSHA PEL is listed as 15 mg/m3.
- The Cal/OSHA PEL is listed as 10 mg/m3.
- The TLV is listed as 10 mg/m3.

3.1.18 Arsenic

Metallic arsenic is most commonly a gray, brittle, crystalline solid. It can also be in a black or yellow amorphous form. Arsenic is also commonly found in its volatile white trioxide form. Arsenic is used in several insecticides, herbicides, defoliants, desiccants, and rodenticides and appears in a variety of forms. It is also used in tanning, pigment production, glass manufacturing, wood preservation, and anti-fouling coatings. Arsenic is classified as a known carcinogen.

Short-term exposure to arsenic can cause marked irritation of the stomach and intestines with nausea, vomiting, and diarrhea. In severe cases the vomiting and stools are bloody and the exposed individual goes into collapse and shock with weak, rapid pulse, cold sweats, coma, and death. Inorganic arsenicals are more toxic than organic arsenicals, and the trivalent form is more toxic than the pentavalent form. Acute arsenic poisoning usually results from ingestion exposures. Blood cell changes, blood vessel damage, and impaired nerve function can also result from chronic arsenic ingestion. Other effects include skin changes, irritation of the throat, increased risk of cancer of the liver, bladder, kidney, and lung.

3.1.19 Beryllium

Beryllium is a confirmed carcinogen with experimental carcinogenic, neoplastigenic, and teratogenic data. Human systemic effects by inhalation include lung fibrosis, dyspnea, and weight loss.

- The OSHA PEL is listed as 0.002 mg/m3.
- The Cal/OSHA PEL is listed as 0.0002 mg/m3.
- The TLV is listed as 0.002 mg/m3 (as Inhalable Particulate Mass, a value of 0.00005 mg/m3 [8-hr. TWA] and 0.0002 mg/m3 [15-min. STEL] is proposed).

WARNING: This chemical is known to the State of California to cause cancer.

3.1.20 Copper

In its elemental form, copper is a common metal with a distinct reddish color. Human systemic effects by ingestion include nausea and vomiting. In animals, inhalation of copper dust has caused hemolysis of the red blood cells, deposition of hemofuscin in the liver and pancreas, and injury to the lung cells. Short-term exposure to copper dust can cause a feeling of illness similar to the common cold with sensations of chills and stuffiness of the head. Small copper particles may enter the eye and cause irritation, discoloration, and damage.

- The OSHA PEL is listed as 0.1 mg/m3 for copper as a fume, and 1.0 mg/m3 for dust.
- The Cal/OSHA PEL is listed as 0.1 mg/m3 for copper as a fume, and 1.0 mg/m3 for dust.

- The TLV is listed as 0.2 mg/m3 for copper as a fume, and 1.0 mg/m3 for dust (a value of 0.1 mg/m3 for elemental metal/and copper oxides, and 0.05 mg/m3 for soluble compounds is proposed).

3.1.21 Zinc

Zinc is a bluish-white, lustrous metallic element, and zinc oxide is a white fume. Short-term exposure to zinc oxide fume can cause a flu-like illness called metal fume fever. Symptoms of metal fume fever include headache, fever, chills, muscle ache, nausea, vomiting, weakness, and tiredness. Pure zinc powder, dust, and fume is relatively non-toxic to humans by inhalation. However, the inhalation of zinc oxides may cause a sweet taste, throat dryness, cough, weakness, generalized aches, chills, nausea, and vomiting. Zinc is flammable in the form of dust when exposed to heat or flame and may ignite spontaneously in air when dry. It is explosive in the form of dust when reacted with acids.

- The OSHA PEL is listed as 15 mg/m3 for total zinc oxide dust, and 5 mg/m3 for zinc oxide fume and the respirable fraction of dust.
- The Cal/OSHA PEL is listed as 10 mg/m3 for total zinc oxide dust, and 5 mg/m3 for zinc oxide fume and the respirable fraction of dust.
- The TLV is listed as 2 mg/m3 for respirable zinc oxide and 0.01 mg/m3 for zinc chromates (as Cr).

3.2 Hazard Communication

In accordance with the Hazard Communication standard, material safety data sheets (MSDSs) will be maintained on site for chemical products used by BC personnel at the Site (i.e., spray paint, PVC cement, etc.). Subcontractors will be responsible for maintaining MSDSs for chemical products they bring on Site. In addition, containers will be clearly labeled in English to indicate their contents and appropriate hazard warnings.

3.3 Opening Wells and Well Vaults

Direct-reading instrumentation specified in Section 5 will be used to monitor any work in a well vault at the site where VOCs are a concern. The well vault will be opened carefully with the BC employee staying upwind as much as possible and then left open for a minimum of three minutes to allow the vault to vent. If the well cap is then removed, allow another three minutes for the well head to vent before proceeding. Personnel should stay upwind as much as possible while working in and around the vault.

When removing a well cap, personnel will remain upwind as much as possible and will carefully remove the cap by opening it away from them in order to minimize the likelihood of exposure to vapors. Personnel will wait a minimum of three minutes to allow the well to vent before proceeding.

3.4 Physical Hazards

The following physical hazards have been identified and may be encountered during scheduled field activities.

- ☒ Slips, Trips and Falls
- ☒ Heavy Equipment
- ☐ Excavations
- ☒ Noise
- ☒ Overhead Utilities
- ☒ Electrical Equipment
- ☐ Confined Spaces
- ☒ Sunburn
- ☒ Cold Stress
- ☒ Sharp Objects/Cutting
- ☐ Elevated Platforms
- ☒ Traffic
- ☒ Housekeeping
- ☒ Materials and Equipment Handling - Lifting
- ☒ Drilling
- ☒ Underground Utilities
- ☒ Equipment Refueling
- ☐ Lockout/Tagout
- ☐ Fire
- ☒ Heat Stress
- ☒ Lightning/Electrical Storms
- ☐ Cutting Acetate Sleeves
- ☐ Ladder Use
- ☒ Driving

Actions to be taken to protect against the hazards identified are provided in the sections below.

3.4.1 Slip, Trips and Falls

Slipping hazards may exist due to uneven terrain, wet or slick surfaces, leaks or spills. Tripping hazards may be present from elevation changes, debris, poor housekeeping or tools and equipment. Some specific hazards may include: climbing/descending ladders, scaffolding, berms or curbing. Collectively, these types of injuries account for nearly 50 percent of all occupational injuries and accepted disabling claims. Prevention requires attention and alertness on the part of each worker, following and enforcing proper procedures, including good housekeeping practices, and wearing appropriate protective equipment.

3.4.2 Housekeeping

Personnel shall maintain a clean and orderly work environment. Make sure that all materials stored in tiers are stacked, racked, blocked, interlocked, or secured to prevent sliding, falling, collapse, or overturning. Keep aisles and passageways clear and in good repair to provide for free and safe movement of employees and material-handling equipment. Do not allow materials to accumulate to a degree that it creates a safety or fire hazard.

During construction activities, scrap and form lumber with protruding nails and other items shall be kept clear from work areas, passageways, and stairs. Combustible scrap and debris shall be removed at regular intervals. Safe means must be provided to facilitate removal of debris.

Containers must be provided for collecting and separating waste, used rags and other debris. Containers used for garbage and other oily flammable or hazardous waste such as caustics, acids, harmless dusts, etc., must be separated and equipped with covers. Garbage and other waste shall be disposed of at frequent and regular intervals.

3.4.3 Heavy Equipment

Equipment, including earth-moving equipment, drill rigs, or other heavy machinery, will be operated in compliance with the manufacturer's instructions, specifications, and limitations, as well as any applicable regulations. The operator is responsible for inspecting the equipment prior to use each work shift to verify that it is functioning properly and safely.

The following precautions should be observed whenever heavy equipment is in use.

- PPE, including steel-toed boots, safety glasses, high visibility vests, and hard hats must be worn.
- Personnel must be aware of the location and operation of heavy equipment and take precautions to avoid getting in the way of its operation. Workers must never assume that the equipment operator sees them; eye contact and hand signals should be used to inform the operator of the worker's intent.
- Personnel should not walk directly in back of, or to the side of, heavy equipment without the operator's knowledge. Workers should avoid entering the swing radius of equipment and be aware of potential pinch points.
- Nonessential personnel will be kept out of the work area.

3.4.4 Materials and Equipment Handling - Lifting

The movement and handling of equipment and materials on the Site pose a risk to workers in the form of muscle strains and minor injuries. These injuries can be avoided by using safe handling practices, proper lifting techniques, and proper personal safety equipment such as steel-toed boots and sturdy work gloves. Where practical, mechanical devices will be utilized to assist in the movement of equipment and materials. Workers will not attempt to move heavy objects by themselves without using appropriate mechanical aids such as drum dollies or hydraulic lift gates.

Proper lifting techniques include the following.

- Lift with the strength of your knees, not your back.
- Firmly plant your feet approximately shoulder-width apart.
- Turn your whole body, don't bent or twist at the waist.
- Be sure that the path is clear of obstructions or tripping hazards; avoid carrying objects that will obstruct your vision.
- Use caution when holding an object from the bottom to prevent crushing of the hands or fingers when lowering.

3.4.5 Excavations

A competent person who is capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them, will be present during excavation activities.

The atmosphere will be tested in excavations, before employees are permitted to enter and begin work, greater than 4 feet in depth or where oxygen deficiency or toxic or flammable gases are likely to be present. The atmosphere shall be ventilated and re-tested until flammable gas concentrations less than 10 percent of the lower explosive limit (LEL) and site-specific action levels are obtained. Worker entry will not be allowed if the oxygen concentration is less than 19.5 percent. In addition, a safe means of access and egress (i.e., a ladder, stairs or ramp) must be provided so that no more than 25 feet of lateral travel is required by employees.

Workers will not enter unstable excavations or excavations greater than 5 feet in depth without appropriate protective systems such as benching, sloping, or shoring. If shoring or shielding systems are not used, side slopes will not be steeper than 1½:1 without written confirmation from the competent person that slope is safe for the soil conditions. Excavations will be constructed in accordance with the OSHA Excavation Safety Standard (29CFR1926 Subpart P).

The competent person will inspect excavations daily. If there is evidence that a cave-in or slide is possible, work will cease until the necessary safeguards have been taken. Excavated material will be placed far enough from the edge of the excavation (a minimum of 2 feet) so that it does not fall back into the opening or affect the integrity of the sidewall. At the end of each day's activities, open excavations will be clearly marked and secured to prevent nearby workers or unauthorized personnel from entering them. Remote sampling techniques will be the preferred method of sample collection in excavations.

3.4.6 Drilling

During all drilling activities, the operator must ensure that the appropriate level of protection and appropriate safety procedures are utilized. The operator will verify that equipment "kill switches" are functioning properly at the start of each day's use. Hard hats, steel-toed boots, and ear and eye protection will be required at all times when working around drill rigs. The proximity of underground and overhead utilities must be identified before any drilling is attempted. The rig may not be moved with the mast in the upright position.

Workers can effectively manage hazards associated with working around heavy equipment if a constant awareness of these hazards is maintained. These hazards include the risk of becoming physically entangled in rotating machinery, slipping and falling, impact injury to eyes, head and body, and injury from machinery operations. Never work or walk on piles of well casings. Make sure all high-pressure lines and hoses have whip checks attached. Constant visual or verbal contact with the equipment operator will facilitate such awareness.

3.4.7 Noise

Noise may result primarily from the operation of heavy equipment, process machinery or other mechanical equipment. Hearing protection with the appropriate noise reduction rating (NRR) shall be worn in areas with high noise levels. A good rule of thumb to determine if hearing protection is needed is the inability to have a conversation at arms length without raising voice levels. If loud noise is present or normal conversation becomes difficult, hearing protection in the form of ear plugs, or equivalent, will be required.

3.4.8 Underground Utilities

Reasonable efforts will be made to identify the location(s) of underground utilities (e.g., pipes, electrical conductors, fuel lines, and water and sewer lines) before intrusive soil work is performed. The state underground utility notification authority (e.g., USA, Dig Alert, Blue Stake, etc.) will be contacted prior to the start of intrusive field activities in accordance with local notification requirements. In areas not evaluated or serviced by the underground utility notification authority, and a reasonable potential for underground utilities exists, one or more of the following techniques will be employed to determine the location of subsurface structures.

- Contracting the services of a qualified private utility locator.
- Having a survey of the subject area conducted by staff trained in the use of subsurface utility locating equipment.
- Subsurface testing (i.e., hand digging or potholing) to the expected depth of probable utilities (not less than 5 feet).

If utilities cannot be located or if unlocated utilities are suspected to be present, subsurface activities (i.e., borings, excavation) should not be conducted before the location(s) or absence of underground utilities is confirmed.

Typical subsurface location marks are as follows.

- Red – electrical
- Yellow – gas/oil/steam
- Blue – water
- Green – sanitary/storm drains/culverts
- Orange – communications
- White – proposed excavation or boring

Intrusive work should be limited to the area 3.3 feet (1 meter) on either side of the location marks. In some special cases such as fiber optics and high-pressure pipelines this area should be expanded to 16.5 feet (5 meters) on either side of the utility.

3.4.9 Overhead Utilities

If work is to be conducted in the vicinity of overhead electrical utilities, the owner of the overhead line will be contacted to determine the maximum voltage. Any overhead utility will be considered to

be energized unless and until the person owning or operating such line verifies that the line is not energized, and the line is visibly grounded at the work site.

Workers will not perform work in proximity to energized high-voltage lines (including scaffolding, well drilling, pile driving, or hoisting equipment) until danger from accidental contact with high-voltage lines has been effectively guarded against.

Equipment with articulated upright booms or masts are not permitted to operate within 15 feet of an overhead utility line (less than 50kV) while the boom is in the upright position. For transmission lines in excess of 50kV, an additional distance of 4 inches for each 10 kV over 50kV will be used.

3.4.10 Equipment Refueling

Care shall be exercised while refueling generators, pumps, vehicles, and other equipment to prevent fire and spills. Personnel shall eliminate static electricity by grounding themselves (touching metal) prior to using refueling hoses and or containers of petroleum liquids. Items being refueled shall be grounded or be located on the ground and not on a trailer, work bench or inside a truck bed. Equipment that is hot must be allowed to cool prior to refueling. Spill response materials shall be available when conducting refueling operations.

3.4.11 Electrical Hazards

Electrical equipment to be used during field activities will be suitably grounded and insulated. Ground-fault circuit interrupters (GFCI), or equivalent, will be used with electrical equipment to reduce the potential for serious electrical shock. Electrical equipment including batteries, generators, panels and extension cords shall be kept dry during use. Extension cords may not be used as a permanent means of providing power and will be removed from service if they are worn, frayed, or if the grounding prong is missing.

Extension cord precautions include the following.

- Be aware of exposed or bare wires, especially on metal grating. Warning: *Electrical contact with metal can cause fatal electrocution.*
- Prior to use, inspect cords for exposed or bare wires, worn or frayed cords, and incorrect splices. Splices are permitted, but there must be insulation equal to the cable, including flexibility.
- Cables and extension cords in passageways, steps or any area where there may be foot traffic should be secured so as to not create a tripping hazard. Overhead cables and extension cords shall be rigged to a height greater than 6 feet.
- Shield extension cords that must run across driveways or areas where vehicle traffic is present.
- Do not run cords across doorways or windows where they can be frayed or cut by a closed door or window.
- Do not run wires through wet or puddled areas.
- Flexible cord sets that are used on construction sites or in damp locations shall be of hard usage or extra hard usage type.

Observation of energized machinery will take place from a safe distance. Only qualified personnel will remove guards, hatch covers, or other security devices if necessary. Equipment lockout procedures and an appropriate facility work permit requirements will be followed. Lockout/tagout procedures will be conducted before activities begin on or near energized or mechanical equipment that may pose a hazard to site personnel. Workers conducting the operation will positively isolate the piece of equipment, lock/tag the energy source, and verify effectiveness of the isolation. Only employees who perform the lockout/tagout procedure may remove their own tags/locks. Employees shall complete lockout/tagout training before initiating this procedure.

Only qualified personnel will remove covers of electrical equipment to expose energized electrical parts. Entering electrical rooms/vaults or areas with live exposed electrical part by BC employees shall be permitted only when accompanied by a qualified personnel after notification and approval of the appropriate facility personnel.

3.4.12 Lockout/Tagout

Lockout/tagout (LO/TO) procedures in accordance with 29 CFR 1910.147 will be performed before activities begin on or near energized or mechanical equipment that may pose a hazard to site personnel. The purpose of the lockout/tagout (LO/TO) system is to safeguard exposure from machinery, energized electrical circuits, piping under pressure, or any type of energy source from unexpected energization or start up that could at cause harm to an individual. Workers conducting the operation will positively isolate the piece of equipment, lock/tag the energy source, and verify effectiveness of the isolation. Only employees who perform the lockout/tagout procedure may remove their own tags/locks. Employees must be thoroughly trained before initiating this procedure.

Whenever multiple personnel (or multiple employers are working on the same worksite) are to be engaged in activities requiring LO/TO, employees/employers shall inform each other of their activities and coordinate their respective LO/TO procedures. Whenever a group lockout/tagout procedure must be performed, they shall utilize a procedure that affords the same level of protection as that provided by the implementation of a personal lockout or tagout device. Group LO/TO devices shall meet the requirements of 29 CFR 1910.145(f)(3).

Basic Lockout/Tagout Procedures

1. Each person will maintain their own lock, key, and lockout device so that no one else can remove the lock.
2. Always notify the operator when work is to be done.
3. Use your own lock to lock out electrical power. Attach a tag or sign to the power disconnect to indicate that maintenance work is in progress. Use the wording "Do Not Operate."
4. Bleed all pressure from pneumatic, hydraulic, or other fluid lines, or safely isolate them from the area where work is being done.
5. Drain contents of lines or tanks as needed. Lock valves open or closed to prevent buildup of pressure.
6. Ground electrical systems as needed.

7. Secure any device under tension or compression so as to prevent accidental movement. Move suspended parts that could drop or cycle to a safe position and block, clamp, or chain them in place.
8. Verify (test) that the mechanism had been isolated from the source of energy.
9. Ensure that all workers remove their individual locks after work is completed. The last worker should remove the locking devices.
10. Ensure that the last person double-checks that all is clear and safe before start-up.

Portable Equipment

Portable electrical equipment such as hand drills, computers, and power saws that use plug type connectors must be unplugged prior to any task that may expose the employee to energized portions of the equipment. Removal of the plug from the power source, such as the generator or wall socket, may be combined with a tagout system, particularly if the plug is at a distance from the equipment being repaired.

3.4.13 Confined Spaces

Entry into confined spaces will be conducted in strict accordance with 29 CFR 1910.146. Confined spaces will be evaluated prior to entry to determine if hazards are present that could pose a risk to entrants. Before workers may enter a permit-required confined space, a pre-entry checklist and entry permit must be completed by the PM or SSO, approved by the RSUM and, all requirements for entry must be met.

Confined spaces may be described as having, but not being limited to, the following characteristics:

- is large enough to permit an employee to enter and perform work; and
- has limited or restricted means of entry and exit; and
- is not equipped, designed, or intended for continuous human occupancy.

If there is any serious health and safety hazard present in the confined space is considered a permit-required confined space (permit space). A permit-space is a confined space that has one or more of the following characteristics:

- contains or has the potential to contain a hazardous atmosphere; or
- contains or has the potential to contain a material with the potential to engulf or entrap an employee; or
- is so configured that an employee may become trapped, disoriented, or asphyxiated by wall configurations or floors that taper to smaller cross sections; or
- contains any other established safety or health hazard (examples may include sources of energy, moving parts or thermal considerations).

All fluid, electrical, and steam lines and other sources of energy that could harm entrants must be completely isolated before entry. The following atmospheric conditions must be met before entry is permissible (air monitoring may be necessary to verify these conditions are met):

- flammable vapor or dust must be at a concentration less than 10 percent of the lower explosive limit (LEL); and

- oxygen must be at a concentration greater than 19.5 percent and less than 23.5 percent; and
- toxic substances must be at a concentration less than their respective permissible exposure limits or specified action limits.

In addition, the following roles must be designated before entry into permit-required confined spaces is allowed: Entry Supervisor; Attendant; and Authorized Entrant(s). Confined space entry for each project also requires training for the project team on written operating procedures, including the use of the Confined Space Pre-Entry Checklist and Confined Space Entry Permit forms.

BC employees are ***not*** trained in rescue services. Such services are to be arranged locally, prior to entry operations, by the PM. Rescue services can typically be provided by the local fire department or contracted service provider.

3.4.14 Fire/Explosion

Site workers should have an increased awareness concerning fire and explosion hazards whenever working with or near flammable materials, especially when performing any activity that may generate sparks, flame, or other source of ignition. Intrinsically safe equipment is required when working in or near environments with the potential for an explosive or flammable atmosphere. The SSO will verify facility requirements for a "hot work" permit before activities that may serve as a source of ignition are conducted.

Flammable materials will be kept away from sources of ignition. In the event of fire, work will cease, the area will be evacuated, and the local fire response team will be notified immediately. Only trained, experienced fire fighters should attempt to extinguish substantial fires at the Site. Site personnel should not attempt to fight fires, unless properly trained and equipped to do so. A fully charged ABC dry chemical fire extinguisher will be readily available for use during all scheduled activities at the Site.

3.4.15 Sunburn

Working outdoors with the skin unprotected for extended periods of time can cause sunburn to the skin. Excessive exposure to sunlight is associated with the development of skin cancer. Field staff should take precautions to prevent sunburn by using sunscreen lotion and/or wearing hats and long-sleeved garments.

3.4.16 Heat Stress

Adverse climate conditions, primarily heat, are important considerations in planning and conducting site operations. Heat-related illnesses range from heat fatigue to heat stroke, with heat stroke being the most serious condition. The effects of ambient temperature can cause physical discomfort, loss of efficiency, and personal injury, and can increase the probability of accidents. In particular, protective clothing that decreases the body's ventilation can be an important factor leading to heat-related illnesses.

To reduce the possibility of heat-related illness, workers should drink plenty of fluids and establish a work schedule that will provide sufficient rest periods for cooling down. Personnel shall maintain

an adequate supply of non-caffeinated drinking fluids on site for personal hydration. Workers should be aware of signs and symptoms of heat-related illnesses, as well as first aid for these conditions. These are summarized in the table below.

Condition	Signs	Symptoms	Response
Heat Rash or Prickly Heat	Red rash on skin.	Intense itching and inflammation.	Increase fluid intake and observe affected worker.
Heat Cramps	Heavy sweating, lack of muscle coordination.	Muscle spasms, and pain in hands, feet, or abdomen.	Increase fluid uptake and rest periods. Closely observe affected worker for more serious symptoms.
Heat Exhaustion	Heavy sweating; pale, cool, moist skin; lack of coordination; fainting.	Weakness, headache, dizziness, nausea.	Remove worker to a cool, shady area. Administer fluids and allow worker to rest until fully recovered. Increase rest periods and closely observe worker for additional signs of heat exhaustion. If symptoms of heat exhaustion recur, treat as above and release worker from the day's activities after he/she has fully recovered.
Heat Stroke	Red, hot, dry skin; disorientation; unconsciousness	Lack of or reduced perspiration; nausea; dizziness and confusion; strong, rapid pulse.	Immediately contact emergency medical services by dialing emergency medical services. Remove the victim to a cool, shady location and observe for signs of shock. Attempt to comfort and cool the victim by administering small amounts of cool water (if conscious), loosening clothing, and placing cool compresses at locations where major arteries occur close to the body's surface (neck, underarms, and groin areas). Carefully follow instructions given by emergency medical services until help arrives.

3.4.17 Cold Stress

Workers performing activities during winter and spring months may encounter extremely cold temperatures, as well as conditions of snow and ice, making activities in the field difficult. Adequate cold weather gear, especially head and foot wear, is required under these conditions. Workers should be aware of signs and symptoms of hypothermia and frostbite, as well as first aid for these conditions. These are summarized in the table below.

Condition	Signs	Symptoms	Response
Hypothermia	Confusion, slurred speech, slow movement.	Sleepiness, confusion, warm feeling.	Remove subject to a non-exposed, warm area, such as truck cab; give warm fluids; warm body core; remove outer and wet clothing and wrap torso in blankets with hot water bottle or other heat source. Get medical attention immediately.
Frostbite	Reddish area on skin, frozen skin.	Numbness or lack of feeling on exposed skin.	Place affected extremity in warm, not hot, water, or wrap in warm towels. Get medical attention.
Trench Foot	Swelling and/or blisters of the feet	Tingling/itching sensation; burning; pain in the feet	Remove wet/constrictive clothing and shoes. Gently dry and warm feet with slight elevation. Seek medical attention.

3.4.18 Lightning/Electrical Storms

Lightning can be unpredictable and may strike many miles in front of, or behind, a thunderstorm. Workers will therefore cease field operations at the **first** sign of a thunderstorm and suspend activities until at least 30 minutes after the last observed occurrence of lightning or thunder. For purposes of this HASP, signs of a thunderstorm will include any visible lightning or audible thunder.

In the event of a thunderstorm, field personnel will take the following actions.

- Get inside a permanent building structure (not a shed or canopy) or fully enclosed metal vehicle (not a convertible or camper shell) with the windows fully up.
- If in a house or building, do not use the telephone or any electrical appliance that's connected to the building's electrical wiring.
- Stay away from tall isolated objects, such as trees, drill rigs, telephone poles, or flag poles.
- Avoid large open areas, such as fields or parking lots, where a person is the relatively highest object.
- Stay away from lakes, ponds, railroad tracks, fences, and other objects that could transmit current from a distant lightning strike.
- If caught out in the open without time to escape or find shelter, seek a low area (if time permits), crouch down, and bend forward holding the ankles. Tuck the head so that it's not the highest part of the body, without letting it touch the ground. Under no circumstances lay down.

If a person struck by lightning contact emergency medical services, even if he/she appears only stunned or otherwise unhurt as medical attention may still be needed. Check for burns, especially at fingers and toes, and areas next to buckles and jewelry.

3.4.19 Sharp Objects/Cutting Utensils

Frequently field tasks require the cutting of items such as rope, packaging or containers. Care should be exercised in using knives and/or cutting implements while performing such cutting tasks. Personnel should cut down and away from their body and other personnel. The item being cut

should be braced or secured from movement while cutting. When slicing open acetate liners, such as those utilized in direct push drilling, personnel should use a hook blade cutting implement designed for this task versus a straight blade knife.

3.4.20 Cutting Acetate Sample Sleeves

The cutting of acetate sleeves presents a potential hazard to sampling personnel. By following proper procedures, the risk associated with this activity can be effectively minimized. To remove the soil sample the acetate liner must be cut with a bladed tool or knife. Knives are more frequently the source of disabling injuries than any other hand tool. The principal hazard in the use of knives is the hand slipping from the handle onto the blade or the blade strikes another part of the body. To prevent this, the following safety procedures should be followed.

- Provide a safety blade holder with a retraction spring on a track where blade mounts. Use a hook type linoleum blade which has a reduced cutting edge. When the hook of the blade is cutting the acetate liner it keeps the blade extended. If the blade breaks or the operator's hand slips the blade automatically retractions into the handle of the safety blade holder.
- Replace blades when they become dull. If material becomes hard to cut the blade is dull.
- Wear leather cut-resistant (such as Kevlar) gloves.
- Wear safety glasses.
- The cutting stroke should be away from the body. If that is not possible, then the hands and body should be in the clear.
- Provide an angle iron device to place the liner in when cutting. This gives a holder for the liner.
- If you drop the knife just let it fall to the ground and DO NOT try to catch it.
- If you lay the knife down make sure the blade is retracted into the holder or the knife is placed in a protective holder.

3.4.21 Elevated Platforms

When working at heights that expose employees to falls greater than 6 feet, especially on sloping roofs and elevated platforms, the requirements of 29 CFR 1926.502 shall be observed. In such instances, a safety harness shall be worn and the lanyard secured at a level not lower than the employee's waist, limiting the free-fall distance to a maximum of 6 feet.

Elevated work platforms shall be constructed, used, and maintained in accordance with Subpart L of the OSHA Construction Safety Orders. Scaffolds and hoisting lines shall be inspected daily by a competent person to verify the integrity of the components. If a material is determined to be defective, it may not be used for any purpose and will be replaced immediately.

A standard railing shall consist of top rail, intermediate rail, toe board, and post. It shall have a vertical height of approximately 42 inches (±3 inches) from the top surface of the top rail to the floor, platform, runway, or ramp. The top rail shall have a smooth surface throughout. The intermediate rail shall be set half way between the top rail and the floor, platform, runway, or ramp.

A cover of standard strength and construction that is secured against accidental displacement shall guard floor holes, hatchways, or any other openings into which a person can walk. When the cover is not in place, the openings shall be guarded with a standard railing (equipped with a toe board) on all exposed sides. Any cover on floor openings shall be properly labeled or stenciled with letters at least one inch high or greater stating "OPENING – DO NOT REMOVE".

Personal Fall Protection Equipment

Full body harness is the only acceptable means of fall arrest for personnel working over surfaces greater than six feet in height. A Fall Arrest System consisting of safety harness and anchor lanyard must be worn by anyone working on elevated surfaces that lack "general" fall protection such as railings, etc.

Lanyards must be tied off at a point above the worker's head and to a firm structure or a portion thereof designed to hold a weight of 5,000 lbs. Only hooks with locking snaps that operate in "as new" condition will be used. These hooks are also referred to as "double action lanyard hooks".

When other possible means of fall protection (railings, etc.) are not available, individuals working at heights of less than 6 feet must tie-off if there is danger of impalement, especially if the impalement hazard cannot be mitigated in accordance with OSHA standards.

All workers must perform routine inspection of belts/harnesses and lanyards prior to their use. The employer shall conduct regular inspections (every three months) of all fall protection equipment. In addition, there shall be an inspection of all workers' personal tools and equipment prior to the employees using them on the job.

Lanyards are to be used for tie-off purposes only, and damaged belts, harnesses, and lanyards must be retired and discarded.

3.4.22 Ladder Use

Ladders are to be maintained in good condition at all times, with tight joints, hardware, and fittings securely attached, and moveable parts freely operating without binding or undo play. Defective ladders must be "tagged" out of service. Safety "feet" shall be kept in good condition. Ladders are to be visually inspected for possible signs of damage or defects daily, before each use.

Where possible, portable straight rung ladders shall be set up so that the horizontal distance from the top support to the foot of the ladder is ¼ of the working length of the ladder. The ladder shall be secured by tying it off to a firm point, or held in place by another worker while in use. If the ladder is used to gain access to a roof or platform, the side rails shall extend at least 3 feet beyond the point of support at the edge of the roof or platform.

Step ladders shall always be set up properly, so that they are in the "A" frame position, level and with all four feet on firm ground, and fully opened with the spreaders locked in place. Personnel are forbidden to stand on the top cap or on the last step of a step ladder, or to stand on the hinged back of a step ladder. A step ladder shall never be used at a straight ladder.

3.4.23 Traffic

Vehicular traffic presents opportunities for serious injury to persons or property. Traffic may consist of street traffic or motor vehicles operated by facility employees or visitors to the Site. Workers and other pedestrians are clearly at risk during periods of heavy traffic. Risk from motor vehicle operations may be minimized by good operating practices and alertness, and care on the part of workers and pedestrians.

Site personnel will wear high-visibility traffic safety vests whenever activities are conducted in areas of heavy traffic. Work vehicles will be arranged to be used as a barrier between site workers and nearby traffic. If required by local ordinances or site location, a traffic control plan will be developed implemented.

It is important to be conscious of all vehicular traffic that may be present during conduct of field operations. Use caution tape, barricades, or safety cones to denote the boundaries of the work area and to alert vehicle operators to the presence of operations which are non-routine to them. Be careful when exiting the work area and especially when walking out from between parked vehicles to avoid vehicular traffic.

Never turn your Back on Traffic. When working in or near a roadway, walk and work with your face to the oncoming traffic. If you must turn your back to traffic, have a coworker watch oncoming traffic for you.

Vehicle and Worksite Position. Whenever possible, place a vehicle between your worksite and oncoming traffic. Not only is the vehicle a large, visible warning sign, but if an oncoming car should fail to yield or deviate, the parked vehicle, rather than your body, would absorb the first impact of a crash. Turn the wheels so that if the vehicle were struck, it would swing away from the worksite. Even though the vehicle would protect you in a crash, it might be knocked several feet backward. Always leave some room between the rear of the vehicle and the work area.

Use of Signs and Cones to Direct Traffic. Traffic signs and cones are used to inform drivers and direct traffic away from and around you. Cones and signs are only effective if they give oncoming drivers enough time to react and make it clear how traffic should react.

Cone Positioning. The most common coning situation is setting a taper of cones that creates a visual barrier for oncoming motorists and gradually closes a lane.

The position of the taper depends on the road width, position and size of the work area, and also on the characteristics of the traffic.

3.4.24 Driving

A lot of driving is required to get to, from, and between project Sites. Safe vehicle maintenance and operation must be a priority. It requires knowledge of directions to (and conditions of) the Site in advance, careful exiting and merging into traffic, anticipating the unexpected, remaining alert to one's physical and mental condition, resisting distractions such as cell phone use, other car activities and contacting assistance when needed. Report all vehicle accidents/incidents to BC's Risk Manager.

3.5 Biological Hazards

The following biological hazards have been identified and may be encountered during scheduled field activities.

- ☒ Bloodborne Pathogens/Sanitary Waste
- ☐ Reptiles/Snakes
- ☐ Venomous Insects
- ☒ Mosquitoes
- ☐ Spiders/Scorpions
- ☐ Ticks
- ☐ Poisonous Plants

If any biological hazards are identified at the Site, workers in the area will immediately notify the SSO and nearby personnel.

3.5.1 Bloodborne Pathogens/Sanitary Waste

Potential exposure to bloodborne pathogens may occur during some work activities (e.g., sewer video surveys or source sampling), rendering first aid or CPR. Direct contact is an important route of exposure for bloodborne pathogens due to puncture injuries, contact with abraded skin, or contact with areas such as the eyes, without appropriate protection. While very few organisms can enter the body through normal intact skin, direct contact with sewage, blood and body fluids is to be avoided. Site personnel should thoroughly wash their hands and face before eating, drinking or smoking and before leaving the work site.

Exposure controls and Universal Precautions are required at suspect locations, in order to prevent contact with blood or other potentially infectious materials as specified in Brown and Caldwell's *Bloodborne Pathogens Program.* All blood or other potentially infectious material will be considered infectious regardless of the perceived status of the source individual. A Hepatitis B vaccination will be offered to BC personnel before the person participates in a task where direct exposure to potentially infectious materials is a possibility (i.e., first aid or CPR). For personnel who have potential exposure to sanitary wastes, a current tetanus/diphtheria inoculation or booster is recommended.

3.5.2 Rodents/Mammals

Animals may potentially carry the rabies virus or disease causing agents. Do not attempt to feed or touch animals. Feces from some small mammals may contain diseases such as Hanta Virus. Avoid generating dust in the vicinity of rodent feces. In addition, animals such as dogs or wild predators (i.e., cougars or coyotes) may pose an attack hazard. Persons should slowly back away in a non-threatening manner if an encounter with a threatening animal occurs. In order to avoid such encounters, use the buddy system and make noise when working in areas where such animals may be present.

3.5.3 Reptiles/Snakes

The primary reptiles of concern are venomous snakes (rattlesnake, water moccasin, copperhead). Avoid contact and areas that may harbor snake populations including high grass, shrubs, and crevices. In the event of a bite, immobilize the affected area and contact emergency medical services. If more than 30 minutes from emergency care, apply bandage wrap two to four inches above the bite (**note**: bandage should be loose enough to slip your finger underneath).

3.5.4 Venomous Insects

Common examples include bees, fire ants and wasps. Avoid contact with insects and their hives. If stung, remove the stinger by gently scraping it out of the skin (do not use tweezers). If the worker is stung by an insect, immediately apply an ice pack to the affected area and wash area with soap and water and apply antiseptic. If an allergic reaction occurs, contact emergency medical services for appropriate treatment.

3.5.5 Mosquitoes

Mosquitoes may transmit diseases such as West Nile Virus. Symptoms of West Nile Virus include: fever, headache, tiredness, body aches, and occasional rash. Avoid mosquito bites by wearing long sleeved shirt and long pants. Apply insect repellent to clothes and/or skin (if FDA approved for topical use). Report any dead birds in the area to local health officials. Mosquitoes are most active from dusk to dawn.

3.5.6 Spiders/Scorpions

The black widow and brown recluse spiders are the most venomous. Avoid contact with spiders and scorpions and areas where they may hide. They favor dark hiding places. Inspect clothing and shoes before getting dressed. Wear gloves and safety shoes when working with lumbar, rocks, inspecting buildings, etc. Signs and symptoms of bites include: headache, cramping pain/muscle rigidity, rash and/or itching, nausea, dizziness, vomiting, weakness or paralysis, and convulsions or shock. Wash bite area with soap and water and apply antibiotic cream. Contact emergency medical services if allergic reaction or severe symptoms occur.

3.5.7 Ticks

Deer ticks may carry and transmit Lyme disease to humans. Signs of Lyme disease include a reddish "bulls-eye" around the affected area approximately a week after the bite. Symptoms include headache, fever, and muscle/joint pain. Persons suspecting infection should contact a health professional. Whenever possible avoid areas likely to be infested with ticks during the spring and summer months.

Wear light-colored clothing so ticks can be easily spotted and removed. Wear long sleeves and pants and tuck pant legs into boots or socks. Apply insect repellents to clothing and skin (if FDA approved for topical application). Persons with long hair should tie their hair back to minimize the potential for ticks to nestle in the scalp.

Personnel should self perform tick checks once daily field work is completed. If a tick is embedded in the skin, use tweezers to grasp the tick's head (near the skin) and pull straight out. Consider saving the removed tick for laboratory analysis.

3.5.8 Poisonous Plants

Common examples include poison ivy, poison oak and poison sumac. Avoid contact. Long-sleeved shirts and pants will allow some protection against inadvertent contact. If contact occurs, immediately wash the affected area thoroughly with soap and water. If an allergic reaction occurs, seek the care of a medical professional.

Poison Ivy is a trailing or climbing woody vine or a shrub like plant with leaves that are each divided into three broad, pointed leaflets. The leaflets are commonly dark glossy green on top and slightly hairy underneath. They produce small yellowish or greenish flowers followed by berry-like drupes.

Poison Oak is a member of the same family as poison ivy and has a very similar appearance. Poison oak has leaves divided into three leaflets and generally have three to seven distinct lobes. Typically they are a shrubby type plant that can grow to eight feet in height, or sometimes can be a climbing plant

The best way to prevent exposure is the ability to recognize these plants. Conduct an initial survey of the area to determine if the plants are present in the work area, and avoid contact with them.

If plants are located and work must be conducted in that area, have the plants removed if possible. If this is not possible, wear long sleeved shirts, gloves, and a heavy material type pants. Remember not to touch contaminated clothing. There are products available that can be applied to exposed skin, (similar to sunscreen products) prior to working around the plants.

4. PERSONAL PROTECTIVE EQUIPMENT

The purpose of PPE is to protect employees from hazards and potential hazards they are likely to encounter during site activities. The amount and type of PPE used will be based on the nature of the hazard encountered of anticipated. Respiratory protection will be utilized when an airborne hazard has been identified using real-time air monitoring devices, or as a precautionary measure in areas designated by the RSUM or SSO.

Dermal protection, primarily in the form of chemical-resistant gloves and coveralls, will be worn whenever contact with chemically affected materials (e.g., soil, groundwater, sludge) is anticipated, without regard to the level of respiratory protection required.

On the basis of the hazards identified for this project, the following levels of personal protective equipment (PPE) will be required and used. Changes to the specified levels of PPE will not be made without the approval of the SSO after consultation with the RSUM.

4.1 Conditions Requiring Level D Protection

In general, site activities will commence in Level D PPE unless otherwise specified, or if the SSO determines on site that a higher level of PPE is required. Air monitoring of employee breathing zones will be routinely conducted using real-time air monitoring devices to determine if upgrading to Level C PPE is necessary. Level D PPE will be permitted as long as air monitoring data indicate that airborne concentrations of chemicals of concern are maintained below the site-specific action levels defined in Section 5.2. Level A or B PPE is not anticipated and is therefore not addressed in this plan. If Level A or B PPE is necessary, this HASP will be revised to reflect changes as appropriate.

It is important to note that dermal protection is required whenever contact with chemically-affected materials is anticipated. The following equipment is specified as the minimum PPE required to conduct activities at the Site.

- Work shirt and long pants
- ANSI- or ASTM-approved steel-toed boots or safety shoes.
- ANSI-approved safety glasses
- ANSI-approved hard hat

Other personal protection readily available for use, if necessary, includes the following items.

- Outer nitrile gloves (11 mil or thicker) and inner nitrile surgical gloves when direct contact with chemically affected soils or groundwater is anticipated (nitrile surgical gloves may be used for collecting or classifying samples as long as they are removed and disposed of immediately after each sampling event).
- Chemical-resistant clothing (e.g., Tyvek or polycoated Tyvek coveralls) when contact with chemically affected soils or groundwater is anticipated.

- Safety shoes/boots with protective overboots or knee-high PVC polyblend boots when direct contact with chemically affected soils is anticipated.
- Hearing protection.
- Sturdy work gloves.
- High-visibility traffic safety vest.

Work will cease and PPE upgraded if action levels specified in Section 5.2 are exceeded. The RSUM will be notified whenever PPE is upgraded or downgraded.

4.2 Conditions Requiring Level C Protection

If air monitoring indicates that the site-specific action levels defined in Section 5.2 are exceeded, workers in the affected area(s) will upgrade PPE to Level C. In addition to the protective equipment specified for Level D, Level C also includes the following items.

- NIOSH-approved half- or full-face air-purifying respirator (APR) equipped with filter cartridges as specified in Section 10.0. Note: safety glasses are not required when wearing a full-face APR.
- Outer nitrile gloves (11 mil or thicker) and inner nitrile surgical gloves when direct contact with chemically affected soils or groundwater is anticipated (nitrile surgical gloves may be used for collecting or classifying samples as long as they are removed and disposed of immediately after each sampling event).
- Chemical-resistant clothing (e.g., Tyvek or polycoated Tyvek coveralls) when contact with chemically affected soils or groundwater is anticipated.
- Safety shoes/boots with protective overboots or knee-high PVC polyblend boots when direct contact with chemically affected soils is anticipated.
- Hearing protection.
- Sturdy work gloves.

Respirators will be stored in clean containers (i.e., self-sealing bag) when not in use. Respirator cartridges will be replaced in accordance with the following change-out schedule.

Type of Cartridge	Cartridge Change-out Schedule
Particulate (i.e., HEPA)	At least weekly or sooner the employee detects an increase in breathing resistance. This will occur as the filter becomes loaded with particulate matter.
Sorbent (i.e., organic vapor)	At the end of each day's use or sooner if the employee detects an abnormal odor or other indicator.

Personnel who wear air-purifying respirators must be trained in their use and must have successfully passed a qualitative respirator fit test and medical evaluation within the last 12 months in accordance with and 29 CFR 1910.134.

4.3 Stop Work Conditions

If air monitoring indicates that the site-specific action levels defined in Section 5.2 are exceeded, activities will cease, and personnel must evacuate the designated Exclusion Zone. The PM and RSUM will be contacted immediately.

Work will also cease if unanticipated conditions or materials are encountered or if an imminent danger is identified. The SSO will immediately contact the RSUM for consultation.

5. AIR MONITORING PLAN

Real-time air monitoring devices will be used to analyze airborne contaminant concentrations approximately every 15 minutes in the workers' breathing zones while workers are in the designated Exclusion Zone, or when task or exposure conditions change (whichever frequency is less). If elevated concentrations are indicated, the monitoring frequency will be increased, as appropriate.

Background concentrations will be determined at the beginning of each work shift by collecting several instrument readings upwind of the scheduled activities. Alternatively, background levels can be determined by collecting readings from a nearby (upwind) area that can reasonably be considered unaffected by Site activities.

Real-time measurements will be made as near as feasible to the breathing zone of the worker with the greatest exposure potential in each active work area. If authorized by the RSUM, real time measurements may cease being taken when enough historical data is generated to warrant its cessation. Air monitoring will be reinstated if potential exposure conditions change.

The equipment will be calibrated daily, and the results will be recorded on BC's Air Monitoring Form. The results of air monitoring will also be recorded on the Air Monitoring Form and will be retained in the project files following completion of field activities. A copy of the Air Monitoring Form is located in Appendix A.

5.1 Monitoring Instruments

On-site worker exposure to airborne contaminants will be monitored during intrusive site activities. A calibrated photoionization detector (PID) with a lamp strength of 10.6 eV or flame ionization detector (FID) will be used to monitor changes in exposure to volatile organic compounds (VOCs). A miniature real-time aerosol monitor (mini-RAM or equivalent) will be used to monitor exposure to airborne dusts. The SSO, or designee, will perform routine monitoring during site operations to evaluate concentrations of VOCs and/or airborne dusts in employee breathing zones. If VOCs and/or airborne dusts are detected above predetermined action levels specified in Section 5.2, the procedures found in Section 4 of this HASP will be followed.

5.2 Site Specific Action Levels

The following action levels were developed for exposure monitoring with real-time air monitoring instruments. Air monitoring data will determine the required respiratory protection levels at the Site during scheduled intrusive activities. The action levels are based on sustained readings indicated by the instrument(s). Air monitoring will be performed and recorded at up to 15-minute intervals.

If elevated concentrations are indicated, the monitoring frequency will be increased, as appropriate. If during this time, sustained measurements are observed, the following actions will be instituted,

and the PM and RSUM will be notified. For purposes of this HASP, sustained readings are defined as the average airborne concentration maintained for a period of one (1) minute above established background levels.

Activity	Action Level	Level of Respiratory Protection
Soil-intrusive activities	< 5 ppm above background (VOCs) < 0.5 mg/m^3 above background (dust)	Level D: No respiratory protection required.
Soil-intrusive activities	5 to 25 ppm (VOCs) 0.5 to 2.5 mg/m^3 (dust)	Level C: Half-or full-face air-purifying respirator fitted with organic vapor/HEPA filter cartridges.
Soil-intrusive activities	> 25 ppm (VOCs) > 2.5 mg/m^3 (dust)	Cease operations and evacuate work area. Contact RSUM and PM immediately.

6. SITE CONTROL MEASURES

The SSO will conduct a safety inspection of the work site before each day's activities begin to verify compliance with the requirements of the HASP. Results of the first day's inspection will be documented on the Site Safety Checklist. A copy of the checklist is included in Appendix B. Thereafter, the SSO should document unsafe conditions or acts, along with corrective action, in the project field log book.

Procedures must be followed to maintain site control so that persons who may be unaware of site conditions are not exposed to hazards. The work area will be barricaded by tape, warning signs, or other appropriate means. Site equipment or machinery will be secured and stored safely.

Access to the specified work area will be limited to authorized personnel. Only BC employees and designated BC subcontracted personnel, as well as designated employees of the client, will be admitted to the work site. Personnel entering the work area are required to sign the signature page of this HASP, indicating they have read and accepted the health and safety practices outlined in this plan.

In some instances it may be necessary to define established work zones: an Exclusion Zone, a Contamination Reduction Zone, and a Support Zone. Work zones may be established based on the extent of anticipated contamination, projected work activities, and the presence or absence of non-project personnel. The physical dimensions and applicability of work zones will be determined for each area based on the nature of job activity and hazards present. Within these zones, prescribed operations will commence using appropriate PPE. Movement between zones will be controlled at checkpoints.

Considerable judgment is needed to maintain a safe working area for each zone, balanced against practical work considerations. Physical and topographical barriers may constrain ideal locations. Field measurements combined with climatic conditions may, in part, determine the control zone distances. Even when work is performed in an area that does not require the use of chemical-resistant clothing, work zone procedures may still be necessary to limit the movement of personnel and retain adequate site control.

Personnel entering the designated Exclusion Zone should exit at the same location. There must be an alternate exit established for emergency situations. In all instances, worker safety will take precedence over decontamination procedures. If decontamination of personnel is necessary, exiting the Site will include the decontamination procedures described in the following section.

7. DECONTAMINATION PROCEDURES

Decontamination will take place in the decontamination area identified on-Site. Workers, PPE, sampling equipment, and heavy equipment leaving the exclusion area will be inspected to determine the level of decontamination necessary to prevent the spread of potentially hazardous materials. Unnecessary equipment and support vehicles are to be left outside the designated Exclusion Zone so that decontamination will not be necessary.

Despite protective procedures, personnel may come in contact with potentially hazardous compounds while performing work tasks. If so, decontamination needs to take place using an Alconox or TSP wash, followed by a rinse with clean water. Standard decontamination procedures for levels C and D are as follows.

- equipment drop
- boot cover and outer glove wash and rinse
- boot cover and outer glove removal
- suit removal
- safety boot wash and rinse
- inner glove wash and rinse
- respirator removal
- inner glove removal
- field wash of hands and face

Site workers should employ only applicable steps in accordance with level of PPE worn and extent of contamination present. The SSO shall maintain adequate quantities of clean water to be used for personal decontamination (i.e., field wash of hands and face) whenever a suitable washing facility is not located in the immediate vicinity of the work area.

Disposable items will be disposed of in an appropriate container. Wash and rinse water generated from decontamination activities will be handled and disposed of properly. Non-disposable items (i.e., respirators) may need to be cleaned or sanitized before reuse. Each site worker is responsible for the maintenance, decontamination, and sanitizing of their own PPE.

Used equipment may be decontaminated as follows.

- Remove adhered materials (i.e., dirt or mud) to increase the effectiveness of the decontamination process.
- An Alconox or TSP and water solution may be used to wash the equipment.
- The equipment will then be rinsed with clean water until it is determined clean.

Each person must follow these procedures to reduce the potential for transferring chemically affected materials off site.

8. TRAINING REQUIREMENTS

BC Site personnel, including subcontractors and visitors conducting work in controlled areas of the Site, must have completed the appropriate training as required by 29 CFR 1910.120. In addition, the SSO will have completed the 8-hour Site Supervisor course, have current training in first aid and CPR, and any additional training appropriate to the level of site hazards. Further site-specific training will be conducted by the SSO prior to the initiation of project activities. This training will include, but will not necessarily be limited to, emergency procedures, site control, personnel responsibilities, and the provisions of this HASP. Each employee will document that the have been briefed on the hazards identified at the site and that they have read and understand the requirements of this HASP by signing the H&S Plan Acknowledgement Form attached as Appendix C.

A daily morning briefing to cover safety procedures and contingency plans in the event of an emergency is to be included with a discussion of the day's activities. These daily meetings will be recorded on the Daily Tailgate Safety Meeting Form. A copy of the Daily Tailgate Safety Meeting Form is included in Appendix D.

9. MEDICAL SURVEILLANCE REQUIREMENTS

BC Site personnel, including subcontractors and site visitors, who will or may work in an area designated as an exclusion zone must have fulfilled the appropriate medical monitoring requirements in accordance with 29 CFR 1910.120(f). Each individual entering an exclusion zone must have successfully completed an annual surveillance examination and/or an initial baseline examination within the last 12 months.

Medical surveillance is conducted as a routine program for BC field staff in accordance with the requirements of 29 CFR 1910.120(f). There will not be any special medical tests or examinations required for staff involved in this project.

10. CONTINGENCY PROCEDURES

Minimum emergency equipment maintained on site will include a fully charged ABC dry chemical fire extinguisher, an adequately stocked first aid kit, and an emergency eyewash station (when corrosive chemicals are present).

In the event of an emergency, site personnel will signal distress with three blasts of a horn (a vehicle horn will be sufficient), or other predetermined signal. Communication signals, such as hand signals, must be established where communication equipment is not feasible or in areas of loud noise.

It is the SSO's duty to evaluate the seriousness of the situation and to notify appropriate authorities. The first part of this plan contains emergency telephone numbers as well as directions to the hospital. Nearby telephone access must be identified and available to communicate with local authorities. If a nearby telephone is not available, a cellular telephone will be maintained on site during work activities. The operation of the cellular phone will be verified to ensure that a signal can be achieved at the work location.

The SSO, or designee, should contact local emergency services in the event of an emergency. After emergency services are notified, the PM and RSUM will be notified of the situation as soon as possible. If personal injury, property damage or equipment damage occurs, the PM and BC Risk Manager will be contacted as soon as practicable. An Accident/Incident Investigation Report will be completed within 24 hours by the SSO, or other designated person. A copy of the Accident/Incident Investigation Report is included in Appendix E.

At projects conducted at mining facilities, incident reporting requirements differ from OSHA standards. Site-specific MSHA reporting requirements must be addressed in conjunction with the RSUM and PM.

10.1 Injury or Illness

If an exposure or injury occurs, work will be temporarily halted until an assessment can be made to determine it is safe to continue work. The SSO, in consultation with the RSUM, will make the decision regarding the safety of continuing work. The SSO will conduct an investigation to determine the cause of the incident and steps to be taken to prevent recurrence

In the event of an injury, the extent and nature of the victim's injuries will be assessed and first aid/CPR will be rendered as appropriate. If necessary, emergency services will be contacted or the individual may be transported to the nearby medical center. The mode of transportation and the eventual destination will be based on the nature and extent of the injury. A hospital route map is presented at the front of this HASP.

In the event of a life-threatening emergency, the injured person will be given immediate first aid and emergency medical services will be contacted by dialing the number listed in the Critical Project

Information section at the beginning of this plan. The individual rendering first aid will follow directions given by emergency medical personnel via telephone.

10.2 Vehicle Collision or Property Damage

If a vehicle collision or property damage event occurs, the SSO, or designee, will contact the BC Risk Manager for appropriate action.

10.3 Fire

In the event of fire, the alarm will be sounded and Site personnel will evacuate to a safe location (preferably upwind). The SSO, or designee, should contact the local fire department immediately by dialing 911. When the fire department arrives, the SSO, or designated representative, will advise the commanding officer of the location and nature of the fire nature, and identification of hazardous materials on site. Only trained, experienced fire fighters should attempt to extinguish substantial fires at the Site. Site personnel should not attempt to fight fires, unless properly trained and equipped to do so. Site personnel should not attempt to fight a fire if it poses a risk to their personal safety.

Note that smoking is not permitted in controlled areas (i.e., exclusion or contamination reduction zones), near flammable or combustible materials, or in areas designated by the facility as non-smoking areas.

10.4 Underground Utilities

In the event that an underground conduit is damaged during subsurface work, mechanized equipment will immediately be shut off and personnel will evacuate the area until the nature of the piping can be determined. Depending on the nature of the broken conduit (e.g., natural gas, water, or electricity), the appropriate local utility will be contacted.

10.5 Site Evacuation

The SSO will designate evacuation routes and refuge areas to be used in the event of a Site emergency. Site personnel will stay upwind from vapors or smoke and upgradient from spills. If workers are in an Exclusion or Contamination Reduction Zone at the start of an emergency, they should exit through the established decontamination corridors, if possible. If evacuation cannot be done through an established decontamination area, site personnel will go to the nearest safe location and remove chemically-affected clothing there or, if possible, leave it near the Exclusion Zone. Personnel will assemble at the predetermined refuge following evacuation and decontamination. The SSO, or designated representative, will count and identify site personnel to verify that all have been evacuated safely.

10.6 Spill of Hazardous Materials

If a hazardous material spill occurs, site personnel should locate the source of the spill and determine the hazard to the health and safety of site workers and the public. Attempts to stop or reduce the flow should only be performed if it can be done without risk to personnel.

Isolate the spill area and do not allow entry by unauthorized personnel. De-energize sources of ignition within 100 feet of the spill, including vehicle engines. Should a spill be of the nature or extent that it cannot be safely contained, or poses an imminent threat to human health or the environment, an emergency cleanup contractor will be called out as soon as possible. Spill containment measures listed below are examples of responses to spills.

- Right or rotate containers to stop the flow of liquids. This step may be accomplished as soon as the spill or leak occurs, providing it is safe to do so.
- Sorbent pads, booms, or adjacent soil may be used to dike or berm materials, subject to flow, and to solidify liquids.
- Sorbent pads, soil, or booms, if used, must be placed in appropriate containers after use, pending disposal.
- Contaminated tools and equipment shall be collected for subsequent cleaning or disposal.

11. DOCUMENTATION

The implementation of the FWSP must be documented on the appropriate forms (see appendices) to verify employee participation and protection. In addition, the regulatory requirements must be met for recordkeeping on training, medical surveillance, injuries and illnesses, exposure monitoring, health risk information, and respirator fit-tests. Documentation of each BC employee's health and safety records is maintained by the Health and Safety Data Manager in Walnut Creek, California.

Health and safety documentation and forms completed, as specified by this plan, are to be retained in the project file.

Other relevant project-specific health and safety documents, such as MSDSs or client-specified procedures, will be attached to this HASP in AppendixF.

APPENDIX A

Air Monitoring Form

BROWN AND CALDWELL

Air Monitoring Form

Page ____ of ____

Instructions: Complete this form immediately prior to project start.

Name of Project/Site:	**Project No:**
Project/Site Location:	
Employee Performing Air Monitoring: (Print and Sign):	**Date:**

Photo Ionization/Flame Ionization Detectors (PIDs/FIDs)

☐ PID ☐ FID	**Manufacturer:**	**Model:**	**Serial #:**
Initial Calibration Reading:		**End-of-Use Calibration Reading:**	
Calibration Standard/Concentration:			

Mini-RAM Dust Monitor

Manufacturer:	**Model:**	**Serial #:**
Zeroed in Z-Bag? ☐ Yes ☐ No		

Monitoring Data

Time	Location and Activity	PID/FID (ppm)	Mini-RAM (mg/m^3)	Time	Location and Activity	PID/FID (ppm)	Mini-RAM (mg/m^3)

APPENDIX B

Site Safety Checklist

BROWN AND CALDWELL

Site Safety Checklist

Page ____ of ____

Instructions: Complete this form immediately prior to project start.

Name of Project/Site:	**Project No:**
Project/Site Location:	
Employee Completing Checklist: (Print and Sign):	**Date:**

Yes	No	N/A		Yes	No	N/A	
☐	☐	☐	Written Health and Safety (H&S) Plan is on site?	☐	☐	☐	Respirators are available, properly cleaned, and stored?
☐	☐	☐	Addenda to the H&S Plan are documented on site?	☐	☐	☐	Overhead utilities do not present a hazard to equipt./personnel?
☐	☐	☐	H&S Plan information matches conditions/activities at the site?	☐	☐	☐	Traffic control measures have been implemented?
☐	☐	☐	H&S Plan read/signed by all site personnel, including visitors?	☐	☐	☐	Trenches and excavations are safe for entry?
☐	☐	☐	Daily tailgate H&S meetings have been held/documented?	☐	☐	☐	Soil Spoils are at least 2 feet from the edge of the excavation?
☐	☐	☐	Site personnel have required training and medical?	☐	☐	☐	Emergency/FA equipt. is on site as described in the H&S Plan?
☐	☐	☐	Air monitoring is performed/documented per the H&S Plan?	☐	☐	☐	Drinking water is readily available?
☐	☐	☐	Air monitoring equipment has been calibrated daily?	☐	☐	☐	Phone is readily available for emergency use?
☐	☐	☐	Site zones are set up and observed where appropriate?	☐	☐	☐	Utility locator has cleared subject locations?
☐	☐	☐	Access to the work area limited to authorized personnel?	☐	☐	☐	Proper drum and material handling techniques are used?
☐	☐	☐	Decontamination procedures followed/match the H&S Plan?	☐	☐	☐	Waste containers/drums are labeled appropriately?
☐	☐	☐	Decontamination stations (incl. hand/face wash) are set up and used?	☐	☐	☐	Ext. cords are grounded/protected from water/vehicle traffic?
☐	☐	☐	PPE used matches H&S Plan requirements?	☐	☐	☐	Tools and equipment are in good working order?
☐	☐	☐	Hearing protection used where appropriate?	☐	☐	☐	GFCIs used for portable electrical tools and equipment?

Notes

(All "no" answers must be addressed and corrected immediately. Note additional health and safety observations here):

APPENDIX C

H&S Plan Acknowledgement Form

BROWN AND CALDWELL

H&S Plan Acknowledgement Form

Instructions: Complete this form immediately prior to project start or as new personnel join the project.

Name of Project/Site:	**Project No:**
Project/Site Location:	
Employee Performing Briefing: (Print and Sign):	**Date:**

Employee Acknowledgement:

The following signatures indicate that these personnel have read and/or been briefed on this Health and Safety (H&S) Plan and understand the potential hazards/controls for the work to be performed.

Important Notice to Subcontractor(s):

Subcontractors are responsible for developing, maintaining, and implementing their own health and safety programs, policies, procedures and equipment as necessary to protect their workers, and others, from their activities. Subcontractors shall operate equipment in accordance with their standard operating procedures as well as manufacturer's specifications. Any project monitoring activities conducted by BC at the Site shall not in any way relieve subcontractors of their critical obligation to monitor their operations and employees for the determination of exposure to hazards that may be present at the Site and to provide required guidance and protection. If requested, subcontractors will provide BC with a copy of their own H&S Plan for this project or other health and safety program documents for review.

BC's Health and Safety Plan has been prepared specifically for this project and is intended to address health and safety issues solely with respect to the activities of BC's own employees at the site. A copy of BC's H&S Plan may be provided to subcontractors in an effort to help them identify expected conditions at the site and general site hazards. The subcontractor shall remain responsible for identifying and evaluating hazards at the site as they pertain to their activities and for taking appropriate precautions. For example, BC's H&S Plan does not address specific hazards associated with tasks and equipment that are particular to the subcontractor's scope of work and site activities. (e.g., operation of a drill rig, excavator, crane or other equipment). Subcontractors are not to rely on BC's H&S Plan to identify all hazards that may be present at the Site. Subcontractor personnel are expected to comply fully with subcontractor's Health and Safety Plan and to observe the minimum safety guidelines applicable to their activities which may be identified in the BC H&S Plan. Failure to do so may result in the removal of the subcontractor or any of the subcontractor's workers from the job site.

Print	Sign	Date	Print	Sign	Date

Daily Tailgate Meeting Form

BROWN AND CALDWELL

Daily Tailgate Meeting Form

Name of Project/Site:	Project No:
Project/Site Location:	
Employee Completing Form: (Print and Sign):	Date:

Employee Acknowledgement:

The following signatures indicate that these personnel have read and/or been briefed on this Health and Safety (H&S) Plan and understand the potential hazards/controls for the work to be performed.

Important Notice to Subcontractor(s):

Subcontractors are responsible for developing, maintaining, and implementing their own health and safety programs, policies, procedures and equipment as necessary to protect their workers, and others, from their activities. Subcontractors shall operate equipment in accordance with their standard operating procedures as well as manufacturer's specifications. Any project monitoring activities conducted by BC at the Site shall not in any way relieve subcontractors of their critical obligation to monitor their operations and employees for the determination of exposure to hazards that may be present at the Site and to provide required guidance and protection. If requested, subcontractors will provide BC with a copy of their own H&S Plan for this project or other health and safety program documents for review.

BC's Health and Safety Plan has been prepared specifically for this project and is intended to address health and safety issues solely with respect to the activities of BC's own employees at the site. A copy of BC's H&S Plan may be provided to subcontractors in an effort to help them identify expected conditions at the site and general site hazards. The subcontractor shall remain responsible for identifying and evaluating hazards at the site as they pertain to their activities and for taking appropriate precautions. For example, BC's H&S Plan does not address specific hazards associated with tasks and equipment that are particular to the subcontractor's scope of work and site activities. (e.g., operation of a drill rig, excavator, crane or other equipment). Subcontractors are not to rely on BC's H&S Plan to identify all hazards that may be present at the Site. Subcontractor personnel are expected to comply fully with subcontractor's Health and Safety Plan and to observe the minimum safety guidelines applicable to their activities which may be identified in the BC H&S Plan. Failure to do so may result in the removal of the subcontractor or any of the subcontractor's workers from the job site.

Print	Sign	Date	Print	Sign	Date

Plan of the Day

(Describe the activities that are planned to be performed today)

Potential Hazards and Topics Discussed

(Describe the potential hazards and controls that may be associated with planned activities)

☐ Electrical ☐ Chemical ☐ Biological ☐ Physical ☐ Other (specify):

APPENDIX E

Accident/Incident Investigation Report

BROWN AND CALDWELL

H&S Plan Accident/Incident Investigation Report

Instructions:

If an accident or incident occurs, complete all applicable information in this form, make a copy for your records, and immediately forward the original to the office Health and Safety Coordinator (HSC). If fields are not applicable, indicate with "N/A". Use separate sheet(s) if necessary and attach sketches, photographs, or other information that may be helpful in understanding how the accident/incident occurred.
HSC – Review and enter report into the BC Online Safety Observation and Incident Reporting System within 3 workdays of receipt. File original in appropriate office health and safety file.

NOTE:

This report is important – please take the time necessary to properly complete it. Incomplete reports will be forwarded to appropriate management for review and action.

General Information

Date of Accident/Incident	**Time of Accident/Incident:**	**Date Accident/Incident Reported:**	**To Whom:**
Exact Location of Accident/Incident (Street, City, State):			**BC Office:**
Name Project:			**Project Number:**
Employee Completing the Investigation (Print and Sign):			**Date:**

Injured/Ill Employee/Property Damage Information

Employee Name:	**Employee No.**	**Department:**	**Phone Number:**
Job Title:		**Manager's Name and Phone Number:**	
Nature of Injury/Illness (laceration, contusion, strain, etc.):		**Body Part Affected** (arm, leg, head, hand, etc.):	
Describe Property Damage and Estimate Loss :			

Description of Accident/Incident

Describe the accident sequentially, beginning with the initiating event, and followed by secondary and tertiary events. End with the nature and extent of injury/damage. Name any object or substance and tell how they were included. Examples: 1) Employee was pulling utility cart that was loaded with wastepaper from office area to hallway. Wheel of utility cart caught against door casing. Bags of heavy wastepaper that were in cart fell to end of cart. Cart tipped over onto foot of employee. Right foot was crushed between utility cart and door casing, resulting in severe contusion to right foot of employee. 2) Employee was driving rental car from office to project site. Car struck icy section of road. Employee lost control of vehicle, which skidded across road into concrete abutment on side of road. Accident resulted in damage to right fender, tire, headlight, and grill.

BROWN AND CALDWELL

H&S Plan Accident/Incident Investigation Report

Analysis of Accident Causes

Immediate Causes - Substandard Actions

What substandard actions caused or could have caused the accident/incident? State the actions on the part of the employee or others that contributed to the occurrence of the accident/incident. Examples: 1) Employee overloaded the utility cart with wastepaper. 2) Employee exceeded safe speed on icy road, and was inattentive to hazard.

Codes (check all that apply)

- ☐ 1. Operating equipment without authority
- ☐ 2. Failure to warn
- ☐ 3. Failure to secure
- ☐ 4. Operating at improper speed
- ☐ 5. Making safety devices inoperable
- ☐ 6. Removing safety devices
- ☐ 7. Using defective equipment
- ☐ 8. Using equipment improperly
- ☐ 9. Failure to use PPE properly
- ☐ 10. Improper loading
- ☐ 11. Improper placement
- ☐ 12. Improper lifting
- ☐ 13. Improper position for task
- ☐ 14. Servicing equipment in operation
- ☐ 15. Horseplay
- ☐ 16. Alcohol or drug influence
- ☐ 17. Other (specify)

Immediate Causes - Substandard Conditions

What substandard conditions caused or could have caused the accident/incident? State the conditions that existed at the time of the accident (the specific control factors that were or may have been the direct or immediate cause or causes of the accident). Examples: 1) Wheel of utility cart was worn and would not roll properly; utility cart was overloaded with wastepaper. 2) Road was covered with icy spots; weather was foggy.

Codes (check all that apply)

- ☐ 1. Inadequate guards or barriers
- ☐ 2. Inadequate or improper PPE
- ☐ 3. Defective tools, equipment, or materials
- ☐ 4. Congestion or restricted action
- ☐ 5. Inadequate earning system
- ☐ 6. Fire and explosion hazards
- ☐ 7. Poor housekeeping
- ☐ 8. Noise exposures
- ☐ 9. Radiation exposures
- ☐ 10. High or low temperature exposures
- ☐ 11. Inadequate or excess illumination
- ☐ 12. Inadequate ventilation
- ☐ 13. Hazardous environ. conditions (vapors, dusts, etc.)
- ☐ 14. Other (specify)

Basic Causes - Personal and Job Factors

What personal and/or job factors caused or could have caused the accident/incident? State the influencing factors or underlying causes, either conditions or actions or both, that contributed to the accident/incident. Examples: 1) Employee had not been instructed in overloading hazards. 2) Employee had not been trained in driving under winter conditions; company has no driver training program.

Codes (check all that apply)

Personal Factors

☐ 1. Inadequate capability ☐ 2. Lack of knowledge ☐ 3. Lack of skill ☐ 4. Improper motivation
☐ 5. Other (specify):_____

Job Factors

☐ 1. Inadequate leadership/supervision ☐ 2. Inadequate engineering ☐ 3. Inadequate purchasing ☐ 4. Inadequate maintenance ☐ 5. Inadequate tools/equipment
☐ 6. Inadequate work standards/procedures ☐ 7. Inadequate Wear and tear ☐ 8. Abuse or misuse
☐ 9. Other (specify):

Remedial Actions

Describe the actions taken or planned to prevent recurrence of accident/incident - provide the implementation date and person responsible for any planned corrective action.. Examples: 1) Wheels of utility cart were replaced with larger size wheels; all carts were inspected for safe operation; employees were instructed in overloading hazards. 2) All project personnel were instructed at the safety training meeting on driving under hazardous conditions; driver training program will be implemented.

Codes (check all that apply)

Job Factors

☐ 1. Reinstruction of personnel involved ☐ 2. Reprimand of personnel involved ☐ 3. Temporary/permanent reassignment of personnel ☐ 4. Action to improve clean-up
☐ 5. Equipment repair or replacement ☐ 6. Improve design ☐ 7. Improve construction ☐ 8. Improve PPE ☐ 9. Install of safety guard or device ☐ 10. Work method change
☐ 11. Order use of safer materials ☐ 12. Regional Safety Unit Manager Review
☐ 13. Other (specify):

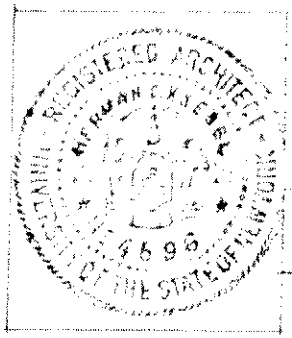
APPENDIX F

Miscellaneous Health and Safety Information

APPENDIX B

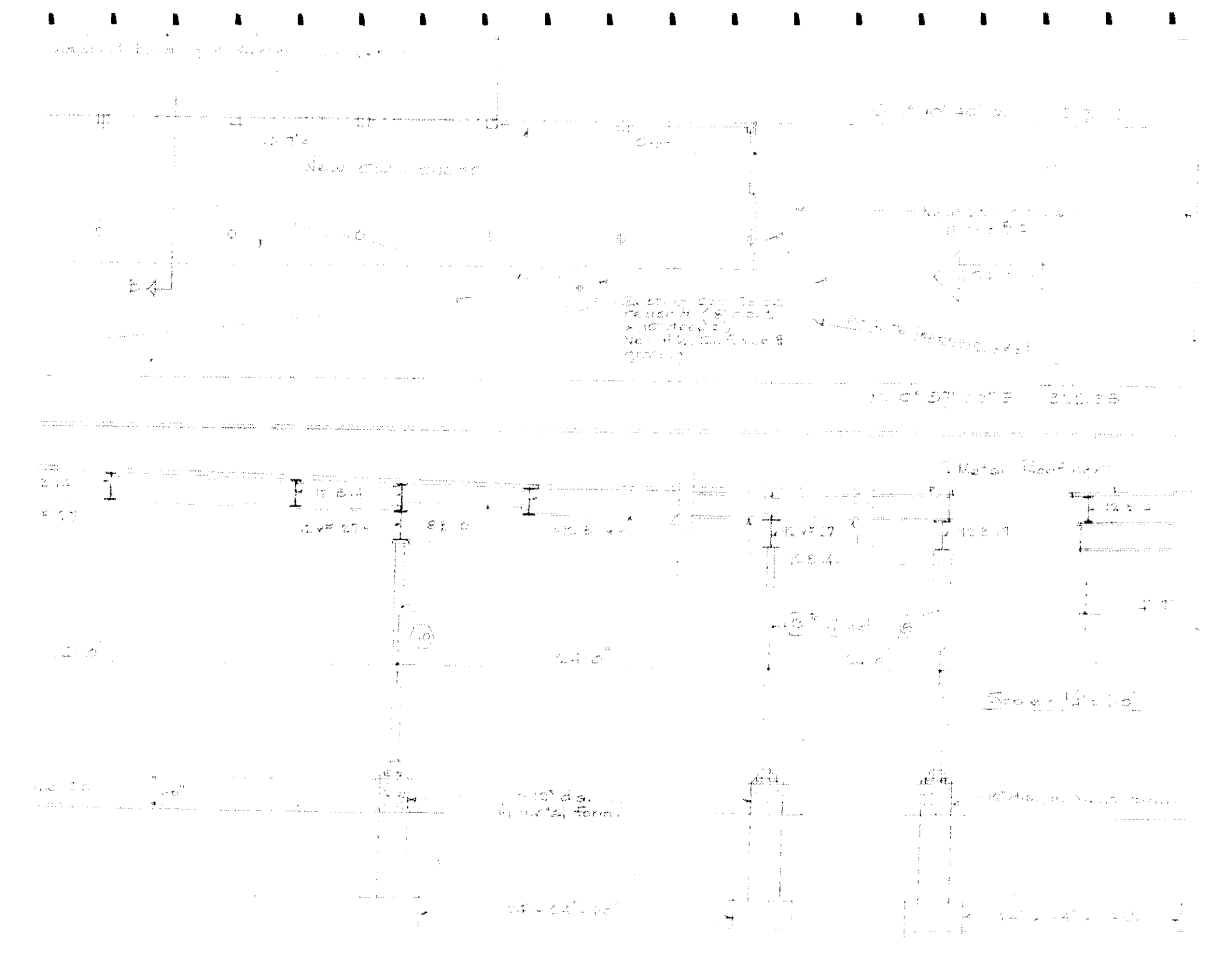
"Truck Shed Structure for Bartlett Tree Experts, Union Ave. Westbury, NY;" Herman C. Knebel, Arch't' July 25, 1963

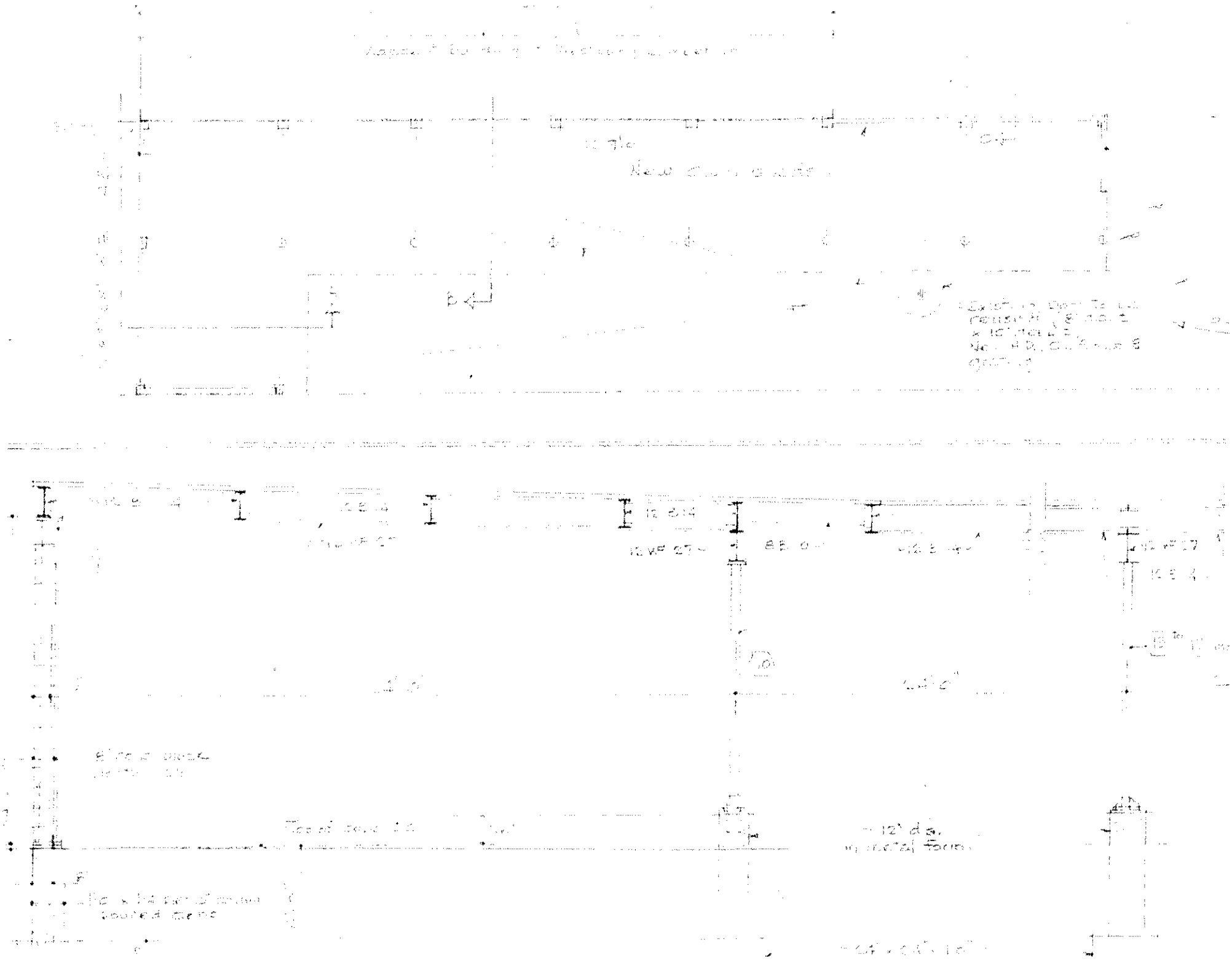
Note: This structure replaces a similar structure destroyed by fire.



Existing Sidewalk and Curb cut

Scale: 1/4" = 1'-0"





APPENDIX C

New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan

New York State Department of Health
Generic Community Air Monitoring Plan

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

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

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

Community Air Monitoring Plan

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

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

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

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background

conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

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

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

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

Particulate Monitoring, Response Levels, and Actions

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

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

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

APPENDIX D

Driller's Well Logs

N 166. (Continued)

	Thickness (feet)	Depth (feet)
Sand, medium to coarse, yellow and few pebbles	12	73
Sand, coarse to medium and some fine gravel, yellow	2	75
Sand, coarse to medium, nearly white and few small pebbles	4	79
No sample obtained	3	82
Sand, coarse, white, clean	5	87
Sand, medium and clay, yellow	5	92
Sand, medium, fairly clean	3	95
Sand, medium, brown and gray clay	1	96
Sand, medium, white and clay	2	98
Sand, coarse, white, clean	5	103
Sand, medium and gray clay	6	109

There are three other wells on this property, N 1666, Well 3, N 1668, Well 2, N 1913, Well 4, ranging in depth from 108 to 359 feet.

N 1667. Westbury Water District, Grand Avenue and Winthrop Street, Westbury. (G D, 3.4 N, 0.9 W). Drilled by Harris-Harmon Well Co., Inc., February 1941. Altitude of land surface about 118 feet above sea level. Log begins at land surface. Driller's log.

	Thickness (feet)	Depth (feet)
Topsoil	1	1
Sand and gravel	24	25
Gravel mixed with clay	24	49
Gravel	11	60
Gravel and sand	15	75
Clay, sandy	15	90
Clay, gravel and sand	45	135
Clay	15	150
Sand	15	165
Clay, tough, gray	28	193
Sand and gravel	15	208
Sand, gray (water-bearing)	40	248

Casing: 24 to 12 inch.
Screen: 30 feet of 12 inch with bottom at 237 feet.

(Continued on next page)

N-2597. (B-5) City of Long Beach, Lafayette Boulevard, Long Beach. Drilled by Layne-New York Co., Inc., September 27, 1948.

Log:

	Thickness (feet)	Depth (feet)
Sand and gravel	109	109
Blue clay	14	123
Fine gravel and coarse sand	21	144
Sand and streaks of clay	35	179
Sand and streaks of gravel, shells and wood	32	211
Sand and fine gravel, streaks of clay	28	249
Sandy clay	52	301
Clay and hard streaks	138	449
Coarse gravel and sand	29	478
Clay	6	484
Clay and sand streaks	16	500
Tough clay and hard sand rock	51	551
Sand and gravel	17	568
Sand and gravel and clay streaks	51	619
Sand and gravel	45	664
Sand, clay and gravel	20	684
Tough clay and streaks of gravel	60	744
Coarse gravel, sand and hard streaks	31	775
Sand, clay hard streaks and wood	21	796
Hard clay	30	826
Sand, gravel and hard streaks of clay	17	843
Blue clay and hard streaks of sand rock	31	874
Sand, gravel and hard streaks	16	890
Tough clay	10	900
Clay and gravel	87	987
Sand, gravel and clay streaks	65	1052
Clay streaks and gravel	4	1056
Clay	14	1070
Clay, sand and gravel	20	1090
Sand and gravel	47	1137
Hard clay and gravel	26	1163
Coarse sand and gravel	82	1245
Clay and hard streaks	7	1252

Casing: 18, 12 and 8 inches.
Screen: 60 feet of 8 inch with bottom at 1235 feet.

Pumping test:
September 27, 1948. Duration: ..... 8 hours
Static water level: ..... 9 feet
Drawdown: ..... 39 feet
Yield: .....1218 gpm

N-2602. (D-7) Westbury Water District, Dryden and Tennyson Street, Westbury. Drilled by Layne-New York Co., Inc., August 11, 1948.

Log:

	Thickness (feet)	Depth (feet)
Sand and gravel	26	26
Brown and white clay	16	42
Hard packed sand and clay	34	76
Brown muddy sand	46	112
Black clay	11	123
Muddy sand	88	211

(Continued on next page)

N-2602. *(Continued)*

	Thickness (feet)	Depth (feet)
Sand and gravel	22	233
Streaks sand and clay	9	242
Sand and gravel	18	260
Streaks sand clay	107	367
Sandy clay	22	389
Sand and gravel	33	422
Clay	8	430
Sandy clay	19	449
Hard packed sand	52	501
Sand and gravel	23	524
Clay	3	527
Gravel	29	556
Clay	11	567
Fine sand	24	591
Clay hard streaks	146	737
Sandy clay	13	750
Sand and gravel	51	801
Streaks of sandy clay below 801 feet		

Casing: 26, 16 and 10 inches.
Screen: 40 feet of 10 inch with bottom at 800 feet.

Pumping test:
August 11, 1948. Duration: ..... 8 hours
Static water level: ..... 99 feet
Drawdown: ..... 89 feet
Yield: ..... 935 gpm

N-2608. (C-7) Otto Tepe, Bellmore and Prospect Avenues, East Meadow. Drilled by Eastern Well & Pump Co., April 1948.

Log:

	Thickness (feet)	Depth (feet)
Top soil and loam	2	2
Light brown sand, heavy grits, gravel and stones	42	44

Casing: 6 inches.
Screen: 12 feet of 6 inch with bottom at 44 feet.

Pumping test:
April 1948. Duration: ..... 3 hours
Static water level: ..... 14 feet
Yield: ..... 240 gpm

N-2610. (C-8) Jacob Boos, Jr., South of Southern State Parkway and East of Seamans Neck Road, Wantagh. Drilled by Eastern Well & Pump Co., May 1948.

Log:

	Thickness (feet)	Depth (feet)
Top soil	1	1
Coarse brown sand, grits and gravel	46	47

Casing: 6 inches.
Screen: 10 feet of 6 inch with bottom at 47 feet.

Pumping test:
May 1948. Duration: ..... 3 hours
Static water level: ..... 16 feet
Yield: ..... 200 gpm

N-3477. *(Continued)*

	Thickness (feet)	Depth (feet)
Brown sand	2	51
Coarse yellow sand	8	59

Casing: 4 inches.
Screen: 8 feet of 4 inch with bottom at 59 feet.

Pumping test:
February 11, 1950. Duration: 4 hours
Static water level: flows
Drawdown: 12 feet
Yield: 70 gpm

N-3482. (D-7) Long Island Comunity Playhouses, Inc., (Hicksville Playhouse) Marie Street and Broadway, Hicksville. Drilled by Duffield Construction Co., June 16, 1950.

Log:

	Thickness (feet)	Depth (feet)
Coarse sand and rock	5	5
Large rock	5	10
Large stone, some sand	30	40
Sand and gravel	49	89

Casing: 8 inches.
Screen: 10 feet of 8 inch with bottom at 89 feet.

Static water level: 65 feet
Yield: 250 gpm

N-3484. (D-6) Westbury Theatre Corporation, Post Avenue and Newton Street, Westbury. Drilled by C. W. Lauman & Co., Inc., April 21, 1950.

Log:

	Thickness (feet)	Depth (feet)
Fill	12	12
Coarse brown sand and heavy gravel	17	29
Fine sand and clay	31	60
Sandy clay	20	80
Solid brown clay	46	126
Fine brown sand and lumps of brown clay	8	134
Medium coarse brown sand	7	141
Fine sand and lumps of clay	23	164
Solid light brown clay	5	169
Solid gray clay	31	200

Casing: 8 inches.
Screen: 24 feet of 8 inch with bottom at 165 feet.

Pumping test:
April 20, 1950. Duration: 3 hours
Static water level: 30 feet
Drawdown: 34 feet
Yield: 300 gpm

N-3486. (E-7) Oyster Bay Water District, Mill Hill Road and Shore Road, Oyster Bay. Drilled by Long Island Water Supply Co., Inc., April 7, 1950.

Log:

	Thickness (feet)	Depth (feet)
Fill	8	8
Clay	2	10
Medium brown sand and small gravel	10	20

N-4199. (D-8) Harry Ernenwein, Old Country Road and Round Swamp Road, Plainview. Drilled by Mathies Well & Pump Co., Inc., June 19, 1953.

Log:

	Thickness (feet)	Depth (feet)
Medium clean sand	60	60
Medium sand, few gravel and clay balls	19	79
Coarse sand and gravel	25	104
Hardpan	6	110
Fine sandy clay	14	124
Fine red sand and lumps of clay	7	131
Very fine red sand and lumps of clay	6	137

Casing: 4 inches.
Screen: 6 feet of 1⅞ inch with bottom at 131 feet.

Pumping test:
June 1, 1953.

Duration:	4 hours
Static water level:	102 feet
Drawdown:	2 feet
Yield:	12 gpm

N-4201. (C-6) Frostland, north of North Franklin Avenue and west of Long Island Railroad, Hempstead. Drilled by Fred Habenicht & Sons, September 6, 1953.

Log:

	Thickness (feet)	Depth (feet)
Well pit	6	6
Sand and gravel (gas odor present)	26	32
Black sand	10	42

Casing: 4 inches.
Screen: 8 feet of 4 inch with bottom at 42 feet.

Pumping test:
September 3, 1953.

Duration:	3 hours
Static water level:	12 feet
Drawdown:	10 feet
Yield:	40 gpm

N-4206. (D-6) Carle Place Water District, north of Asbury Avenue and west of Cherry Lane, Carle Place. Drilled by Layne-New York Co., Inc., August 5, 1954.

Log:

	Thickness (feet)	Depth (feet)
Heavy gravel	59	59
Yellow clay and sand	100	159
Black and gray clay	8	167
Gray clay and sand	41	208
Sandy clay	24	232
Sand and gravel	6	238
Sand, gravel and streaks clay (white)	32	270
Sand and gravel	8	278
Clay	2	280
Sandy clay	10	290
White clay	6	296
Coarse gravel and sand	62	358
Sandy clay	10	368

(Continued on next page)

N-4376. *(Continued)*

	Thickness (feet)	Depth (feet)
Hard gray clay	17	185
Hard gray clay	80	265
Soft sandy clay	35	300
Sandy clay	35	335
Sand and gravel	32	367

Casing: 6 inches.
Screen: 10 feet of 4 inch with bottom at 356 feet.

Pumping test:
December 7, 1953. Duration: ..... 4 hours
Static water level: ..... 50 feet
Drawdown: ..... 10 feet
Yield: ..... 150 gpm

N-4382. (D-7) Jarco Metal Products Corporation, south of Portland Avenue and west of Grand Boulevard, New Cassel. Drilled by Eastern Well & Pump Co., December 18, 1953.

Log:

	Thickness (feet)	Depth (feet)
Top soil and fill	4	4
Brown sand, grits and gravel	1	5
Solid gray clay	2	7
Clean and sharp, brown sand, grits and gravel	4	11
Fairly sharp brown sand and grits and gravel	5	16
Clean coarse light brown sand, grits and gravel	6	22
Medium coarse light brown sand, mostly grits and gravel	7	29
Light brown layers clay, hard layers brown sandy clay	12	41
Dark brown sandy clay, silt	7	48
Fine brown sand and clay, hardpan	4	52
Light brown fine sharp sand, few grits	8	60
Fine brown sand, lumps and layers of gray brown clay, hardpan	12	72
Very fine sandy brown clay	9	81
Fine brown fairly sharp sand, lot of brown clay, water	7	88
Fine sharp brown sand (clean)	4	92
Layer of hardpan	at	92
Brown sand, a little coarser and sharp	2	94
Fine brown sharp clay, has life	1	95
Layer gray sandy clay	at	95
Fine brown sand	1	96
Very fine silt, brown sand, lumps of clay	2	98
Very hard sandy brown clay	5	103
Very hard solid black clay	7	110
Dirty dark brown sand, mica	8	118
Fine dirty brown sand, hardpan and mica	7	125
Layer sandy clay	at	125
Very fine soupy brown sand, hardpan	7	132
Hard brown sandy clay and mica	6	138
Brown fine soupy sand clay and mica	10	148
Fine light brown sand, fairly clean	9	157
Hardpan, lumps of clay	3	160
Brown sandy clay	19	179
Hard sandy brown and gray clay	at	179
Reddish brown fine sand	9	188
Solid gray clay	4	192
Fine fairly clean light brown sand, lump of clay hardpan and mica	14	206
Medium fine to fine light brown sand, clean and sharp, some mica	15	221

N-4382. *(Continued)*

Casing: 6 inches.
Screen: 11 feet of 4 inch with bottom at 205 feet.

Pumping test:
December 18, 1953. Duration: ..... 4 hours
Yield: ..... 69 gpm

N-4383. (D-7) La Grega Realty Corporation, north of Main Street and west of Urban Avenue, Westbury. Drilled by Mathies Well & Pump Co., Inc., December 3, 1953.

Log:	Thickness (feet)	Depth (feet)
Loam and sandy clay	5	5
Coarse sand and gravel	37	42
Sandy clay	7	49
Fine sand	6	55
Sandy clay	35	90
Fine sand	15	105
Medium fine clean sand	11	116
Fine sand and small traces of clay	20	136

Casing: 4 inches.
Screen: 10 feet of 4 inch with bottom at 136 feet.

Pumping test:
December 3, 1953. Duration: ..... 4 hours
Static water level: ..... 44 feet
Yield: ..... 43 gpm

N-4384. (C-6) Aurora Plastics, north of Hempstead Turnpike and east of Cherry Valley Road, West Hempstead. Drilled by Sweeney & Gray Co., Inc., December 10, 1953.

Log:	Thickness (feet)	Depth (feet)
Medium sand	42	42

Casing: 6 inches.
Screen: 11 feet of 6 inch with bottom at 42 feet.

Pumping test:
March 5, 1954. Duration: ..... 4 hours
Static water level: ..... 10½ feet
Drawdown: ..... 5½ feet
Yield: ..... 69 gpm

N-4385. (C-8) Bildner-Big Ben Corporation, north of Thorne Avenue and east of Hicksville-Massapequa Road, Plainedge. Drilled by Eastern Well & Pump Co., April 5, 1954.

Log:	Thickness (feet)	Depth (feet)
Coarse brown sand and grits	29	29
Light brown sand, medium grits and gravel	17	46

Casing: 6 inches.
Screen: 5⅓ feet of 4 inch with bottom at 43 feet.

Pumping test:
April 5, 1954. Duration: ..... 2 hours
Static water level: ..... 5 feet
Drawdown: ..... 6 feet
Yield: ..... 60 gpm

N-4893. *(Continued)*

Pumping test:
November 15, 1954.

Duration:	8 hours
Static water level:	51 feet
Drawdown:	10 feet
Yield:	150 gpm

N-4924. (E-6) Woodside Farms, Inc., north of Glen Head Road and west of Cedar Swamp Road, Glen Head. Drilled by Long Island Water Supply Co., October 28, 1954.

Log:

	Thickness (feet)	Depth (feet)
Sand and gravel	25	25
Brown clay	16	41
Coarse sand and gravel	20	61

Casing: 6 inches.
Screen: 10 feet of 6 inch with bottom at 61 feet.

Pumping test:
August 18, 1954.

Duration:	4 hours
Static water level:	15 feet
Drawdown:	35 feet
Yield:	45 gpm

N-5007. (D-7) Westbury Water District, north of Brush Hollow Road and west of Kings Street, North Hempstead. Drilled by Layne-New York Co., Inc., May 16, 1955.

Log:

	Thickness (feet)	Depth (feet)
Sand, gravel	14	14
Brown clay	1	15
Sand, clay, iron oxide	32	47
Brown sandy clay	3	50
Gray clay	24	74
White-brown clay	5	79
Brown sand	9	88
Sand clay	4	92
White sand	6	98
Clay	2	100
White sand	7	107
Clay	15	122
Sand, clay	21	143
Brown sand	8	151
Various colored clay	36	187
Brown sand	10	197
White clay	5	202
White-brown sand	21	223
Red-white clay	2	225
White-brown sand	35	260
Brown-white clay	2	262

Casing: 12 inches.
Screen: 50 feet of 12 inch with bottom at 260 feet.

Pumping test:
November 10, 1954.

Duration:	8 hours
Static water level:	37 feet
Drawdown:	35 feet
Yield:	1110 gpm

N-5654. (C-6) Westbury Water District, north of Old Country Road and east of Grand Street, Westbury. Drilled by Layne-New York Co., Inc., August 15, 1956.

Log:	Thickness (feet)	Depth (feet)
Brown sand and gravel	34	34
Light brown sand	14	48
Fine muddy sand	34	82
Sand, brown clay, iron oxide	54	136
Black clay	5	141
Fine white sand	7	148
Gray clay	18	166
Sand	13	179
Clay	4	183
Fine sand, some brown clay	46	229
White-brown clay, fine white-brown sand	31	260
Coarse sand and gravel	15	275
Hard streaks	1	276
Sand	65	341
Sand, clay	11	352

Casing: 20 inches.
Screen: 60 feet of 12 inch with bottom at 335 feet.

Pumping test:
August 15, 1956. Duration: 8 hours
Static water level: 25½ feet
Drawdown: 19 feet
Yield: 975 gpm

N-5655. (D-7) Westbury Water District, north of Broadway and east of Brooklyn Avenue, Westbury. Drilled by Layne-New York Co., Inc., August 16, 1956.

Log:	Thickness (feet)	Depth (feet)
Sand, gravel	32	32
Various colored clay	24	56
Fine muddy sand, clay	20	76
Fine sand	9	85
Clay, iron oxide	1	86
Sand, clay, iron oxide	14	100
Various colored clay	10	110
Fine sand, clay, iron oxide	14	124
Fine brown sand	7	131
Fine sand, clay, iron oxide	25	156
Fine white sand	7	163
White and brown clay	3	166
Fine muddy brown sand, iron oxide	7	173
White and brown clay	12	185
Fine muddy sand	9	194
White and brown clay	4	198
Fine brown sand	12	210
White yellow clay	2	212
Brown sand	13	225
White and brown clay	4	229
Fine white brown sand	21	250
Fine clay	3	253
Fine sand	7	260
Various color clay	5	265

Casing: 20 and 12 inches.
Screen: 50 feet of 12 inch, with bottom at 255 feet.

APPENDIX E

1998 Preliminary Site Assessment (PSA), Soil and Groundwater Quality Data Tables

TABLE 1

SUMMARY OF PSA SAMPLING PROGRAM

BARTLETT TREE COMPANY SITE
(continued)

Program Element	Environmental Media	Sample Type/Depth	Number of Samples	Equipment	Laboratory Analyses [1,2,3]
Downgradient (n=3)	Groundwater	At surface of water in probe at water table and at 25 feet below water table	6	Groundwater probe with dedicated disposable polyethylene tubing equipped with bottom check valve	1 location for TCL +30* plus Herbicides (GP-4) 2 locations for TCL Pesticides, Herbicides and TAL Metals (GP-2, GP-3)
Off-Site Monitoring Well(s) (Union Oil)	Groundwater	Purge 3 well volumes with bailer.	1	Disposable polyethylene tubing equipped with bottom check valve; disposable polyethylene bailer	TCL Pesticides, Herbicides (MW-1)
Trip Blank	Aqueous	Distilled Water	1**	Sample supplied by laboratory	TCL VOCs
Matrix Spike/ Matrix Spike Duplicate	Soil/Sediment	Soil/Sediment (split of actual sample interval)	1***	Soil probe with disposable polyethylene scoop and/or sterile wooden tongue depressor	TCL +30 plus Herbicides

TABLE 1

SUMMARY OF PSA SAMPLING PROGRAM

BARTLETT TREE COMPANY SITE

Program Element	Environmental Media	Sample Type/Depth	Number of Samples	Equipment	Laboratory Analyses [1,2,3]
Dry Well	Soil/Sediment	Bore through dry well, collect continuous soil cores to water table; composite similar 2 to 6 foot intervals; discreet grab samples for VOC analysis	7	Soil probe with disposable aluminum tray for compositing, disposable polyethylene scoop and sterile wooden tongue depressor	TCL+30 plus Herbicides (DW-1)
	Groundwater	At surface of water in probe at water table and at 25 feet below water table	2	Groundwater probe with dedicated disposable polyethylene tubing equipped with bottom check valve	TCL +30 plus Herbicides (DW-1_
Groundwater Probes: Upgradient (n=1)	Groundwater	At surface of water in probe at water table and at 25 feet below water table	2	Groundwater probe with dedicated disposable polyethylene tubing equipped with bottom check valve	TCL +30 plus Herbicides (GP-1)

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TABLE 1

SUMMARY OF PSA SAMPLING PROGRAM

BARTLETT TREE COMPANY SITE

(continued)

Program Element	Environmental Media	Sample Type/Depth	Number of Samples	Equipment	Laboratory Analyses [1,2,3]
Matrix Spike/ Matrix Spike Duplicate	Aqueous	Groundwater (split of actual sample)	1***	Groundwater probe with dedicated disposable polyethylene tubing equipped with bottom check valve; disposable polyethylene bailer	TCL +30 plus Herbicides

[1] TCL+30 Analysis includes TCL VOCs, TCL SVOCs, TCL Pesticides/PCBs, TAL Metals and cyanide.

[2] All TCL VOC analyses to include Freon 113.

[3] All pesticide analyses to include USEPA SW846 Method 8141. Herbicides will be analyzed by Method 8150.

*Final selection of samples for TCL +30 analysis to be made in the field based on visual observations and/or screening for volatile organic compounds utilizing a Photoionization Detector (PID) or Flame Ionization Detector (FID).

**One trip blank will accompany each shipment of aqueous samples requiring volatile organic analysis.

***One MS/MSD for each media for every 20 samples collected, or one every 2 weeks.

TABLE 2
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
GROUNDWATER SAMPLING RESULTS
VOLATILE ORGANIC COMPOUNDS

SAMPLE IDENTIFICATION	DW-1	DW-1	GP-1	GP-1	GP-4	GP-4	TB-1	TB-3	CONTRACT REQUIRED DETECTION LIMIT	NYSDEC CLASS GA GROUNDWATER STANDARD/ GUIDELINE
SAMPLE DEPTH	37'	62'	38'	62'	37'	62'	--	--		
DATE OF COLLECTION	11/18/96	11/18/96	11/12/96	11/12/96	11/13/96	11/13/96	11/13/96	11/18/96		
DILUTION FACTOR	1	1	1	1	1	1	1	1		
UNITS	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Chloromethane	U	U	U	U	U	U	U	U	10	5 ST
Bromomethane	U	U	U	U	U	U	U	U	10	5 ST
Vinyl Chloride	U	U	U	U	U	U	U	U	10	2 ST
Chloroethane	U	U	U	U	U	U	U	U	10	5 ST
Methylene Chloride	2 J	2 J	3 JB	3 JB	2 JB	2 JB	20 B	U	10	5 ST
Acetone	U	U	U	U	U	U	U	U	10	50 GV
Carbon Disulfide	U	U	U	U	U	U	U	U	10	----
1,1-Dichloroethene	U	U	U	U	U	U	U	U	10	5 ST
1,1-Dichloroethane	U	U	U	1 J	U	U	U	U	10	5 ST
1,2-Dichloroethene (total)	U	U	4 J	73	U	140	U	U	10	5 ST*
Chloroform	U	U	U	U	U	U	U	U	10	7 ST
1,2-Dichloroethane	U	U	U	U	U	U	U	U	10	5 ST
2-Butanone	U	U	U	U	U	U	U	U	10	50 GV
1,1,1-Trichloroethane	U	U	U	U	U	2 J	U	U	10	5 ST
Carbon Tetrachloride	U	U	U	U	U	U	U	U	10	5 ST
Bromodichloromethane	U	U	U	U	U	U	U	U	10	50 GV
1,2-Dichloropropane	U	U	U	U	U	U	U	U	10	5 ST
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	10	5 ST
Trichloroethene	U	U	8 J	170	U	160	U	U	10	5 ST
Dibromochloromethane	U	U	U	U	U	U	U	U	10	50 GV
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	10	5 ST
Benzene	U	U	U	U	U	U	U	U	10	0.7 ST
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	U	10	5 ST
Bromoform	U	U	U	U	U	U	U	U	10	50 GV
4-Methyl-2-pentanone	U	U	U	U	U	U	U	U	10	----
2-Hexanone	U	U	U	U	U	U	U	U	10	50 GV
Tetrachloroethene	10	12	160	6 J	5 J	U	U	U	10	5 ST
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	10	5 ST
Toluene	U	U	U	U	U	U	U	U	10	5 ST
Chlorobenzene	U	U	U	U	U	U	U	U	10	5 ST
Ethylbenzene	6 J	7 J	U	U	U	U	U	U	10	5 ST
Styrene	U	U	U	U	U	U	U	U	10	5 ST
Xylene (total)	33	37	U	U	U	U	U	U	10	5 ST*
Freon 113	U	U	U	U	U	U	U	U	10	5 ST
Vinyl Acetate	U	U	U	U	U	U	U	U	10	----
TOTAL VOCs	51	58	175	253	7	304	20	0		

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
B: Compound found in the method blank as well as the sample.
J: Compound found at level below CRDL, value estimated.
CRDL: Contract required detection limit.
DF: Dilution factor.
GV: Guidance value.
ST: Standard.

Notes:
* : Applies to each isomer individually.
---- : Not established.
[ ]: Value exceeds standard/guideline.
Detection Limit = DF*CRDL

TABLE 3
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
GROUNDWATER SAMPLING RESULTS
SEMIVOLATILE ORGANIC COMPOUNDS

SAMPLE IDENTIFICATION	DW-1	DW-1	GP-1	GP-1	GP-4	GP-4	CONTRACT REQUIRED DETECTION LIMIT	NYSDEC CLASS GA GROUNDWATER STANDARDS/ GUIDELINES
SAMPLE DEPTH	37'	62'	38'	62'	37'	62'		
DATE OF COLLECTION	11/18/96	11/18/96	11/12/96	11/12/96	11/13/96	11/13/96		
DILUTION FACTOR	1	1	1	1	1	1		
UNITS	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Phenol	U	U	U	U	U	U	10	1 ST **
bis(2-Chloroethyl)ether	U	U	U	U	U	U	10	1.0 ST
2-Chlorophenol	U	U	U	U	U	U	10	1 ST **
1,3-Dichlorobenzene	U	U	U	U	U	U	10	5 ST
1,4-Dichlorobenzene	U	U	U	U	U	U	10	4.7 ST *
1,2-Dichlorobenzene	U	U	U	U	U	U	10	4.7 ST *
2-Methylphenol	U	U	U	U	U	U	10	1 ST **
2,2'-oxybis(1-Chloropropane)	U	U	U	U	U	U	10	5 ST
4-Methylphenol	U	U	U	U	U	U	10	1 ST **
N-Nitroso-di-n-propylamine	U	U	U	U	U	U	10	----
Hexachloroethane	U	U	U	U	U	U	10	5 ST
Nitrobenzene	U	U	U	U	U	U	10	5 ST
Isophorone	U	U	U	U	U	U	10	50 GV
2-Nitrophenol	U	U	U	U	U	U	10	1 ST **
2,4-Dimethylphenol	U	U	U	U	U	U	10	1 ST **
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	10	5 ST
2,4-Dichlorophenol	U	U	U	U	U	U	10	1 ST **
1,2,4-Trichlorobenzene	U	U	U	U	U	U	10	5 ST
Naphthalene	U	3 J	U	U	U	U	10	10 GV
4-Chloroaniline	U	U	U	U	U	U	10	5 ST
Hexachlorobutadiene	U	U	U	U	U	U	10	5 ST
4-Chloro-3-methylphenol	U	U	U	U	U	U	10	1 ST **
2-Methylnaphthalene	U	5 J	U	U	U	U	10	----
Hexachlorocyclopentadiene	U	U	U	U	U	U	10	5 ST
2,4,6-Trichlorophenol	U	U	U	U	U	U	10	1 ST **
2,4,5-Trichlorophenol	U	U	U	U	U	U	25	1 ST **
2-Chloronaphthalene	U	U	U	U	U	U	10	10 GV
2-Nitroaniline	U	U	U	U	U	U	25	5 ST
Dimethylphthalate	U	U	U	U	U	U	10	50 GV
Acenaphthylene	U	U	U	U	U	U	10	----
2,6-Dinitrotoluene	U	U	U	U	U	U	10	5 ST
3-Nitroaniline	U	U	U	U	U	U	25	5 ST
Acenaphthene	U	U	U	U	U	U	10	20 GV
2,4-Dinitrophenol	U	U	U	U	U	U	25	1 ST **
4-Nitrophenol	U	U	U	U	U	U	25	1 ST **

TABLE 3 (continued)
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
GROUNDWATER SAMPLING RESULTS
SEMIVOLATILE ORGANIC COMPOUNDS

SAMPLE IDENTIFICATION	DW-1	DW-1	GP-1	GP-1	GP-4	GP-4	CONTRACT REQUIRED DETECTION LIMIT	NYSDEC CLASS GA GROUNDWATER STANDARDS/ GUIDELINES
SAMPLE DEPTH	37'	62'	38'	62'	37'	62'		
DATE OF COLLECTION	11/18/96	11/18/96	11/12/96	11/12/96	11/13/96	11/13/96		
DILUTION FACTOR	1	1	1	1	1	1		
UNITS	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Dibenzofuran	U	U	U	U	U	U	10	----
2,4-Dinitrotoluene	U	U	U	U	U	U	10	5 ST
Diethylphthalate	U	U	U	U	U	U	10	50 GV
4-Chlorophenyl-phenylether	U	U	U	U	U	U	10	----
Fluorene	U	U	U	U	U	U	10	50 GV
4-Nitroaniline	U	U	U	U	U	U	25	5 ST
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	25	1 ST **
N-Nitrosodiphenylamine	U	U	U	U	U	U	10	50 GV
4-Bromophenyl-phenylether	U	U	U	U	U	U	10	----
Hexachlorobenzene	U	U	U	U	U	U	10	0.35 ST
Pentachlorophenol	U	U	U	U	U	U	25	1 ST **
Phenanthrene	U	U	U	U	U	U	10	50 GV
Anthracene	U	U	U	U	U	U	10	50 GV
Carbazole	U	U	U	U	U	U	10	----
Di-n-butylphthalate	U	U	U	U	U	U	10	50 ST
Fluoranthene	U	U	U	U	U	U	10	50 GV
Pyrene	U	U	U	U	U	U	10	50 GV
Butylbenzylphthalate	U	U	U	U	U	U	10	50 GV
3,3'-Dichlorobenzidine	U	U	U	U	U	U	10	5 ST
Benzo(a)anthracene	U	U	U	U	U	U	10	0.002 GV
Chrysene	U	U	U	U	U	U	10	0.002 GV
bis(2-Ethylhexyl)phthalate	U	U	1 J	U	U	U	10	50 ST
Di-n-octylphthalate	U	U	U	U	U	U	10	50 GV
Benzo(b)fluoranthene	U	U	U	U	U	U	10	0.002 GV
Benzo(k)fluoranthene	U	U	U	U	U	U	10	0.002 GV
Benzo(a)pyrene	U	U	U	U	U	U	10	ND ST
Indeno(1,2,3-cd)pyrene	U	U	U	U	U	U	10	0.002 GV
Dibenzo(a,h)anthracene	U	U	U	U	U	U	10	----
Benzo(g,h,i)perylene	U	U	U	U	U	U	10	----
TOTAL PAHs	0	3	0	0	0	0		
TOTAL CaPAHs	0	0	0	0	0	0		
TOTAL SVOCs	0	8	1	0	0	0		

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
J: Compound found at a concentration below the detection limit.
CRDL: Contract required detection limit.
DF: Dilution factor.
ST: Standard.
GV: Guidance value.
ND: Not-detectable.

Notes:
* : Value pertains to the sum of the isomers.
** : Value pertains to total phenols.
[ ]: Value exceeds standard/guideline.
---- : Not established.
Detection Limit = DF*CRDL

TABLE 4
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
GROUNDWATER SAMPLING RESULTS
PESTICIDES AND PCBs

SAMPLE IDENTIFICATION	DW-1	DW-1	GP-1	GP-1	GP-2	GP-2	CONTRACT REQUIRED DETECTION LIMIT	NYSDEC CLASS GA GROUNDWATER STANDARD/ GUIDELINE
SAMPLE DEPTH	37'	62'	38'	62'	37'	62'		
DATE OF COLLECTION	11/18/96	11/18/96	11/12/96	11/12/96	11/14/96	11/14/96		
DILUTION FACTOR	1	1	1	1	1	1		
UNITS	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
PESTICIDES								
alpha-BHC	U	U	U	U	U	U	0.05	ND ST*
beta-BHC	U	U	U	U	U	U	0.05	ND ST*
delta-BHC	0.036 JP	0.049 JP	U	U	U	U	0.05	ND ST*
gamma-BHC (Lindane)	0.63	3.2 D	U	U	U	U	0.05	ND ST*
Heptachlor	U	U	U	U	U	U	0.05	ND ST**
Aldrin	U	U	U	U	U	U	0.05	ND ST
Heptachlor Epoxide	U	U	U	U	U	U	0.05	ND ST**
Endosulfan I	U	U	U	U	U	U	0.05	----
Dieldrin	0.11 P	0.59	0.073 J	U	U	U	0.10	ND ST
4,4'-DDE	0.19	0.16	0.073 J	U	U	U	0.10	ND ST***
Endrin	0.077 J	0.098 J	U	U	U	U	0.10	ND ST
Endosulfan II	U	U	U	U	U	U	0.10	----
4,4'-DDD	1.7 P	6 D	U	U	U	U	0.10	ND ST***
Endosulfan Sulfate	U	U	U	U	U	U	0.10	----
4,4'-DDT	19 D	1.9	U	U	U	U	0.10	ND ST***
Methoxychlor	1.9	4.9 JD	U	U	U	U	0.50	35 ST
Endrin Ketone	U	U	U	U	U	U	0.10	5 ST
Endrin Aldehyde	U	U	U	U	U	U	0.10	5 ST
alpha-Chlordane	0.08	0.11 P	U	U	U	U	0.05	0.1 ST****
gamma-Chlordane	0.054 P	0.086 P	U	U	U	U	0.05	0.1 ST****
Toxaphene	U	U	U	U	U	U	5.00	ND ST
TOTAL PESTICIDES	23.777	17.093	0.146	0	0	0		
PCBs								
Aroclor-1016	U	U	U	U	U	U	1.00	0.1 ST*****
Aroclor-1221	U	U	U	U	U	U	2.00	0.1 ST*****
Aroclor-1232	U	U	U	U	U	U	1.00	0.1 ST*****
Aroclor-1242	U	U	U	U	U	U	1.00	0.1 ST*****
Aroclor-1248	U	U	U	U	U	U	1.00	0.1 ST*****
Aroclor-1254	U	U	U	U	U	U	1.00	0.1 ST*****
Aroclor-1260	U	U	U	U	U	U	1.00	0.1 ST*****
TOTAL PCBs	0	0	0	0	0	0		

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
J: Compound found at a concentration below the detection limit, value estimated.
P: Concentration from primary and confirmation columns have a >25% difference, lower value reported.
CRDL: Contract required detection limit.
DF: Dilution factor.
GV: Guidance value.
ST: Standard.
ND: Non-detectable.
D: Result taken from the reanalysis at a 1:10 dilution.

Notes:
* : Value applies to the sum of these substances.
** : Value applies to the sum of these substances.
*** : Value applies to the sum of these substances.
**** : Value applies to the sum of these substances.
***** : Value applies to the sum of these substances.
---- : Not established.
☐ : Value exceeds standard/guideline.
Detection Limit = DF*CRDL

TABLE 4 (continued)
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
GROUNDWATER SAMPLING RESULTS
PESTICIDES AND PCBs

SAMPLE IDENTIFICATION	GP-3	GP-3	GP-4	GP-4	MW-1		CONTRACT REQUIRED DETECTION LIMIT	NYSDEC CLASS GA GROUNDWATER STANDARD/ GUIDELINES
SAMPLE DEPTH	37'	62'	37'	62'	--			
DATE OF COLLECTION	11/13/96	11/14/96	11/13/96	11/13/96	11/14/96			
DILUTION FACTOR	1	1	1	1	1			
UNITS	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)		(ug/L)	(ug/L)
PESTICIDES								
alpha-BHC	U	U	U	U	U		0.05	ND ST*
beta-BHC	U	U	U	U	U		0.05	ND ST*
delta-BHC	U	U	U	U	U		0.05	ND ST*
gamma-BHC (Lindane)	U	U	U	U	U		0.05	ND ST*
Heptachlor	U	U	U	U	U		0.05	ND ST**
Aldrin	U	U	U	U	U		0.05	ND ST
Heptachlor Epoxide	U	U	U	U	U		0.05	ND ST**
Endosulfan I	U	U	U	U	U		0.05	----
Dieldrin	U	U	U	U	U		0.10	ND ST
4,4'-DDE	U	U	U	U	U		0.10	ND ST***
Endrin	U	U	U	U	U		0.10	ND ST
Endosulfan II	U	U	U	U	U		0.10	----
4,4'-DDD	U	U	U	U	U		0.10	ND ST***
Endosulfan Sulfate	U	U	U	U	U		0.10	----
4,4'-DDT	U	U	U	U	U		0.10	ND ST***
Methoxychlor	U	U	U	U	U		0.50	35 ST
Endrin Ketone	U	U	U	U	U		0.10	5 ST
Endrin Aldehyde	U	U	U	U	U		0.10	5 ST
alpha-Chlordane	U	U	U	U	U		0.05	0.1 ST****
gamma-Chlordane	U	U	U	U	U		0.05	0.1 ST****
Toxaphene	U	U	U	U	U		5.00	ND ST
TOTAL PESTICIDES	0	0	0	0	0			
PCBs								
Aroclor-1016	U	U	U	U	U		1.00	0.1 ST*****
Aroclor-1221	U	U	U	U	U		2.00	0.1 ST*****
Aroclor-1232	U	U	U	U	U		1.00	0.1 ST*****
Aroclor-1242	U	U	U	U	U		1.00	0.1 ST*****
Aroclor-1248	U	U	U	U	U		1.00	0.1 ST*****
Aroclor-1254	U	U	U	U	U		1.00	0.1 ST*****
Aroclor-1260	U	U	U	U	U		1.00	0.1 ST*****
TOTAL PCBs	0	0	0	0	0			

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
J: Compound found at a concentration below the detection limit, value estimated.
P: Concentration from primary and confirmation columns have a >25% difference, lower value reported.
CRDL: Contract required detection limit.
DF: Dilution factor.
GV: Guidance value.
ST: Standard.
ND: Non-detectable.

Notes:
* : Value applies to the sum of these substances.
** : Value applies to the sum of these substances.
*** : Value applies to the sum of these substances.
**** : Value applies to the sum of these substances.
***** : Value applies to the sum of these substances.
---- : Not established.
[ ] : Value exceeds standard/guideline.
Detection Limit = DF*CRDL

TABLE 5
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
GROUNDWATER SAMPLING RESULTS
HERBICIDES

SAMPLE IDENTIFICATION	DW-1	DW-1	GP-2	GP-2	GP-3	GP-3	GP-4	GP-4	MW-1	CONTRACT REQUIRED DETECTION LIMIT	NYSDEC CLASS GA GROUNDWATER STANDARD/ GUIDELINE
SAMPLE DEPTH	37'	62'	37'	62'	37'	62'	37'	62'	--		
DATE OF COLLECTION	11/18/96	11/18/96	11/14/96	11/14/96	11/13/96	11/14/96	11/13/96	11/13/96	11/14/96		
DILUTION FACTOR	1	1	1	1	1	1	1	1	1		
UNITS	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Diazinon	U	U	U	U	U	U	U	U	U		0.7 ST
Carbaryl (Sevin)	U	U	U	U	U	U	U	U	U		29 ST
Malathion	U	U	U	U	U	U	U	U	U		7.0 ST
2,4-D	U	U	U	U	U	U	U	U	U	2.5	4.4 ST
2,4,5-TP (Silvex)	U	U	U	U	U	U	U	U	U	0.25	0.26 ST
2,4,5-T	U	U	U	U	U	U	U	U	U	0.25	35 ST
2,4-DB	U	U	U	U	U	U	U	U	U	2.5	----
Dalapon	U	U	U	U	U	U	U	U	U	10	50 ST
Dicamba	U	U	U	U	U	U	U	U	U	0.25	0.44 ST
Dinoseb	U	U	U	U	U	U	U	U	U	1.2	1 ST*
2,4-DP (Dichloroprop)	U	U	U	U	U	U	U	U	U	2.5	----
MCPA	U	U	U	U	U	U	U	U	U	1000	0.44
MCPP	U	U	U	U	U	U	U	U	U	1000	----
TOTAL HERBICIDES	0	0	0	0	0	0	0	0	0		

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
CRDL: Contract required detection limit.
DF: Dilution factor.
GV: Guidance value.
ST: Standard.
ND: Non-detectable.

Notes:
---- : Not established.
* : Value applies to the sum of these substances.
: Value exceeds standard/guideline.
Detection Limit = DF*CRDL

TABLE 6
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
GROUNDWATER SAMPLING RESULTS
INORGANIC CONSTITUENTS

SAMPLE IDENTIFICATION	DW-1		DW-1		GP-1		GP-1		INSTRUMENT DETECTION LIMITS	NYSDEC CLASS GA GROUNDWATER STANDARDS/ GUIDELINES
SAMPLE DEPTH	37'		62'		38'		62'			
DATE OF COLLECTION	11/18/96		11/18/96		11/12/96		11/12/96			
DILUTION FACTOR	1	1	1	1	1	1	1	1		
FILTERED/UNFILTERED	unfiltered	filtered	unfiltered	filtered	unfiltered	filtered	unfiltered	filtered		
UNITS	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Aluminum	3590	93.1 B	34600	147 B	81000	148 B	36900	142 B	71.4	----
Antimony	13.6 B	U	32.4 B	8.6 B	U	U	14.1 B	6.3 B	8.9	3 GV
Arsenic	U	U	133	U	67	U	159	U	5.1	25 ST
Barium	97.5 B	94.7 B	458	128 B	598	293	783	120 B	12.8	1000 ST
Beryllium	1.7 B	U	3.4 B	U	4.1 B	U	10.3	U	0.10	3 GV
Cadmium	1.7 B	U	U	U	U	U	U	U	0.30	10 ST
Calcium	19400	18700	18900	15000	15800	15200	15600	18200	172	----
Chromium	63.3	3.2 B	340	U	189	U	216	U	1.2	50 ST
Cobalt	7.7 B	3.3 B	64.5	11.6 B	41 B	234	770	9.1 B	1.4	----
Copper	28.6	5.9 B	166	5.9 B	144	11.5 B	103	7.9 B	2.5	200 ST
Iron	13000	1070	404000	8600	87500	1690	539000	2510	17.4	300 ST *
Lead	25.1	U	317	2.2 B	47.6	U	131	U	2.1	25 ST
Magnesium	3420 B	3000 B	9710	7000	5910	10300	10700	2850 B	181	35000 GV
Manganese	218	118	1960	481	2020	3190	9150	386	0.4	300 ST *
Mercury	U	U	U	U	U	U	0.32	U	0.20	2 ST
Nickel	73.5	114	200	28.6 B	120	51.2	247	12.5 B	1.9	----
Potassium	2550 B	3430 B	6930	5790	4950 B	5050	6280	2310 B	418	----
Selenium	U	U	U	6.5	U	U	U	U	4.1	10 ST
Silver	83	U	U	3.6 B	U	3.9 B	U	U	1.4	50 ST
Sodium	19300	16400	32000	28800	25000	23800	21000	25400	650	20000 ST
Thallium	U	U	U	U	U	16.3	U	9.8 B	6.1	4 GV
Vanadium	22.2 B	U	157	2.7 B	154	U	154	U	1.2	----
Zinc	258	173	1110	90.8	212	90.2	749	34.0	3.8	300 ST
Cyanide	U	N/A	U	N/A	U	N/A	U	N/A	10.0	100 ST

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
B: Compound concentration is less than the CRDL but greater than the IDL.
IDL: Instrument detection limit.
CRDL: Contract required detection limit.
DF: Dilution factor.
GV: Guidance value.
ST: Standard.
N/A: Compound not analyzed for.

Notes:
* : Standard for the sum of iron and manganese is 500 ug/L.
---- : Not established.
☐ : Value exceeds standard/guideline.
Detection Limit = DF*IDL

TABLE 6 (continued)
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
GROUNDWATER SAMPLING RESULTS
INORGANIC CONSTITUENTS

SAMPLE IDENTIFICATION	GP-2	GP-2	GP-3	GP-3	GP-4		GP-4		INSTRUMENT DETECTION LIMITS	NYSDEC CLASS GA GROUNDWATER STANDARDS/ GUIDELINES
SAMPLE DEPTH	37'	62'	37'	62'	37'		62'			
DATE OF COLLECTION	11/14/96	11/14/96	11/13/96	11/14/96	11/13/96		11/13/96			
DILUTION FACTOR	1	1	1	1	1	1	1	1		
FILTERED/UNFILTERED	unfiltered	unfiltered	unfiltered	unfiltered	unfiltered	filtered	unfiltered	filtered		
UNITS	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Aluminum	5700	12200	19600	17900	43500	138 B	19400	138 B	71.4	----
Antimony	U	U	U	U	U	U	U	U	8.9	3 GV
Arsenic	9.3 B	38.6	8.3 B	71.8	26.7	U	210	U	5.1	25 ST
Barium	125 B	1320	439	1270	404	89.4 B	2440	198 B	12.8	1000 ST
Beryllium	U	2 B	1 B	1.6 B	3 B	U	1.6 B	U	0.10	3 GV
Cadmium	U	U	U	U	U	U	U	U	0.30	10 ST
Calcium	18300	21600	13100	12000	11900	11400	12500	13900	172	----
Chromium	50.9	49.6	83.5	91.2	113	U	132	U	1.2	50 ST
Cobalt	4.3 B	127	17.1 B	153	63.2	15.6 B	224	25.0 B	1.4	----
Copper	9 B	48.6	47.1	49.8	75.2	5.5 B	49.9	5.3 B	2.5	200 ST
Iron	11400	78000	25900	137000	55300	105	229000	785	17.4	300 ST *
Lead	7.6	50.4	18.4	39.2	48	U	44.3	U	2.1	25 ST
Magnesium	3460 B	5670	4120 B	4510 B	7010	1980 B	4370 B	4790 B	181	35000 GV
Manganese	374	5580	896	5330	2990	686	20700	1270	0.4	300 ST *
Mercury	U	0.36	U	U	U	U	U	U	0.20	2 ST
Nickel	25.9 B	55.7	59.7	96.2	82.1	7.2 B	106	27.1 B	1.9	----
Potassium	3230 B	8540	3710 B	7060	6110	2760 B	7610	8410	418	----
Selenium	4.6 B	U	U	U	U	U	U	U	4.1	10 ST
Silver	U	U	U	U	U	U	2.4 B	U	1.4	50 ST
Sodium	18200	34600	11900	33100	9970	9240	33700	34900	650	20000 ST
Thallium	U	U	U	U	U	U	U	12.2	6.1	4 GV
Vanadium	13.2 B	75.9	40 B	114	114	U	136	U	1.2	----
Zinc	40.2	134	113	244	164	25.0	272	46.9	3.8	300 ST
Cyanide	U	U	U	U	U	N/A	U	N/A	10.0	100 ST

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
B: Compound concentration is less than the CRDL but greater than the IDL.
IDL: Instrument detection limit.
CRDL: Contract required detection limit.
DF: Dilution factor.
GV: Guidance value.
ST: Standard.
N/A: Compound not analyzed for.

Notes:
* : Standard for the sum of iron and manganese is 500 ug/L.
---- : Not established.
[ ] : Value exceeds standard/guideline.
Detection Limit = DF*IDL

TABLE 6 (continued)
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
GROUNDWATER SAMPLING RESULTS
INORGANIC CONSTITUENTS

SAMPLE IDENTIFICATION	MW-1								INSTRUMENT DETECTION LIMITS	NYSDEC CLASS GA GROUNDWATER STANDARDS/ GUIDELINES
SAMPLE DEPTH	--									
DATE OF COLLECTION	11/14/96									
DILUTION FACTOR	1									
UNITS	(ug/L)								(ug/L)	(ug/L)
Aluminum	156 B								71.4	----
Antimony	U								8.9	3 GV
Arsenic	9.3 B								5.1	25 ST
Barium	78.3 B								12.8	1000 ST
Beryllium	U								0.10	3 GV
Cadmium	U								0.30	10 ST
Calcium	23900								172	----
Chromium	2 B								1.2	50 ST
Cobalt	U								1.4	----
Copper	U								2.5	200 ST
Iron	178								17.4	300 ST *
Lead	2.7 B								2.1	25 ST
Magnesium	3800 B								181	35000 GV
Manganese	68.8								0.4	300 ST *
Mercury	U								0.20	2 ST
Nickel	5.3 B								1.9	----
Potassium	3170 B								418	----
Selenium	U								4.1	10 ST
Silver	U								1.4	50 ST
Sodium	14500								650	20000 ST
Thallium	U								6.1	4 GV
Vanadium	U								1.2	----
Zinc	14.7 B								3.8	300 ST
Cyanide	U								10.0	100 ST

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
B: Compound concentration is less than the CRDL but greater than the IDL.
IDL: Instrument detection limit.
CRDL: Contract required detection limit.
DF: Dilution factor.
GV: Guidance value.
ST: Standard.

Notes:
* : Standard for the sum of iron and manganese is 500 ug/L.
---- : Not established.
☐ : Value exceeds standard/guideline.
Detection Limit = DF*IDL

TABLE 7
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
SOIL BORING SAMPLING RESULTS
VOLATILE ORGANIC COMPOUNDS

SAMPLE IDENTIFICATION	DW-1	DW-1	DW-1	DW-1	DW-1	DW-1	DW-1	TBLK2	CONTRACT REQUIRED DETECTION LIMIT	NYSDEC RECOMMENDED SOIL CLEANUP OBJECTIVES
SAMPLE DEPTH	8'-12'	12'-16'	16'-18'	18'-22'	22'-28'	28'-34'	34'-38'	--		
DATE OF COLLECTION	11/14/96	11/14/96	11/14/96	11/14/96	11/18/96	11/18/96	11/18/96	11/14/96		
DILUTION FACTOR	5	1250	1250	125	1	1	1	1		
PERCENT SOLIDS	86	95	98	90	94	91	95	--		
UNITS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/l)	(ug/kg)	(ug/kg)
Chloromethane	U	U	U	U	U	U	U	U	10	----
Bromomethane	U	U	U	U	U	U	U	U	10	----
Vinyl Chloride	U	U	U	U	U	U	U	U	10	200
Chloroethane	U	U	U	U	U	U	U	U	10	1900
Methylene Chloride	31 JB	9200 JB	9000 JB	1400 B	U	4 JB	U	3 JB	10	100
Acetone	68	U	U	U	28	16	20	9 J	10	200
Carbon Disulfide	U	U	U	U	U	U	U	U	10	2700
1,1-Dichloroethene	U	U	U	U	U	U	U	U	10	400
1,1-Dichloroethane	U	U	U	U	U	U	U	U	10	200
1,2-Dichloroethene (total)	U	U	U	U	U	U	U	U	10	300
Chloroform	U	U	U	U	U	U	U	U	10	300
1,2-Dichloroethane	U	U	U	U	U	U	U	U	10	100
2-Butanone	U	U	U	U	U	U	U	U	10	300
1,1,1-Trichloroethane	U	U	U	U	U	U	U	U	10	800
Carbon Tetrachloride	U	U	U	U	U	U	U	U	10	600
Bromodichloromethane	U	U	U	U	U	U	U	U	10	----
1,2-Dichloropropane	U	U	U	U	U	U	U	U	10	----
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	10	----
Trichloroethene	U	U	U	U	U	U	U	U	10	700
Dibromochloromethane	U	U	U	U	U	U	U	U	10	----
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	10	----
Benzene	86	U	U	U	U	U	U	U	10	60
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	U	10	----
Bromoform	U	U	U	U	U	U	U	U	10	----
4-Methyl-2-pentanone	U	U	U	U	U	U	U	U	10	1000
2-Hexanone	U	U	U	U	U	U	U	U	10	----
Tetrachloroethene	U	U	U	840 J	140	81	4 J	U	10	1400
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	10	600
Toluene	190	U	U	U	U	U	U	U	10	1500
Chlorobenzene	330	U	U	U	U	U	U	U	10	1700
Ethylbenzene	28000 D*	49000	15000	400 J	19	8 J	45	U	10	5500
Styrene	U	U	U	U	U	U	U	U	10	----
Xylene (total)	200000 D**	440000	230000	11000	240	67	480	U	10	1200
Freon 113	U	U	U	U	U	U	U	U	10	600
Vinyl Acetate	U	U	U	U	U	U	U	U	10	----
TOTAL VOCs	228705	498200	254000	13640	427	176	549	12		10000

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
J: Compound found at a concentration below the detection limit, value estimated.
B: Compound found in the blank as well as the sample.
CRDL: Contract required detection limit.
DF: Dilution factor.
%S: Percent solids.

Notes:
□: Value exceeds recommended cleanup objective.
---- : Not established,
Detection Limit = CRDL*DF*(100/%S)
D*: Result taken from the diluted analysis at 1:125
D**: Result taken from the diluted analysis at 1:1250

TABLE 8
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
SOIL BORING SAMPLING RESULTS
SEMIVOLATILE ORGANIC COMPOUNDS

SAMPLE IDENTIFICATION	DW-1	DW-1	DW-1	DW-1	DW-1	DW-1	DW-1	CONTRACT	NYSDEC
SAMPLE DEPTH	8'-12'	12'-16'	16'-18'	18'-22'	22'-28'	28'-34'	34'-38'	REQUIRED	RECOMMENDED
DATE OF COLLECTION	11/14/96	11/14/96	11/14/96	11/14/96	11/18/96	11/18/96	11/18/96	DETECTION	SOIL CLEANUP
DILUTION FACTOR	1	1	1	1	2	2	2	LIMIT	OBJECTIVES
PERCENT SOLIDS	86	95	93	94	94	91	95		
UNITS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Phenol	U	U	U	U	U	U	U	330	30 or MDL
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U	330	----
2-Chlorophenol	U	U	U	U	U	U	U	330	800
1,3-Dichlorobenzene	U	U	U	U	U	U	U	330	1600
1,4-Dichlorobenzene	140 J	160 J	U	U	U	U	U	330	8500
1,2-Dichlorobenzene	U	U	U	U	U	U	U	330	7900
2-Methylphenol	U	U	U	U	U	U	U	330	100 or MDL
2,2'-oxybis(1-Chloropropane)	U	U	U	U	U	U	U	330	----
4-Methylphenol	87 J	U	U	U	U	U	U	330	900
N-Nitroso-di-n-propylamine	U	U	U	U	U	U	U	330	----
Hexachloroethane	U	U	U	U	U	U	U	330	----
Nitrobenzene	U	U	U	U	U	U	U	330	200 or MDL
Isophorone	U	U	U	U	U	U	U	330	4400
2-Nitrophenol	U	U	U	U	U	U	U	330	330 or MDL
2,4-Dimethylphenol	U	U	U	U	U	U	U	330	----
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U	330	----
2,4-Dichlorophenol	U	U	U	U	U	U	200 J	330	400
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U	330	3400
Naphthalene	12000 D**	**81000 JD***	**44000 JD***	10000 D**	72 J	U	110 J	330	13000
4-Chloroaniline	U	U	U	U	U	U	U	330	220 or MDL
Hexachlorobutadiene	U	100 J	0 J	83 J	U	78 J	U	330	----
4-Chloro-3-methylphenol	U	U	U	U	U	U	U	330	240 or MDL
2-Methylnaphthalene	31000 D**	**220000 D***	**290000 D***	28000 D**	160 J	150 J	380 J	330	36400
Hexachlorocyclopentadiene	U	U	U	U	U	U	U	330	----
2,4,6-Trichlorophenol	U	U	U	U	U	U	U	330	----
2,4,5-Trichlorophenol	U	U	U	U	U	U	U	800	100
2-Chloronaphthalene	U	U	U	U	U	U	U	330	----
2-Nitroaniline	U	U	U	U	U	U	U	800	430 or MDL
Dimethylphthalate	U	U	U	U	U	U	U	330	2000
Acenaphthylene	U	U	U	U	U	U	U	330	41000
2,6-Dinitrotoluene	U	U	U	U	U	U	U	330	1000
3-Nitroaniline	U	U	U	U	U	U	U	800	500 or MDL
Acenaphthene	370 J	500	U	400	U	U	U	330	50000
2,4-Dinitrophenol	U	U	U	U	U	U	U	800	200 or MDL
4-Nitrophenol	U	U	U	U	U	U	U	800	100 or MDL

TABLE 8 (continued)
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
SOIL BORING SAMPLING RESULTS
SEMIVOLATILE ORGANIC COMPOUNDS

SAMPLE IDENTIFICATION	DW-1	DW-1	DW-1	DW-1	DW-1	DW-1	DW-1	CONTRACT REQUIRED DETECTION LIMIT	NYSDEC RECOMMENDED SOIL CLEANUP OBJECTIVES
SAMPLE DEPTH	8'-12'	12'-16'	16'-18'	18'-22'	22'-28'	28'-34'	34'-38'		
DATE OF COLLECTION	11/14/96	11/14/96	11/14/96	11/14/96	11/18/96	11/18/96	11/18/96		
DILUTION FACTOR	1	1	1	1	2	2	2		
PERCENT SOLIDS	86	95	93	94	94	91	95		
UNITS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Dibenzofuran	570	1100	2700	U	U	U	U	330	6200
2,4-Dinitrotoluene	U	U	U	U	U	U	U	330	----
Diethylphthalate	U	U	U	U	110 J	450 J	U	330	7100
4-Chlorophenyl-phenylether	U	U	U	U	U	U	U	330	----
Fluorene	590	U	2400	730	U	U	U	330	50000
4-Nitroaniline	U	U	U	U	U	U	U	800	----
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U	800	----
N-Nitrosodiphenylamine	U	U	U	U	U	U	U	330	----
4-Bromophenyl-phenylether	U	U	U	U	U	U	U	330	----
Hexachlorobenzene	U	U	U	U	U	U	U	330	410
Pentachlorophenol	U	U	U	U	U	U	U	800	1000 or MDL
Phenanthrene	910	530	1200	330 J	U	U	U	330	50000
Anthracene	51 J	U	U	U	U	U	U	330	50000
Carbazole	U	U	U	U	U	U	U	330	----
Di-n-butylphthalate	220 J	150 J	U	120 J	U	U	U	330	8100
Fluoranthene	200 J	U	67 J	83 J	U	U	U	330	50000
Pyrene	770	400	U	400	U	370 J	U	330	50000
Butylbenzylphthalate	430	U	U	U	U	200 J	U	330	50000
3,3'-Dichlorobenzidine	U	U	U	U	650 J	U	251 J	330	----
Benzo(a)anthracene	87 J	U	U	U	U	U	U	330	224 or MDL
Chrysene	200 J	53 J	U	40 J	U	U	U	330	400
bis(2-Ethylhexyl)phthalate	24000 D**	2900 B	2000 B	570 B	U	U	490 JB	330	50000
Di-n-octylphthalate	130 J	150 J	140 J	U	U	U	U	330	50000
Benzo(b)fluoranthene	U	U	U	U	U	U	U	330	1100
Benzo(k)fluoranthene	U	U	U	U	U	U	U	330	1100
Benzo(a)pyrene	U	U	U	U	U	U	U	330	61 or MDL
Indeno(1,2,3-cd)pyrene	U	U	U	U	U	U	U	330	3200
Dibenzo(a,h)anthracene	U	U	U	U	U	U	U	330	14 or MDL
Benzo(g,h,i)perylene	U	U	U	U	U	U	U	330	50000
TOTAL PAHs	15178	82483	47667	11983	72	370	0		
TOTAL CaPAHs	287	53	0	40	0	0	0		10000
TOTAL SVOCs	71755	307043	342507	40756	992	1248	741		500000

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
J: Compound found at a concentration below the detection limit.
B: Compound found in the method blank as well as the sample.
CRDL: Contract required detection limit.
DF: Dilution factor.
MDL: Method detection limit.
%S: Percent solids.

Notes:
[ ]: Value exceeds recommended cleanup objective.
---- : Not established.
Detection Limit = CRDL*DF*(100/%S)
D*: Result taken from the reanalysis at a 1:300 dilution
D**: Result taken from the reanalysis at a 1:10 dilution

TABLE 9
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
SOIL BORING SAMPLING RESULTS
PESTICIDES AND PCBs

SAMPLE IDENTIFICATION	DW-1	DW-1	DW-1	DW-1	DW-1	DW-1	DW-1	CONTRACT REQUIRED DETECTION LIMIT	NYSDEC RECOMMENDED SOIL CLEANUP OBJECTIVES
SAMPLE DEPTH	8'-12'	12'-16'	16'-18'	18'-22'	22'-28'	28'-34'	34'-38'		
DATE OF COLLECTION	11/14/96	11/14/96	11/14/96	11/14/96	11/18/96	11/18/96	11/18/96		
DILUTION FACTOR	1000	1000	10000	10000	100000	100000	10000		
PERCENT SOLIDS	86	95	93	94	94	81	95		
UNITS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
PESTICIDES									
alpha-BHC	U	U	U	U	U	U	U	1.70	110
beta-BHC	U	U	U	U	U	U	U	1.70	200
delta-BHC	U	U	U	U	U	U	U	1.70	300
gamma-BHC (Lindane)	2400	3400	U	U	U	U	U	1.70	540
Heptachlor	U	U	U	U	U	U	U	1.70	100
Aldrin	U	U	U	U	U	U	U	1.70	41
Heptachlor Epoxide	U	U	U	U	U	U	U	1.70	20
Endosulfan I	U	U	U	U	U	U	U	1.70	900
Dieldrin	U	16000	29000 J	18000 J	U	U	26000 J	3.30	44
4,4'-DDE	12000	5400	U	U	U	U	25000 J	3.30	2100
Endrin	U	U	U	U	U	U	U	3.30	100
Endosulfan II	U	U	U	U	U	U	U	3.30	900
4,4'-DDD	110000 D	310000 PD	560000 P	160000 P	680000 P	670000 P	270000 P	3.30	2900
Endosulfan sulfate	U	U	U	U	U	U	U	3.30	1000
4,4'-DDT	U	300000 D	1600000 D*	1700000 D*	11000000 D**	9400000 D**	4500000 D*	3.30	2100
Methoxychlor	U	560000	U	U	U	U	12000 J	17.00	**
Endrin Ketone	U	U	U	U	U	U	U	3.30	----
Endrin Aldehyde	U	U	U	U	U	U	U	3.30	----
alpha-Chlordane	U	1900 P	U	U	U	U	2600 JP	1.70	540
gamma-Chlordane	U	1400 J	U	U	U	U	2500 JP	1.70	540
Toxaphene	U	U	U	U	U	U	U	170.00	----
TOTAL PESTICIDES	124400	1198100	2189000	1878000	11680000	10070000	4838100		10000
PCBs									
Aroclor-1016	U	U	U	U	U	U	U	33.00	10000*
Aroclor-1221	U	U	U	U	U	U	U	67.00	10000*
Aroclor-1232	U	U	U	U	U	U	U	33.00	10000*
Aroclor-1242	U	U	U	U	U	U	U	33.00	10000*
Aroclor-1248	U	U	U	U	U	U	U	33.00	10000*
Aroclor-1254	U	U	U	U	U	U	U	33.00	10000*
Aroclor-1260	U	U	U	U	U	U	U	33.00	10000*
TOTAL PCBs	0	0	0	0	0	0	0		

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
J: Compound found at a concentration below the detection limit, value estimated.
P: Concentration from primary and confirmation columns have a >25% difference, lower value reported.
CRDL: Contract required detection limit.
DF: Dilution factor.
%S: Percent solids.

Notes:
* : Value is for total PCBs in subsurface soil.
** : Total pesticides not to exceed 10,000 ug/kg.
▭ : Value exceeds recommended cleanup objective.
---- : Not established.
Detection Limit = CRDL*DF*(100/%S)
D: Result taken from the reanalysis at a 1:10,000 dilution.
D*: Result taken from the reanalysis at a 1:100,000 dilution.
D**: Result taken from the reanalysis at a 1:1,000,000 dilution.

TABLE 10
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
SOIL BORING SAMPLING RESULTS
HERBICIDES

SAMPLE IDENTIFICATION	DW-1	DW-1	DW-1	DW-1	DW-1	DW-1	DW-1	CONTRACT REQUIRED DETECTION LIMIT	NYSDEC RECOMMENDED SOIL CLEANUP OBJECTIVES
SAMPLE DEPTH	8'-12'	12'-16'	16'-18'	18'-22'	22'-28'	28'-34'	34'-38'		
DATE OF COLLECTION	11/14/96	11/14/96	11/14/96	11/14/96	11/18/96	11/18/96	11/18/96		
DILUTION FACTOR	1	1	1	1	1	1	1		
PERCENT SOLIDS	86	95	93	94	94	91	95		
UNITS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Diazinon	U	U	U	U	U	U	U		----
Carbaryl (Sevin)	U	U	U	U	U	U	U		----
Malathion	U	U	U	U	U	U	U		----
2,4-D	U	U	U	U	U	U	U		500
2,4,5-TP (Silvex)	5.8	U	U	U	7.1	U	U		700
2,4,5-T	U	U	U	U	U	U	U		1900
2,4-DB	U	U	U	U	U	U	U		----
Dalapon	U	U	U	U	U	U	U		----
Dicamba	U	U	U	U	U	11	U		----
Dinoseb	U	U	U	U	U	U	U		----
2,4-DP (Dichloroprop)	U	U	U	U	U	U	U		----
MCPA	U	U	U	U	U	U	U		----
MCPP	U	U	U	U	U	U	U		----

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
B: Compound found in the blank as well as the sample.
CRDL: Contract required detection limit.
DF: Dilution factor.
%S: Percent solids.

Notes:
---- : Not established.
☐: Value exceeds recommended cleanup objective.
Detection Limit = CRDL*DF*(100/%S)

TABLE 11
BARTLETT TREE COMPANY
NYSDEC PRELIMINARY SITE ASSESSMENT
SOIL BORING SAMPLING RESULTS
INORGANIC CONSTITUENTS

SAMPLE IDENTIFICATION	DW-1	DW-1	DW-1	DW-1	DW-1	DW-1	DW-1	INSTRUMENT DETECTION LIMITS	NYSDEC RECOMMENDED SOIL CLEANUP OBJECTIVES
SAMPLE DEPTH	8'-12'	12'-16'	16'-18'	18'-22'	22'-28'	28'-34'	34'-38'		
DATE OF COLLECTION	11/14/96	11/14/96	11/14/96	11/14/96	11/18/96	11/18/96	11/18/96		
DILUTION FACTOR	1	1	1	1	1	1	1		
PERCENT SOLIDS	86	95	93	94	94	91	95		
UNITS	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(ug/L)	(mg/kg)
Aluminum	3990	1450	1220	1070	1260	1770	1370	84	SB
Antimony	1.8 B	1.3 B	U	0.93 B	1.3 B	U	1.1 B	31	SB
Arsenic	13.1	**8.9**	4.7	3.7	4.4	2.5	1.1	5	7.5 or SB
Barium	50.3	10 B	4.8 B	4.5 B	4.5 B	8.5 B	8.3 B	55	300 or SB
Beryllium	**0.26 B**	**0.27 B**	0.04 B	0.04 B	0.07 B	0.11 B	0.1 B	4	0.16 or SB
Cadmium	3.5	1.9	0.24 B	U	U	U	U	2	10* or SB
Calcium	9320	1430	94 B	180 B	48.7 B	64.4 B	99 B	4003	SB
Chromium	25.2	5.4	3.1	6.8	3.5	12.1	6.5	4	50* or SB
Cobalt	2.8 B	0.96 B	0.31 B	0.42 B	0.51 B	0.53 B	0.76 B	23	30 or SB
Copper	**74.3**	9.7	3.5	2.8	2.2 B	3	3.3	10	25 or SB
Iron	**11600**	**3230**	1470	1940	1990	**3450**	**3110**	73	2000 or SB
Lead	332	109	4.4	7.8	1.5	2.8	4.4	35	400* or SB
Magnesium	3770	752	U	U	U	U	U	3322	SB
Manganese	141	27.3	5	8.6	5.7	9.3	16.4	5	SB
Mercury	1.2	U	U	U	U	U	U	0.2	0.1
Nickel	12.6	2.8 B	1.6 B	2 B	1.8 B	4.8	3.6 B	38	13 or SB
Potassium	308 B	116 B	63.2 B	76.9 B	91.5 B	145 B	132 B	1693	SB
Selenium	U	U	U	U	U	U	U	5	2 or SB
Silver	0.5 B	0.4 B	U	0.18 B	0.22 B	0.23 B	U	7	SB
Sodium	92.4 B	U	U	67.8 B	77.1 B	U	U	2841	SB
Thallium	U	U	U	U	U	U	U	5	SB
Vanadium	13.5	4.2 B	2.5 B	2.9 B	2.9 B	4 B	5.9	22	150 or SB
Zinc	**530**	**162**	**57.9**	**74.9**	15.7	19.7	11.1	12	20 or SB
Cyanide	U	U	U	U	U	U	U	10	SB

Qualifiers/Abbreviations:
U: Compound analyzed for but not detected.
B: Compound concentration is less than the CRDL but greater than the IDL.
IDL: Instrument detection level.
DF: Dilution factor.
%S: Percent solids.

Notes:
---- : Not established.
bold : Value exceeds NYSDEC Soil Cleanup Objective.
* : Proposed revised value listed in TAGM 4046.
Detection Limit = IDL*DF*(100/%S)*(Final Vol/Initial Wt)
(Final Vol/Initial Wt) is typically 0.2 - This converts ug/L to mg/kg.