511 West 21st Street
New York, NY
BCP Site # C231080

REMEDIAL INVESTIGATION WORK PLAN

Prepared For:
510 West 22nd Street Partners, LLC
c/o Albanese Development Corporation
1050 Franklin Avenue
Garden City, New York 11530
FLS Project Number: 10173-002

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
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"I Arnold F. Fleming certify that I am currently a NYS registered professional engineer and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the NYSDEC DER Technical Guidance for Site Investigation and Remediation (DER-10.)"

Arnold F. Fleming, P.E.

Qualified Environmental Professional

10/23/13

Date

Signature

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1.0 INTRODUCTION

On behalf of 510 West 22nd Street Partners, LLC (hereafter referred to as "Volunteer"), Fleming-Lee Shue, Inc. (FLS) prepared this Remedial Investigation Work Plan (RIWP) for the Former Time Warner Cable Site located at 511 West 21st Street (Site), New York, New York (Figure 1). This RIWP is in accordance with the requirements and format presented in DER-10. The Site is being considered for acceptance into the New York State Brownfield Cleanup Program (BCP).

The subject property is bound by West 21st Street to the south and West 22nd Street to the north between 10th Avenue and 11th Avenue in Manhattan, New York. The property has frontage on the north side of West 21st Street and the south side of West 22nd Street. The lot is 19,750 ft^2 in size, and is improved with a vacant 5-story 88,030 gross square foot parking garage building. A site plan is provided on Figure 2.

The Volunteer intends to develop the Site with a 10-story office building with ground-floor retail. The proposed project will have a footprint covering the majority of the Site and will contain one sub-grade level on the east block through portion of the site.

1.1 Summary of Historical Documentation and Reports

FLS reviewed available documentation on historical environmental investigations at the Site, including:

- Phase I Environmental Site Assessment, prepared by AKRF, Inc., May 2007.
- Phase II Subsurface Investigation, prepared by AKRF, Inc., August 2008.
- UST Closure/Remedial Action Report, prepared by Legette, Brashears & Graham (LBG), April 2008.
- Geotechnical Engineering Investigation, prepared by Pillori Associates, May 2008.
- Selected Quarterly Groundwater Monitoring Reports, prepared by LBG from 2008 through October 2012.
- Phase I Environmental Site Assessment, prepared by Fleming-Lee Shue, Inc., November 2011.

1.2 Objectives

Previous investigations have identified gasoline-related contamination in soil and groundwater on-site, and mercury contamination in one soil sample. Remedial measures to address some petroleum impacts have been commenced and groundwater monitoring is ongoing. A summary of the previous investigations and findings is provided in Section 2.3. The proposed RI will further define soil and groundwater quality and groundwater flow direction across the entire Site. A soil vapor survey is also proposed to evaluate the potential for on-site soil vapor that may be present in the unsaturated zone. If soil vapor is detected, an assessment will be made for the potential for off-site migration and will include either sampling along the site perimeter or the building foundation. This survey

is intended as a screening procedure to obtain an indication of the presence of organic vapor in soils, and to meet the requirements of the New York State Department of Environmental Conservation (NYSDEC) BCP and the New York State Department of Health (NYSDOH). The final goal of collecting this additional data from these sampling events is to define the nature and extent of all contamination and to confirm the contaminant source area(s). Upon completion of these sampling rounds an assessment will be made regarding the quantity and quality of the data. Once this is confirmed to be sufficient the information collected from this proposed investigation will be assessed in conjunction with previous data to develop a comprehensive Remedial Action Work Plan (RAWP).

Once the Site has been fully characterized and the extent and source of contamination delineated, the information will be used to document potential exposure pathways and evaluate contaminant fate and transport. This will involve reviewing the soil, groundwater and soil gas results and an evaluation of the physical conditions of the contaminant source(s). Potential areas where people may come into contact will be identified and risk of exposure assessed. If exposure pathways are identified, measures will be developed to decrease any associated risk.

Waste classification sampling will also be conducted at this time to allow the excavation contractor to better evaluate the proper handling and disposal facilities for the soils proposed to be excavated on the eastern portion of the Site. This sampling will reduce, and possibly eliminate, the need for stockpiling soils on-Site.

Contact information for key personnel and hours of operation are presented in attached Table 1. Relevant qualifications are located in Appendix A. Attached Table 2 provides a project schedule which details the time from NYSDEC approval of the RIWP to approval of the RAWP. FLS estimates that this project will take approximately 17 months to achieve NYSDEC Remedial Work Plan (RWP) approval.

2.0 SITE BACKGROUND

The property is a 19,750 ft^2 L-shaped lot with a vacant 88,030 gross square foot 5-story parking garage building with a 1-story annex in the southwest corner. The property is flat with average elevation approximately 10 feet (Manhattan Datum - 2.75 feet above National Geodetic Vertical Datum). The property is served by New York City public utilities. The elevated High Line Park runs along the eastern property boundary.

The Site is located within an area of Manhattan that is zoned by the New York City Department of City Planning for manufacturing and commercial use. The City's zoning code for the Site is M1-5, which is a manufacturing district. This zoning allows as-of-right all of the uses proposed by the project.

According to a review of historical maps, the Site was used for manufacturing in the 1800s, with the first known manufacturing occurring in 1836 by a gas meter company. Previous reports indicate that the current parking garage structure was constructed in 1918/19 as a 2-story parking garage building, and the building was then gutted to its load bearing walls and reconstructed as a 5-story building in 1989. Time Warner occupied the building from 1991 to 2008 and used the building mainly for vehicle parking, but also for storage, vehicle maintenance, and offices. Time Warner vacated the building in 2008 and it has remained vacant since that time.

2.1 Geology

The Site-specific geologic information was obtained from the Pillori Associates Geotechnical Investigation (May 2008).

The Site is underlain by 13 to 17 feet of man-made fill. Native soils beneath the fill layer consist of organic silty clay of estuarine origin as well as sand and silt of glacial origin. The depth-to-bedrock varies from approximately 33 feet below grade at the northern end of the Site to 65 feet below grade at the southern end of the Site. Published geologic data indicates that the Site is underlain with mica schist that is known as the Manhattan Schist. The Manhattan Schist is a mass of metamorphic rock covering the deeper limestone stratum, which is the firm bedrock providing the foundation for New York City's skyscrapers.

2.2 Hydrogeology

The depth-to-groundwater at the Site is approximately 6 to 7 feet below sidewalk grade. The previous investigations indicate that the local groundwater flow direction is to the southwest. The wells used to measure the flow direction are primarily located on the southern portion of the Site and on the sidewalk south of the Site. FLS intends to measure groundwater flow across the entire Site.

2.3 Previous Investigations

2.3.1 2007 AKRF Phase I Environmental Site Assessment

The following environmental concerns were identified in the Phase I Environmental Site Assessment (ESA):

- The subsurface conditions at the subject property have been affected by two petroleum releases from on-Site gasoline underground storage tanks (USTs). Spill #00-10394 was opened when contamination was discovered in 2000. According to the NYSDEC SPILLS database, the leaks associated with the UST were repaired and a small amount of soil was excavated. Subsequent subsurface investigations (including required offsite sampling) found benzene and methyl tert-butyl ether (MTBE) contamination in soil, and benzene, toluene, ethylbenzene and xylenes (BTEX) and MTBE contamination in groundwater, with the greatest concentrations located west of the gasoline dispensers and southwest of the former tank field. The NYSDEC project manager's remarks indicate that DEC required the installation of permanent monitoring wells and the development of a Remedial Action Plan under a stipulation agreement. The spill remains active.

- The subsurface conditions at the subject property may have been affected by 24 petroleum releases from many different off-Site sources. Several of the off-Site releases caused regional contamination of soils and groundwater, and resulted in significant amounts of free petroleum product in nearby offsite monitoring wells.

- The former Consolidated Edison West 18th Street Gas Works site caused extensive contamination of soil and groundwater from manufactured gas plant wastes and petroleum. Remediation activities started in 2004. Two voluntary cleanup program sites and three BCP sites are located within the boundaries of the former gas works. Coal tar and BTEX contamination of both soil and groundwater have been encountered. Because of the down gradient and cross gradient location of the former gas works, it is unlikely to have affected environmental conditions on the Site.

- The Site storage areas contained two 270-gallon aboveground storage tanks that appeared to be in good condition. Small leaks and spills from auto repair activities were captured by an oil water separator beneath the floor slab in the northern section of the building. A floor drain was located in the center of the fueling area at the southwest corner of the building.

2.3.2 2008 LBG UST Closure/Remedial Action Report

Leggette, Brashears and Graham, Inc. (LBG), under contract with Time Warner, removed the tanks present on the Site in 2007 along with the dispensers and piping in 2007/8, including removal of contaminated soils that could be excavated

without endangering the building's structural elements. The closure report describes the conditions of the tanks and piping as sound, with no soil contamination in the shallow soils that would indicate possible piping leaks that could have caused the noted groundwater contamination. Evidence of free product was noted around the foundation footings and was removed by the use of sumps to skim the product. Contaminated soils near the foundations could not be removed without endangering the building's foundations.

After the tanks and contaminated soils were removed, LBG applied a mixture of two oxidants designed to oxidize the dissolved organic material and slowly release oxygen into the groundwater to enhance bio-remediation of the gasoline constituents. Before backfilling the excavations, the end point samples were reviewed by the NYSDEC and additional excavation to the east of the gasoline tanks was performed to remove MTBE-contaminated soil above clean-up objectives. Two test pits were excavated to examine soil conditions near the south foundation wall and gravel was placed at the bottom of these test pits to allow additional oxidizing chemicals to be added in the future. Remediation sumps were installed in the test pit area.

LBG also advanced three soil borings on the Site and installed two groundwater monitoring wells (one onsite and one offsite) in February 2008 to supplement the four wells previously installed on and adjacent to the Site in connection with Spill # 00-10394.

2.3.3 2008 AKRF Phase II ESI

AKRF conducted an investigation on July 7 and 11, 2008, which included the advancement of 10 soil borings and the collection of 18 soil and six groundwater samples for laboratory analysis. The results and conclusions were as follows:

- Elevated volatile organic compounds (VOCs) were detected in 10 of the 18 soil samples. The VOCs were present at concentrations exceeding their respective NYSDEC Technical and Administrative Guidance Memorandum No. 4046 Recommended Soil Cleanup Objectives (RSCOs). These compounds exceeding RSCOs included 1,2,4-trimethylbenzene, benzene, isopropylbenzene, MTBE, n-butylbenzene and n-propylbenzene. They were detected in five soil samples, mostly at the soil-water interface. Based on the distribution and concentrations, AKRF concluded that the VOCs detected beneath the southern portion of the building appeared to be attributable to the known on-site spill of MTBE-containing gasoline. The VOCs detected in the northern portion of the site included gasoline-related compounds, but not MTBE. As noted in AKRF's Phase I ESA, historical Sanborn maps from 1951 through 1987 indicate the presence of two 1000-gallon gasoline tanks in this portion of the Site. AKRF concluded that the gasoline contamination found in this area may be the result of past releases from these tanks or associated

piping, or of off-Site releases, including several closed status spills on the east-adjacent property.

- The concentrations of eight semi-volatile organic compounds (SVOCs) exceeded their RSCOs in 12 soil samples, mostly from the upper 5 feet of the soil borings. The majority of the SVOCs detected, including those that exceeded their respective RSCOs, are polycyclic aromatic hydrocarbons, which are typically detected in urban fill encountered in New York City. Therefore, AKRF concluded that the nature and levels of the SVOCs detected on-Site are likely attributable to the presence of urban fill beneath the Site.

- The concentrations of six metals (calcium, copper, lead, magnesium, mercury and zinc) exceeded their respective RSCOs and Eastern U.S. background levels reported in TAGM No. 4046 in six soil samples. The highest concentration of lead, 600 parts per million (ppm), was detected in sample SB-4 (3-5 feet), and the highest concentration of mercury (2.4 ppm) was identified in sample SB-5 (1-6 feet). These metals' Eastern U.S. Background Levels are 500 ppm and 0.2 ppm respectively. Based on the detected concentrations of metals, AKRF concluded that the exceedances may be attributable to urban fill beneath the Site, which typically contains highly variable concentrations of metals.

- VOCs were detected in each of the groundwater samples at concentrations exceeding the NYSDEC Class GA Ambient Water Quality Standards (drinking water standards). The highest concentrations of VOCs were detected in samples SB-2 (GW) (25,000 parts per billion of MTBE), SB-3 (GW) (13,550 ppb of MTBE), and SB-8 (GW) (1,798 ppb of gasoline related compounds). MTBE was present below the Class GA standard in groundwater sample SB-6 (GW), and was detected at a concentration of 20 ppb, in exceedance of the Class GA standard of 10 ppb, in monitoring well Roux MW-3.

  AKRF concluded that based on Site history, the VOC contamination in groundwater at SB-1, SB-2 and SB-3 is likely attributable to the on-Site spill of MTBE-containing gasoline. Although an active fuel oil spill was reported on the property south-adjacent to Roux MW -3, fuel oil does not contain MTBE, and AKRF concluded that the presence of this chemical in the samples indicated contamination migrating from the subject Site or the west-adjacent property, which also had an active MTBE-containing gasoline spill reported. AKRF also concluded that the low levels of MTBE detected in sample SB-6 (GW) may be attributable to spills on the southern portion of the Site or the west-adjacent property. However, since MTBE was not detected in sample SB-8 (GW) or in the soil samples collected in the northern portion of the Site, AKRF concluded that the VOCs detected in this area were generally not likely to be attributable to the gasoline spill in the southern portion of the Site, and may instead be due to past to releases from the gasoline tanks

formerly located in this area (or possibly from spills on the east-adjacent property).

- Bis(2-ethylhexyl)phthalate was the only SVOC detected at concentrations exceeding its Class GA standard in groundwater sample SB-3 (GW). Bis(2-ethylhexyl)phthalate, which is commonly used in plastics, was not detected in soil samples from boring SB-3 and was concluded to be a laboratory contaminant. AKRF attributed the presence of other SVOCs, at concentrations below their respective Class GA standards to the presence of suspended soil particles in the samples, which were not filtered prior to analysis.

- Ten metals were detected at concentrations exceeding their respective Class GA standards in unfiltered groundwater samples (total metals analysis). However, in the filtered samples (dissolved metals analysis), only iron, magnesium, manganese and sodium were detected at concentrations that exceeded their respective Class GA standards. Most metals detected in the unfiltered samples were either not detected or detected at much lower levels in the filtered samples. According to AKRF, these analytical results suggested that metals detected in the unfiltered samples were primarily due to suspended sediments in the groundwater samples.

Overall, AKRF concluded that gasoline and MTBE contamination from on-Site Spill # 00-10394 remains in the southern portion of the Site, and may be migrating off-Site in groundwater. Additional petroleum contamination, either from historical on-site gasoline storage tanks or from off-Site spills, was discovered in the northern portion of the Site. The Site was underlain by urban fill, which may contain highly variable concentrations of SVOCs and metals.

2.3.4 LBG Groundwater Monitoring Reports (2008-2011)

Quarterly groundwater monitoring at the Site by LBG began in March of 2008. The first sampling event of this series showed that VOCs associated with gasoline (BTEX) were present at concentrations exceeding the groundwater standards in each of the monitoring wells with MBTE having the most pervasive presence and highest concentrations.

The NYSDEC requested three additional wells be installed to the south and southwest of the gasoline tank area to further delineate the extent of groundwater contamination on and off site in 2010 based upon continued exceedance of the groundwater standards during quarterly monitoring. After installation of these additional wells, a comprehensive groundwater study was performed sampling all 9 available wells in June 2010. No gasoline constituents were detected at concentrations that exceeded their respective Part 375 restricted commercial standards in the soil samples taken as part of the installation of the three additional wells.

The groundwater analytical results from this sampling indicated VOCs present at concentrations exceeding the groundwater standards in samples from 6 of 9 monitoring wells. MTBE was the most common constituent, which was detected at the highest concentrations in the groundwater samples. BTEX compounds were at the highest concentrations in the down gradient wells closest to the former tank area (MW-8 and GFMW-1) where the highest concentration of MTBE was also detected. The mean concentration of MTBE in all existing wells had trended lower over the 2 year period following the oxidant application with MTBE being reduced by 78 to 98 percent.

Quarterly groundwater monitoring continued in 2011, although the quarterly reports were not made available to FLS for review. The most recent groundwater monitoring report discussed in section 2.3.6 indicates that BTEX and MTBE concentrations increased in certain wells during 2011.

2.3.5 FLS Phase I Environmental Site Assessment (November 2011)

A Phase I ESA was prepared for the Site by FLS in November 2011 on behalf of 510 West 22nd Street Partners, LLC. The Phase I ESA identified the following recognized environmental conditions (RECs):

- The open spill case (Spill #0010394) on the Site;
- The historical Sanborn Fire Insurance maps from 1921 to 1988 show 11 properties with underground gasoline tanks in the vicinity of the Site. Most of these sites have been converted to art galleries and/or office space, or redeveloped into multi-story apartment buildings. The adjacent property to the west of the subject property at 521-529 West 21st Street is listed on the NYSDEC Spills Database as an active spill site for the release of gasoline and fuel oil to the soil and groundwater. This is considered a REC that could potentially impact the Site.

Although the prior uses of nearby sites and the active spill incident/case on the adjacent property to the west are RECs, FLS concluded that the ongoing remediation activities for the on-Site spill (Spill #0010394) and future remediation planned as part of construction should address any contamination that may migrate beneath the subject property from off-site sources.

2.3.6 LBG Groundwater Monitoring Report (2012)

LBG's most recent groundwater monitoring report from the 2nd quarter of 2012 describes 2 rounds of chemical oxidation injections performed at the Site in late 2011 and early 2012, due to rebounding concentrations of BTEX and MTBE in certain wells since mid-2010. A slurry mix of RegenOx® and Oxygen Release Compound Advanced® was injected into the saturated zone at and beneath the water table in the southern-central portion of the Site during each round. LBG's evaluation of the results from the 2nd quarter of 2012 groundwater monitoring

states that the injections were successful in mobilizing residual VOCs into the dissolved phase. However, the evaluation also states that continued groundwater monitoring is necessary to ensure the effectiveness of the injections, and discusses the likelihood of additional future injections and soil excavation, indicating that remediation of soil and groundwater at the Site is not yet completed.

2.4 Prior Remedial Actions

Three USTs were removed from the Site in 2007/2008 along with the associated dispensers and piping. Contaminated soil on the southern portion of the Site was removed from as large an area as possible without compromising the building's foundation. The tanks and piping were reported to be in good condition. Evidence of free product was noted near the footings and skimmed. Based on endpoint sampling results, additional MTBE-contaminated soil was removed and test pits dug around the southern portion of the building. Oxidants were added to the excavation and test pits prior to backfilling. Remediation sumps were installed in the test pit area.

Soil and groundwater samples were collected in 2008 and confirmed the presence of gasoline related compounds in addition to MTBE in the southern portion of the Site. This contamination was attributed to both an on-site and off-site source. At the request of the NYSDEC, additional wells were installed in the southern portion of the Site.

In late 2011 and early 2012, a slurry mix of RegenOx and Oxygen Release Compound Advanced® was injected into the saturated zone beneath the southern-central portion of the building. Groundwater samples collected in the 2nd quarter of 2012 indicated that the injections were successful in mobilizing residual VOCs into the dissolved phase however further sampling was recommended to confirm these findings. It was anticipated that further remediation would be required.

2.5 Fish and Wildlife Resource Impact Analysis

The purpose of a Fish and Wildlife Resources Impact Analysis (FWRIA) is to determine potential impacts to fish and wildlife from site contamination. The need for a FWRIA is based on four criteria:

1. The remediation is directed toward a specific discharge or spill event that does not adversely impact fish and wildlife resources.
2. The AOCs at the site consist solely of an underground storage tank(s) or an underground tank system, with no significant impact on surrounding groundwater or surface water.
3. The site is a point source of contamination to the groundwater (i.e. dry cleaner of gas station) which will be prevented from discharging to surface water, and there is no widespread soil contamination or habitat of an endangered, threatened or special concern species present.
4. There are no ecological resources present on or in the vicinity of the site, (e.g. an urban site which is not proximate to a surface water body, wetland or other ecologically significant area.)

There are no fish or wildlife resources in the vicinity of the Site, nor are there any ecological resources present; therefore, there will be no impact to any such resources. The AOCs at the Site are associated with former USTs and some contaminated soil was excavated during removal of the tanks. Groundwater contamination is present beneath the Site; however, no sensitive receptors have been identified.

Accordingly, a FWRIA is not required as part of the remedial investigation.

3.0 PROPOSED FIELDWORK

3.1 Soil Vapor

The NYSDOH 2006 Soil Vapor Intrusion Guidance requires that the soil vapor intrusion pathway be evaluated at all current and future remedial sites in New York State. Therefore, a soil gas vapor sampling program is proposed to satisfy the NYSDOH's requirements.

3.1.1 Soil Vapor Sampling

FLS proposes to collect four sub-slab soil vapor samples from underneath the existing foundation slab, the locations of which were determined with reference to previous sampling results. Two samples will be collected from beneath the 5-story parking garage structure, and two samples will be collected from the 1-story area in the southwest corner of the Site. The proposed sub-slab soil vapor sample locations are shown on Figure 3. Based on the results, FLS will make a determination if additional sub-slab soil vapor sampling may be warranted in certain areas to further evaluate the sub-slab soil vapor media.

Temporary soil vapor points will be installed using a Geoprobe® sampling drill rig. A disposable stainless steel point will be advanced to the desired depth below the slab to allow for the collection of a sub-slab vapor sample. Prior to vapor sample collection, the annulus around the soil vapor point will be sealed with a clay seal to prevent the infiltration of ambient air into the sampling point.

All soil vapor probes will undergo a "tracer gas" test to verify the integrity of the soil vapor probe seals. One of the three tracer gas techniques described in the NYSDOH Soil Vapor Intrusion Guidance will be used. Once the sampling tube has been properly installed and sealed, the soil vapor in the tube and drill rod tip will be purged of three volumes of the sample probe and tubing using a peristaltic pump or PID attached to the end of the sampling tube. The soil vapor will not be purged at a flow rate greater than 0.2 liters per minute. Four soil gas samples will be collected using Summa Canisters. The Summa Canisters will have a regulator set to collect the vapor sample at a rate not to exceed 0.2 liters per minute. One ambient air sample will be collected at the Site, concurrently with one of the subsurface samples for quality assurance purposes.

Each soil vapor sample will be handled in accordance with the sample handling protocol outlined in Sections 4.6 and 4.8 of the Quality Assurance Protocol Plan (QAPP), provided in Appendix B. Samples will be forwarded to Accutest Laboratories (Accutest) of Dayton, New Jersey, a NYSDOH-Environmental Laboratory Approval Program (ELAP) certified laboratory, and analyzed for VOCs by EPA Method TO-15.

The soil vapor sample analytical reports will be subjected to a third-party review. The third-party reviewer will produce a Data Usability Summary Report (DUSR).

3.2 Soil Sampling

FLS proposes to advance 14 soil borings at the Site using a truck-mounted hollow-stem auger (HSA) drill rig. Two soil samples will be collected from each soil boring. Four of the soil borings will be converted into monitoring wells to collect groundwater samples and better assess groundwater flow direction. The location of these soil borings are based on identified AOCs and previous soil analytical results. Additionally, the soil borings are located across the Site to fill in data gaps from the prior investigations. The proposed soil boring locations are shown on Figure 3. The soil sample results from the previous investigations are indicated on Figure 4.

A QAPP is included as Appendix B. The QAPP outlines protocols and procedures that will be followed during the RI. The QAPP has been prepared to ensure Quality Assurance/Quality Control measures will be followed during the environmental sampling activities.

FLS proposes to obtain soil samples using a split-spoon soil sampler advanced using standard penetration techniques with a HSA drill rig. Split-spoon samples will be collected continuously at 2-foot intervals to retrieve relatively undisturbed soil cores down to approximately 15 feet to fully assess the subsurface soils to this depth. The borings will be advanced 7 to 10 feet into the saturated zone. To reduce the chance of cross-contamination during sampling, the sampling equipment will be decontaminated between uses a with non-phosphate detergent wash followed by a clean water rinse, followed by a final rinse with deionized water. The drilling equipment (cutting heads, augers and drill rods) will be cleaned between uses.

The soil samples will be field screened for volatile organic vapors using a calibrated photo-ionization detector (PID). A soil-boring log, describing the subsurface lithology, will be created for each soil boring. The PID readings will also be noted on the soil boring logs. The first soil sample will be collected just beneath the slab (0'-2') and the second soil sample from the highest PID reading or, if no elevated readings are noted, from the soil/groundwater interface.

Each soil sample will be analyzed for the following:

- Target Compound List (TCL) SVOCs (both base neutral extractable and acid extractable (BN/AEs) compounds) plus up to 20 tentatively identified compounds (TICs) by EPA Method 8270,
- TCL volatile organic compounds (VOCs) plus up to 10 TICs by EPA Method 8260,
- Target Analyte List (TAL) Metals by EPA Method 6010C/7471B, and
- PCBs and Pesticides by EPA Methods 8082 and 8081.

The samples will be sent to Accutest for analysis. Based on the intended use of the site, the soil results will be compared to the NYSDEC's Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs) and Protection of Groundwater SCOs.

The soil sample analytical reports will undergo a third party review of the analyses conducted. The third party (yet to be chosen) will produce a DUSR, which will be submitted to the NYSDEC.

3.3 Monitoring Well Installation

The proposed soil boring and monitoring well locations are indicated on Figure 3. These locations are based on the results from previous investigations and were selected to fill in identified data gaps. The results of the 2008 and 2012 groundwater sampling events are indicated on Figure 5. The actual final location of each well will depend on the following:

- The location of underground utilities
- Overhead clearance and space limitations inside the existing building.

A 2-inch diameter, machine-slotted, PVC well screen will be installed approximately 10 feet into the saturated zone. A No. 1 Morie Sand/equivalent gravel pack will be tremied into the annular space outside the well screen to a minimum of 2-feet above the top of the well screen. A minimum 2-foot-thick bentonite seal will be installed above the sand pack. Any remaining annular space will be sealed with a Portland cement mix. A surface completion consisting of a flush-mounted, watertight manhole will be cemented into the concrete or pavement above the well. The monitoring wells will be developed by pumping and surging with a submersible pump until the discharge is silt-free. The wells will be allowed to sit for a minimum of 1 week before ground-water sampling. A New York-State licensed surveyor will survey the monitoring wells for location and elevation. The survey data, soil boring and groundwater monitoring well locations, as well as to the Site's physical features, will be identified on the survey map.

3.4 Groundwater Sampling

One initial round of groundwater sampling and water level measurements will be conducted to supplement the multiple rounds of data collected to date. A groundwater sample will be collected from each of the four proposed monitoring wells, and the six existing on-Site monitoring wells. Low-flow sampling methods will be used to collect the water samples. The QAPP outlines the groundwater sampling procedures that will be followed during this RI. One trip blank per day will accompany the lab glassware from the laboratory to the Site and back, and will also be analyzed for VOCs for quality control. A field blank sample will also be collected to test proper cleanliness of the sampling material, and a blind duplicate sample will be submitted to verify repeatability of results. The first round of groundwater samples will be analyzed for:

- TCL volatile organic compounds (VOCs) plus up to 10 TICs by EPA Method 8260.
- TCL SVOCs (both base neutral extractable and acid extractable (BN/AEs) compounds) plus up to 20 TICs by EPA Method 8270, and
- TCL Pesticides/PCBs by EPA Method 608.
- TAL metals plus cyanide by EPA Method 846; EPA Method 9012.

TCL VOCs and SVOCs were selected because the focus of the proposed sampling is the delineation of remaining fuel oil and gasoline components. Since the majority of the buildings in the area of the Site are constructed on top of urban fill it is not anticipated that the metals analysis will provide data that would be usable in pinpointing the extent of the fuel oil/gasoline contamination. Because the Site has been covered with a building since 1918 and there is no evidence of PCB containing equipment, it is not anticipated that pesticides or PCBs will be an issue at the property.

Multiple sampling events have been completed for the six existing wells installed by LBG. Therefore, the second round of groundwater sampling will be limited to the four proposed FLS monitoring wells. The analyticals selected for the second round of groundwater sampling will be dependent on the results obtained from the first round of groundwater sampling. If a parameter is detected below the applicable standards it will be omitted from the second sampling round.

As with the soil analyses, the groundwater sample analytical reports will undergo a third party review of the analyses conducted. The third party will produce a DUSR, which will be submitted to the NYSDEC.

3.5 Soil Waste Classification for Disposal

An in-situ waste characterization program is proposed to facilitate direct load-out of Site soils. For disposal purposes, the area to be excavated will be segmented into grid areas representing approximately 800 cubic yards or less, with composite samples identified by the section number and total depth. Representative composite samples will be collected at the frequency required by the disposal facility. In no case will composite samples represent volumes exceeding 1,500 tons (approximately 1,000 cubic yards).

In each grid area, a representative number of borings will be advanced to depths of 15 feet, which is the proposed foundation depth. Soil from each boring will be composited. Soil samples for VOC analyses will be grab samples only as per the disposal facility requirements.

Each composite sample will be analyzed for the following parameters:

- Resource Conservation and Recovery Act Characteristics (pH/Corrosivity, Reactivity, Ignitability/Flashpoint)
- TCLP Metals
- Total Metals
- Total Petroleum Hydrocarbons
- PCBs/Pesticides
- SVOCs
- Paint Filter Test

Additional parameters may be added or deleted to satisfy specific disposal facility requirements, if known.

The details of the proposed field investigation and analysis are provided in Table 3.

3.6 Community Air Monitoring

The soil vapor sampling and the soil borings and monitoring well installation will be conducted under a Site-specific Health and Safety Plan (HASP). The HASP is provided as Appendix C. During soil vapor sampling soil boring/ monitoring well installation, air monitoring will be continuously conducted with a PID in the work zone to measure ambient VOC concentrations for all indoor activities. Periodic monitoring will be completed during sampling activities, such as soil and groundwater sampling. Background readings will be taken at the beginning of each workday. The indoor VOC concentrations will be measured at a minimum of once every 2 hours. If the VOC concentrations exceed 5 ppm for a period of greater than 15 minutes, work activities will be temporarily halted until concentrations decrease below 5 ppm. The procedures for air monitoring are outlined in the Community Air Monitoring Plan (CAMP) provided in Appendix D. A Community Health and Safety Plan was developed to provide the steps that will be taken during intrusive activities to prevent any exposure to the public. A copy of this plan is provided in Appendix E.

A project logbook will be kept and background readings as well as any readings that exceed action levels, thereby triggering a response, will be recorded within it. This record will be available for review by the NYSDEC/NYSDOH. The required action levels and responses are addressed in the HASP. Additionally, Site workers will ensure investigation-derived wastes (IDW) are quickly containerized and covered in order to minimize nuisance odors during field work.

3.7 Investigation-Derived Waste Management

The waste generated during Site investigation will be stored in 55-gallon, Department of Transportation-approved, steel drums which will be kept covered during the work and sealed at the end of each work day, and labeled with the date, well/boring number(s), waste type (soil, purge water, free product), and a point of contact. An appropriate waste designation will be evaluated from the results of the soil and water samples collected during well installation and the IDW will be properly disposed of according to local, state, and federal regulations.

4.0 RI REPORT/RAWP PREPARATION

A Remedial Investigation Report (RIR) will be prepared upon completion of all fieldwork and review of analytical results. The report will include the following components:

- Summary of all field activities
- Discussion of field and laboratory data
- Identification and characterization of the source(s) of the contamination
- Discussion of subsurface conditions including stratigraphy, groundwater flow direction, etc.
- Conclusions and recommendations
- Soil boring and monitoring well logs
- Photo log of field activities
- Groundwater elevation contour maps
- Tabulated laboratory analytical data
- Quantitative Human Health Exposure Assessment
- DUSRs

In addition to the data collected by FLS during implementation of this investigation, data collected during previous investigations will evaluated for use within the DUSR.

The RIR will be submitted as a separate document in electronic form. All sampling data provided will be in the appropriate EDD EQuIS format.

A Remedial Action Work Plan (RAWP) will be submitted as a separate document along with the RIR. The RAWP will include the following:

- Site Cleanup Goals
- Presentation of several possible remedies to address contamination at the site
- Explanation of the selected remedy and how it meets all remedy selection criteria

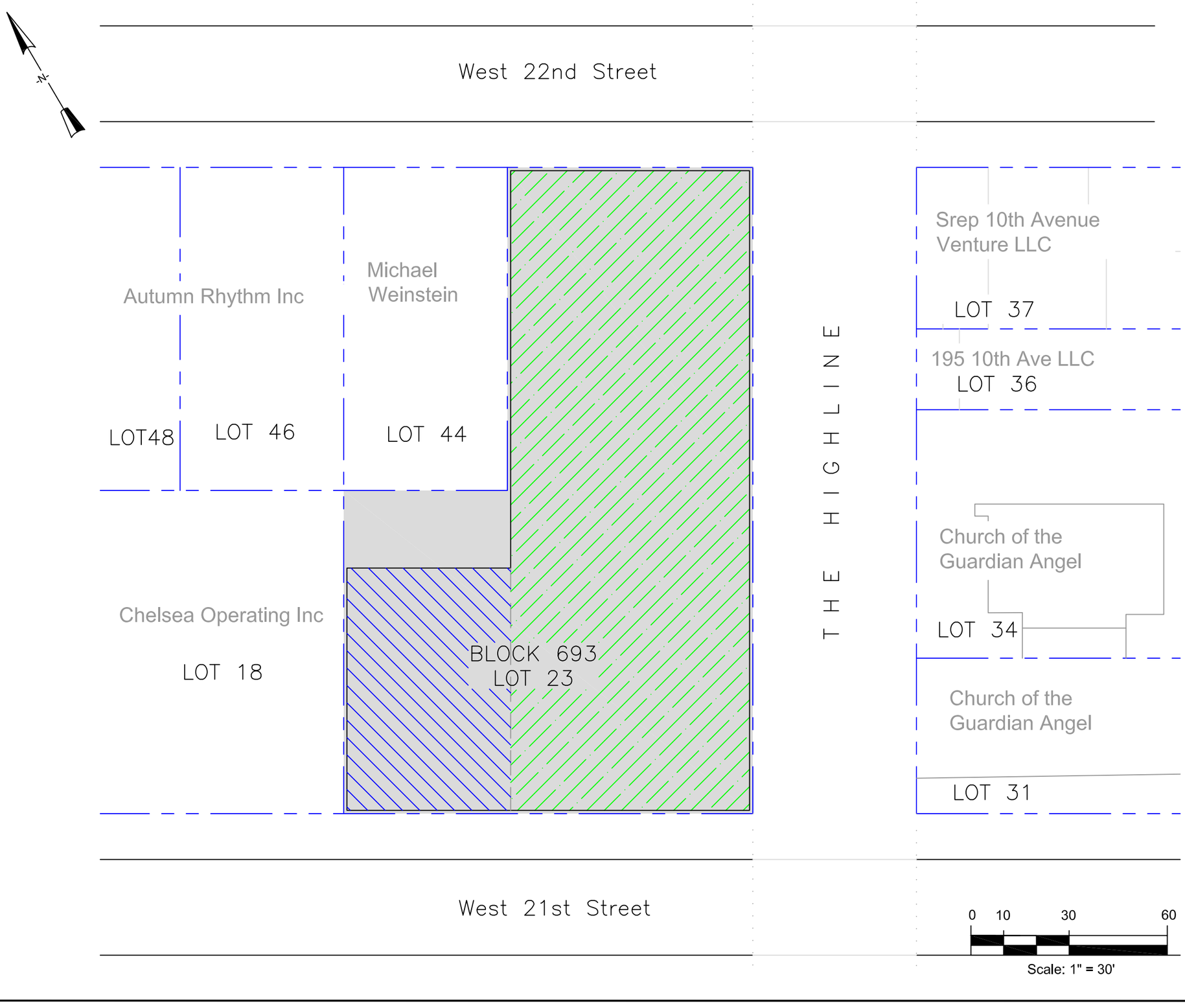
FIGURES

Fleming Lee Shue

FIGURE 1: SITE LOCATION

511 West 21st Street
New York, N.Y.

BCP Site No. C231080



Fleming Lee Shue
Environmental Management & Consulting
158 West 29th Street, 9th Fl.
New York, NY 10001

511 West 21st Street
Block 693 Lot 23
BCP Site # C231080-02-13

FIGURE 2

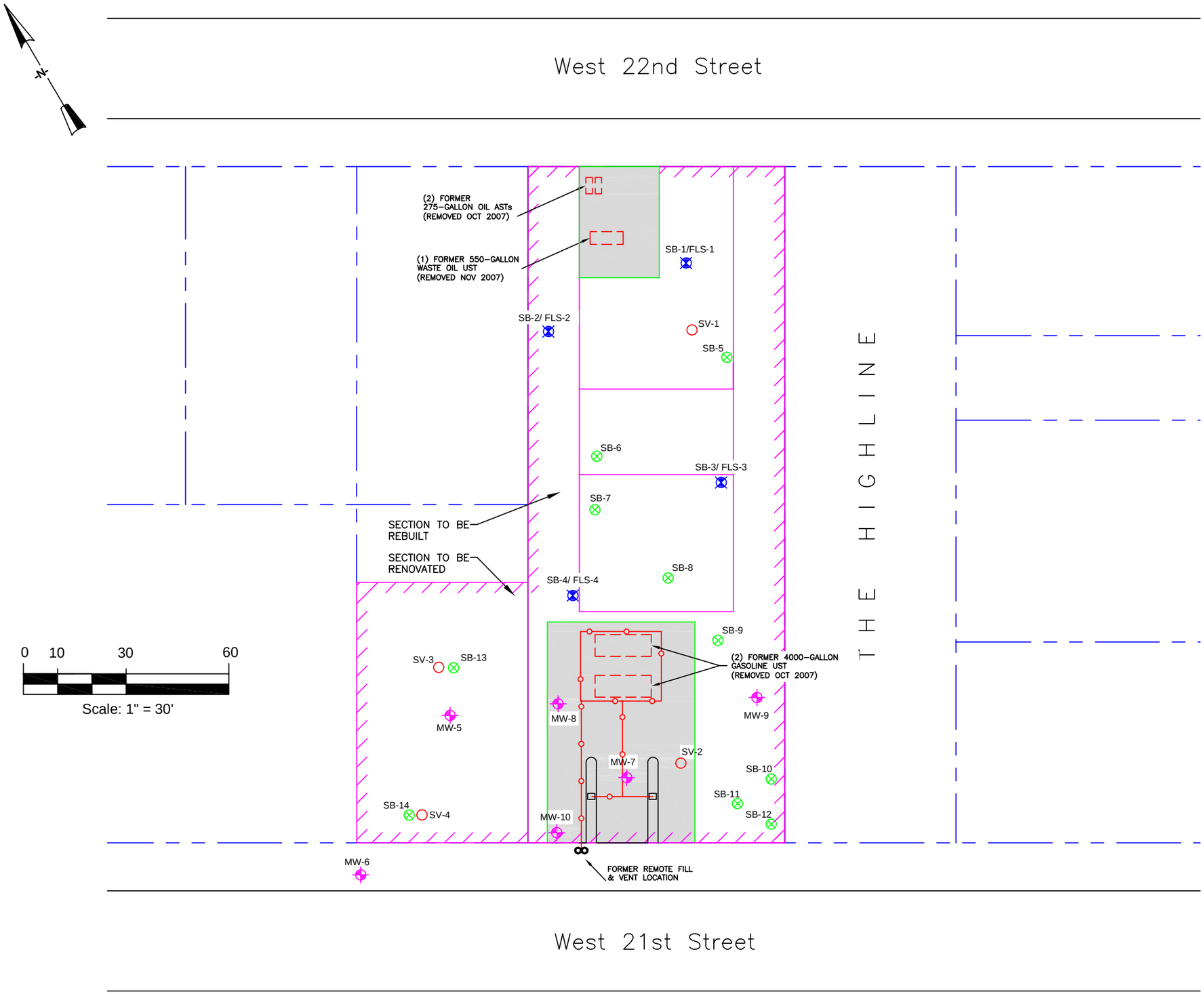
SITE LAYOUT

Date
May 2013

Project Number
10173-002

LEGEND

- PROPERTY LINES
- BUILDING OUTLINE
- SITE PROPERTY
- BUILDING SECTION TO BE RENOVATED
- BUILDING SECTION TO BE REBUILT



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Environmental Management & Consulting

158 West 29th Street, 9th Fl.
New York, NY 10001

511 West 21st Street
Block 693 Lot 23

FIGURE 3

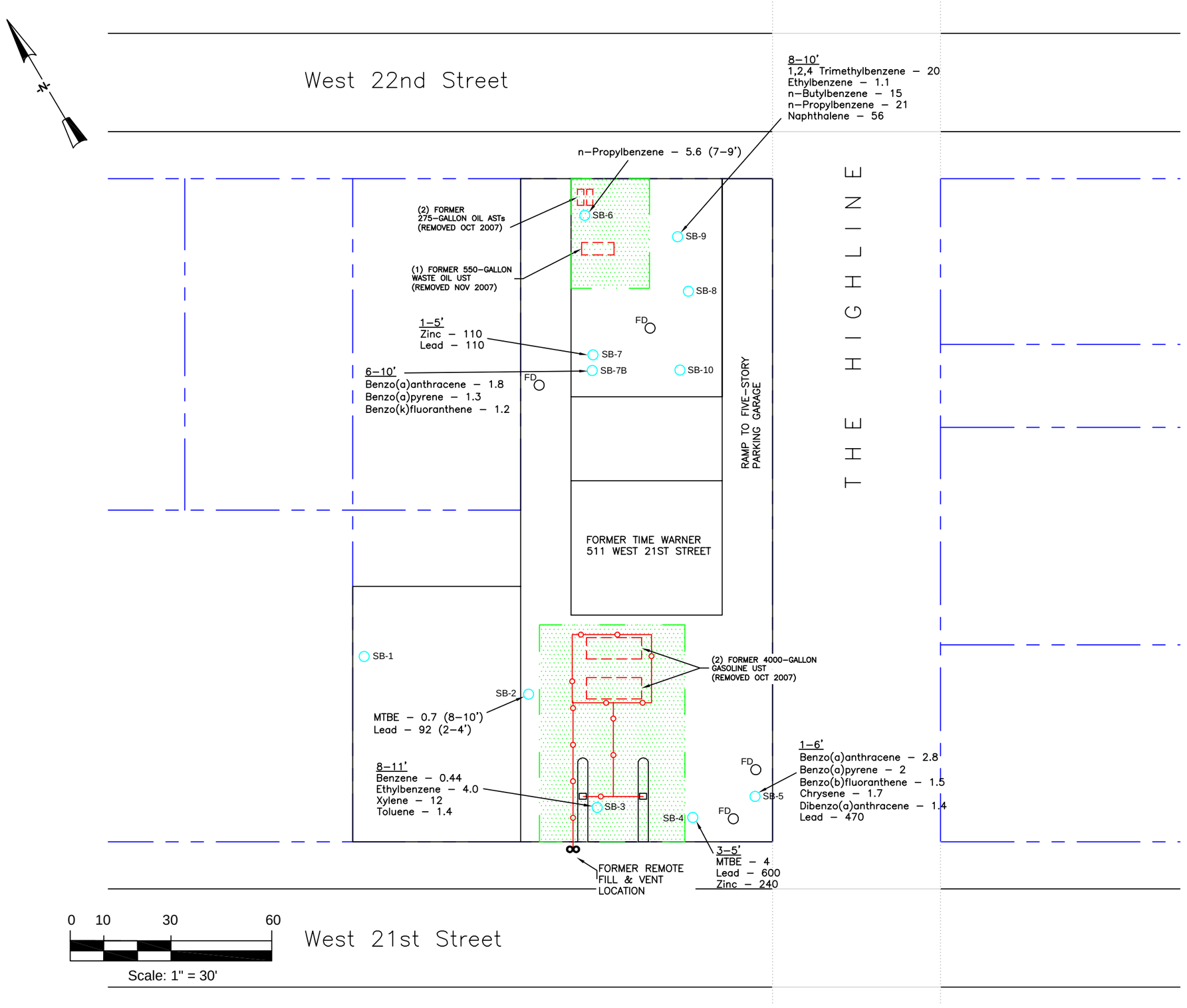
AREAS OF CONCERN / PROPOSED SAMPLING LOCATIONS

Date
October 2013

Project Number
10173-002

LEGEND

- PROPERTY LINES
- BUILDING OUTLINE
- UNDERGROUND STORAGE TANKS (REMOVED 2007)
- PRODUCT LINE
- AREAS OF CONCERN
- SV-1 — PROPOSED SUB-SLAB SOIL VAPOR SAMPLE LOCATION
- SB-5 — PROPOSED SOIL BORING LOCATION
- SB-1/FLS-1 — PROPOSED MONITORING WELL/ SOIL BORING LOCATION
- MW-5 — EXISTING LBG MONITORING WELL LOCATION



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158 West 29th Street, 9th Fl.
New York, NY 10001

511 West 21st Street
Block 693 Lot 23
BCP Site # C231080-02-13

FIGURE 4

AREAS OF CONCERN / PREVIOUS SOIL SAMPLE RESULTS

Date
October 2013

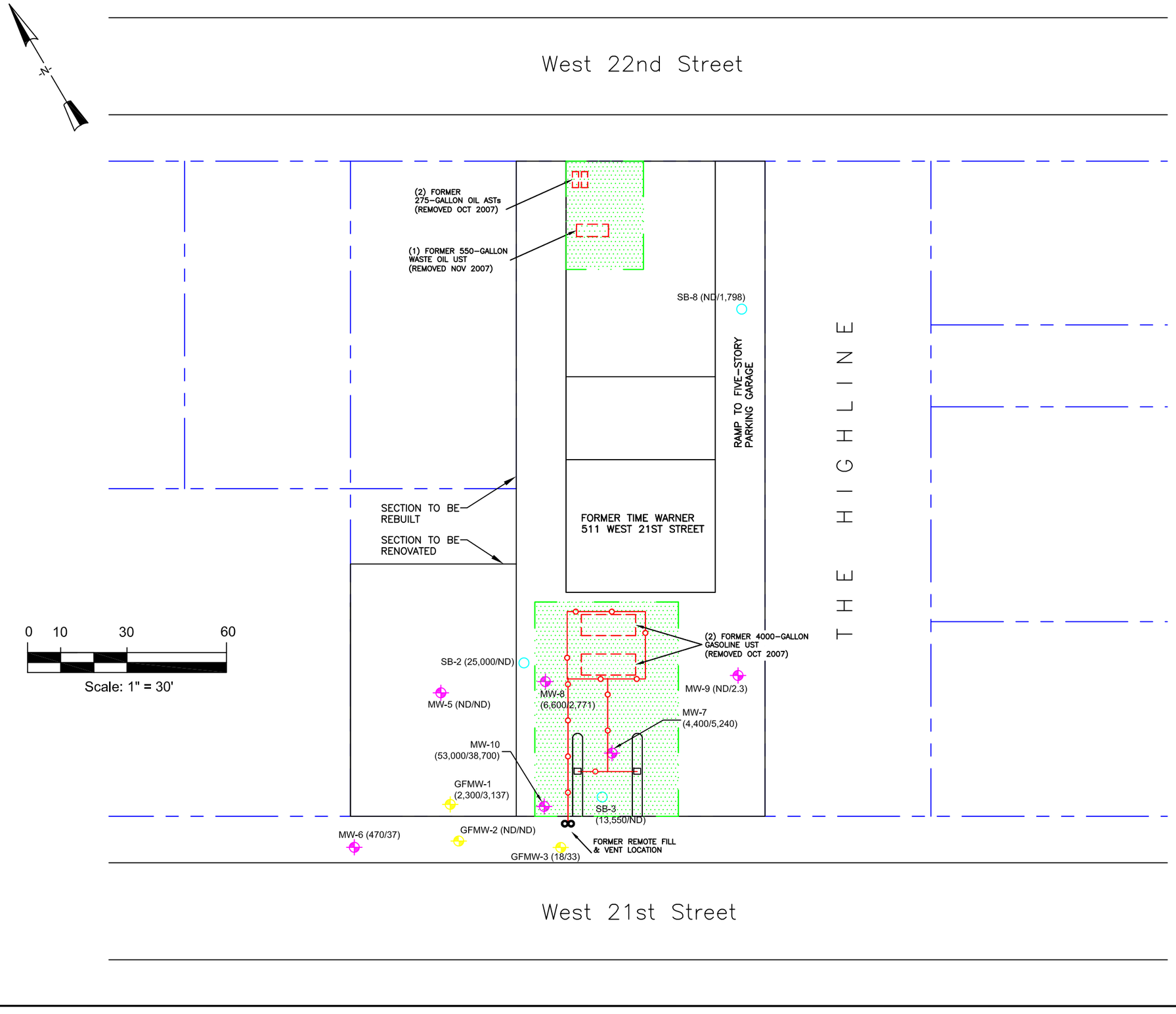
Project Number
10173-002

LEGEND

- PROPERTY LINES
- BUILDING OUTLINE
- UNDERGROUND STORAGE TANKS (REMOVED 2007)
- PRODUCT LINE
- AREAS OF CONCERN
- FD — FLOOR DRAIN
- SB–6 — SOIL BORINGS (AKRF)

RESULTS IN PARTS PER MILLION

FILE: P:\Project Files\10173 – Albanese Development Corp\002 – 511 West 21st Street\Figures\Remedial Investigation Workplan October 2012\Figure RIWP– 4 – Areas of Concern.dwg DATE: 10/24/2013



Fleming Lee Shue

Environmental Management & Consulting

158 West 29th Street, 9th Fl.
New York, NY 10001

511 West 21st Street
Block 693 Lot 23

FIGURE 5

AREAS OF CONCERN / 2012 GROUNDWATER RESULTS

Date
May 2013

Project Number
10173-002

LEGEND

- PROPERTY LINES
- BUILDING OUTLINE
- UNDERGROUND STORAGE TANKS (REMOVED 2007)
- PRODUCT LINE
- AREAS OF CONCERN
- MW-9 (ND/2.3) — LBG MONITORING WELL LOCATION AND 2012 MTBE/BTEX GROUNDWATER RESULTS (ug/L)
- GFMW-1 (2,300/3,137) — EXISTING MONITORING WELL LOCATION AND MTBE/BTEX GROUNDWATER RESULTS (ug/L)
- SB-3 (13,500/ND) — AKRF 2008 – MTBE/GASOLINE RELATED

FILE: P:\Project Files\10173 - Albonese Development Corp\002 - 511 West 21st Street\Reports\Remedial Investigation Work Plan - Oct. 2012\Revised RIWP, Tables, Figs - NYSDEC\Figure 5 - Groundwater Sampling Results_4.29.13.dwg DATE: 5/2/2013

TABLES

TABLE 1
CONTACT INFORMATION AND HOURS OF OPERATION

NAME	TITLE	ROLE	CONTACT INFORMATION	
FLEMING LEE SHUE			**(P) 212-675-3225**	**Email**
Arnie Fleming	Principal	Professional Engineer	Ext. 301	arnie@flemingleeshue.com
Peter Helseth	Senior Consultant	Project Director	Ext. 308	peter@flemingleeshue.com
Susan Bianchetti	Senior Project Manager	Project Manager	Ext. 310	susan@flemingleeshue.com
Bill Maniquez	Geologist	Field Manager	Ext. 315	bill@flemingleeshue.com
Raphael Rosenbaum	Environmental Scientist	Field Personnel	Ext. 316	raphael@flemingleeshue.com
NYSDEC				
Javier Pérez	Environmental Engineer	NYSDEC Project Manager	518-402-9768	jxperezm@gw.dec.state.ny.us

Subconsultants	Tasks	Hours of Operation*
ADT	Geoprobe Drilling	Allowable - 7 AM to 6 PM - Anticipated 7 AM to 3 PM
Clean Earth of Carteret	Soil Transport and Disposal	When required will show between the allowable hours of 7 AM to 6 PM

* NYC Noise Code

TABLE 2
PROJECT SCHEDULE

MONTH*

Item	Task Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	RIWP Approved																	
2	Retain Subs/Access/Fieldwork																	
3	1st Round GW Sampling																	
4	Lab. Analysis																	
5	Data Validation Review																	
6	Develop EDD's																	
7	RIR Preparation																	
8	RIR Review																	
9	RIR Revisions																	
10	Revised RIR Approval																	
11	Alternatives Analysis																	
12	Remedial Work Plan (RWP)																	
13	RWP Review																	
14	RWP Revisions																	
15	Revised RWP "approvable"																	
16	Develop PDD																	
17	Public Review																	
18	RWP Approval																	

* Months will be defined from when NYSDEC approval is received.

Key Map
Fieldwork
Lab Analysis/Validation/EDDs
Report Writing
Public Review
Agencies Review/Approval
DEC Report Writing
Agency Acceptance

TABLE 3
SAMPLING SUMMARY TABLE

SAMPLE DESIGNATION	PROPOSED LOCATION	SAMPLE DEPTH	PROPOSED ANALYSIS
Soil Vapor			
SV-1 & SV-2	5-story parking garage	5 fbg	VOCs by EPA Method TO-15
SV-3 & SV-4	1-story building	5 fbg	VOCs by EPA Method TO-15
Soil Borings/Soil Samples			
SB-1 to SB-12	5-story parking garage	15 fbg	TCL SVOCs + 20 TICs EPA Method 8270; TCL VOCs + 10 TICS EPA Method 8260; TAL Metals EPA Method 6010C/7471B; and PCBs/Pesticides EPA Methods 8082/8081
SB-13 & SB-14	1-story building	15 fbg	TCL SVOCs + 20 TICs EPA Method 8270; TCL VOCs + 10 TICS EPA Method 8260; TAL Metals EPA Method 6010C/7471B; and PCBs/Pesticides EPA Methods 8082/8081
Monitoring Well/Groundwater Samples			
FLS-1 to FLS-4 LBG MW-5 to MW-10	5-story parking garage	15 fbg	TCL SVOCs + 20 TICs EPA Method 8270; TCL VOCs + 10 TICS EPA Method 8260
Soil Waste Classification			
	As Required	N/A	RCRA Characteristics (pH/Corrosivity, Reactivity, Ignitability/Flashpoint; TCLP Metals; Total Metals; TPH; PCBs/Pesticides; SVOCs and Paint Filter

(1) Sampling methods will be in compliance with Chapter 3 of DER-10 Technical Guidance for Site Investigation and Remediation.

(2) Detection limits will be consistent with chemical-specific SCGs for the media being analyzed and will be based on the selected laboratory's lowest detection limits for the requested analytical method.

(3) Rational for sample location and collection is provided in the RIWP.

APPENDIX A

Contact List Qualifications

Fleming Lee Shue

Environmental Management & Consulting

Arnold F. Fleming, PE

Owner

Education

- Bachelor of Science, Civil Engineering, Manhattan College (1968)
- Masters of Engineering, Manhattan College (1969)

Professional Registration

Professional Engineer, New York

General Expertise

Arnold F. Fleming is an environmental engineer with over 30 years of experience in the areas of water quality and planning studies, domestic and industrial wastewater treatment and disposal, environmental impact analysis, contaminated materials assessment and remediation, and environmental permitting. Mr. Fleming was one of the founders of Allee King Rosen & Fleming, Inc., AKRF, Inc., and AKRF Engineering P.C. For over 20 years, Mr. Fleming has provided these firms with engineering expertise in all technical areas relating to permitting and hazardous waste assessment and management and the assessment of impacts in these technical areas.

Mr. Fleming's experience includes the following:

Wastewater Planning:

Project manager for the preparation of 208 wastewater facility planning studies for Middlesex, Mercer, Cumberland, Burlington and Camden Counties, N.J, and the Statewide Combined Sewer 208 Study for New York State.

Project manager for the 201 Facility Plans and Environmental Assessments for Walton, N.Y., Salem County, N.J., Ridgewood-Fairlawn, N.J. and Totowa-West Patterson, N.J.

Water Quality Studies:

Hudson River Waste Assimilative Capacity Study of the Hudson River Estuary for the New York State Department of Health.

Effects of PL 92-500 (The Clean Water Act) on Hudson River Water Quality, for the National Commission on Water Quality.

Effects of PL 92-500 (The Clean Water Act) on Susquahana River Water Quality, for the National Commission on Water Quality.

Impact of the Freshkills Landfill on Water Quality of New York Harbor for a Part 360 permit to operate the landfill.

Water quality studies for the design of an industrial wastewater treatment plant for Brazil's third petrochemical complex in Rio Grand do Sul State.

Environmental Impact Analysis:

Project manager for the Sportsplex EIS to develop a new stadium in Flushing Meadow Corona Park in Queens New York.

Project Manager for the EIS for the Hudson River Center, a Hotel proposed for the pier at 36th Street on the West side of Manhattan.

Project Manager for the EIS for the North Haven Mall in Connecticut.

Prepared the EAS for BSA use variances for residential uses in manufacturing zones in Brooklyn and Manhattan.

Prepared the infrastructure and utility assessments for over 100 EIS's in the City of New York and the Metropolitan New York Area including the USTA Tennis Stadium in Flushing Meadow Corona Park in Queens, the Fulton Landing Project in Brooklyn, the Queens West Development in Queens, the Riverside South Development in Manhattan.

Contaminated Materials Assessment and Remediation:

Principal in charge of the preparation of Phase I Environmental Assessments for several hundred residential, commercial and industrial properties throughout the New York Metropolitan Area.

Principal in charge for the preparation of Phase I ESA and regulatory compliance assessments for 8 New York Metropolitan Area Hospitals including Mount Sinai for State financing including performance of the site inspections and final report preparation.

Principal in charge for the Phase II Environmental Assessments for over 100 residential, commercial and industrial sites in the Metropolitan New York area. Duties include design of sampling program, oversight of means and methods of sample collection, and preparation of final reports including recommendations for remediation.

Principal in charge for the design of over 50 remediation systems including UST tank removals, contaminated soil disposal, soil vapor extraction systems, sparged air/ soil vapor extraction systems. Remedial designs include approximately 20 sites remediated under the State of New York Voluntary Clean-up program, and

two sites on the Registry of Inactive Hazardous Waste Sites. Had one of only two sites declared remediated and removed from the Registry of Inactive Hazardous Waste Sites in New York City.

Preparation of the Brownfield Applications and the Remediation plans for the Harlem Park Project and a residential site in Chelsea. Both sites were admitted to the program.

Notable recent work includes:

Muss Staten Island Site

Managed the initial Phase II sampling for this former industrial site re-zoned for single family residential development. The site was listed on the Registry of Inactive Hazardous Waste Sites. Prepared in Remedial Investigation and Feasibility Studied that led to a Record of Decision (ROD) setting forth the remediation for the site.

Prepared the remedial Design to satisfy the ROD and managed the oversight of the remediation leading up to the removal of the site from the registry.

Designed a revetment system to protect the capping material that was an integral part of the remediation from storm related erosion from the adjacent Raritan Bay.

Petitioned the Federal Emergency Management Agency to remove the site from the 100-year flood plain on the basis of the new elevations and erosion measures implemented on the site.

Related 23rd Street Development

Prepared the Phase I and asbestos surveys for this Manhattan development site. Designed the Phase II sampling program, executed the sampling and on the basis of the findings obtained approval to remediated an extensive oil spill via bio-remediation. The system was designed and installed under the new building with operation to begin upon occupancy of the building. The approach allowed the construction schedule to proceed without delay due to the discovered contamination.

Home Depot Rego Park

Prepared a Voluntary Clean-up Application, performed additional sampling and developed a remedial work plan to remove solvent contaminated soils from this development site. Designed a sparged air/ Vapor Extraction System to remediated contaminated groundwater and site soils. Operated the system for two years reducing the groundwater contamination by over 90%. The sparged air / VES was designed to be installed under the building avoiding the delay of remediation the site prior to construction.

Queens West Development Corporation

Technical representative to the Queens West Development Corporation a subsidiary to the Empire State Development Corporation charged with developing the 78 area redevelopment of the Hunters Point waterfront into a mixed commercial/residential development. Mr. Fleming developed a model remediation plan for the first residential building in 1995 and has applied this model to the next three residential development sites in Stage 1 of the development, the first having opened for residency in the summer of 2002. Mr. Fleming is assisting QWDC in selecting a developer for Stage 2 and 4 and is advising them on the remediation of Stage 2, a former oil refinery and paint factories. Development of Stage 2 is to occur simultaneous to the remediation efforts in the refinery portion of the site.

Environmental Permitting:

Mr. Fleming has directed the environmental permitting activities at his firms for over 20 years. His direction included the integration of biological, water quality, and engineering aspects of a project to meet the permitting criteria of both State and Federal Permitting Agencies. His unique understanding of the issues and permitting requirements has allowed projects to anticipate the regulatory needs into project development to allow timely review and issuance of permits.

Notable projects that Mr. Fleming has led the permitting are:

Hudson River Park

For this new park stretching from Battery Park City to 59th Street, Mr. Fleming oversaw the preparation of the US Army Corps of Engineers and the New York State Department of Environmental Conservation permit application s and responses to comments leading to issuance of this waterfront development permit. This permit was unique in that it addressed the first segment that was designed and ready to be built as well as the entire park for which no design was available. To address the future segments, schematic design drawings were submitted showing conceptual designs that would be refined as the park was designed and build. A permit condition to submit each segment design for review and determination of consistency with the master permit was included to assure that no impacts were introduced in the design process. If a determination on any segment were made that the design was not consistent with the master permit, a new permit process would be initiated.

West Side Ferry Terminal

For the New York City Economic Development Corporation, Mr. Fleming led the permit effort to allow a new public ferry terminal located within the bounds of the Hudson River Park. Because the ferry terminal was not approved when the Park permit was issued, this project was carved out of the park permitting process and followed a separate permit track. The permit application was assembled using updated submissions from the Park permit application and addressed the specific concerns of the State

and federal permitting agencies with dredging in this portion of the Hudson River.

Colgate Site – Jersey City New Jersey

For this mixed commercial/residential waterfront redevelopment project, Mr. Fleming prepared the state Coastal Zone Development permit and a US army Corp of Engineers dredge and fill permit to allow a marina, esplanade and a new combined sewer manifold to be built. The sewer manifold was placed in the river because of space limitations and was permitted, the first fill permit in this portion of the Hudson River in 20 years.

Queens West Development Project

Mr. Fleming led the permitting effort to allow redevelopment of the waters edge associated with this 78 acre mixed Commercial/Residential waterfront development. The project has three stages, the first under construction and permitted in 1995. Mr. Fleming managed the permitting effort for this first waterfront permit. The current application to the state and federal permitting agencies is for a project wide permit covering the remaining 3 stages of which 2 are under design. The final stage of the project was the subject to a schematic design only. Notable in the current permit is the reconstruction of collapsed platforms that are to become a site wide park and esplanade providing water access to this portion of the east river for the first time in over a century.

Strategic Planning for Waterfront Development - Greenpoint Brooklyn

For a private developer, Mr. Fleming has prepared an evaluation of the permitting concerns including a jurisdictional assessment of the existing waterfront edge, to assist in the establishing of a development plan that will be compatible with the requirements of federal and state permits.

Environmental Permits for Shoreline Protection – River East

For this 10 acre site obtained the permits to install 500 feet of revetment to allow a 1.4 million square foot residential development on a former oil terminal. Also prepared the Remedial Action Work Plan to remove historic spilled oil simultaneous to the shoreline construction.

Fleming Lee Shue

Environmental Management & Consulting

Peter S. Helseth, P.E.

Senior Consultant

Education

- Master of Business Administration (MBA), Finance, Fordham University (2010)
- Bachelor of Science (BS), Civil Engineering, University of Vermont (2003)

Professional Registration

Professional Engineer, New York (2008)

Health and Safety Training

- OSHA 40-Hour Hazardous Waste Activities Training (July 2009)
- OSHA 30-Hour Construction Safety Training (July 2009)

General Expertise

Peter S. Helseth, P.E. is currently a Senior Consultant with Fleming Lee-Shue. As a Senior Consultant, Mr. Helseth has been involved with UST removals, soil excavation, remedial investigations & design, monitoring & sampling, sub-slab depressurization system (SSDS) and vapor barrier design, construction inspections, submittals review, engineer's estimates, roadway profiling design, grading & earthwork design, drainage design, and general construction knowledge. He has over eight years of civil engineering design experience on various types of projects.

Project Experience

Environmental Design and Remediation

Notable recent work includes:

71R Doctor's Hospital – NYCSCA

Designed the Sub-Slab Depressurization System (SSDS) for new school construction as a Project Engineer. Included design of SSDS suction pits, fans, piping, risers, and other construction details while coordinating locations with project architect. Also, provided engineer's estimate on total construction cost of system.

Village of Port Chester Police Station – Village of Port Chester

Oversaw remediation of gasoline-impacted soils from rear parking lot of active police station. Provided daily oversight of the remediation including contractor's removal of impacted soils, dewatering of excavation, coordination with contractor's field personnel, communication with police station officials and village officials, and documentation through daily reports and photos. Additional

responsibilities included review of contractor invoices post remediation for accuracy on behalf of the Village.

Mott Haven Campus / Metropolitan Avenue / Sunset Park – NYCSCA

Performed bi-weekly site inspections of active SSDS systems to monitor proper operation. Responsibilities included field inspection, written report, and photos for each project. Also, address instances in which any of the fans are not operating properly with notification to NYCSCA and immediately correcting the problem.

NYSDEC Brownfield Cleanup Project – Chartis

Oversaw remediation of various contaminations from industrial uses on 1.4-acre site including removal of 34 USTs and excavation of approximately 13,000 tons of contaminated soils to date. Work for the project was performed under tents with PPE levels, occasionally at Level "C." Responsibilities included tracking and reporting of daily activities including quantity and condition of soil/tanks removed from project site and daily equipment & manpower utilized.

Shoring and Excavation Cleanup Project – Bulova Corporation

Oversaw installation of a sheeting/tie-back shoring system adjacent to a retaining wall, excavation of unleaded gasoline-impacted soils, application of Regenox™ (a chemical oxidant used to remediate remaining smear zone soil impacts) as well as Oxygen Releasing Compound-Advanced™ (ORC-A™, used to remediate remaining groundwater impacts). Additional responsibilities included coordination with contractor field personnel, communication with property owner personnel, and implementation of a Community Air Monitoring Program (CAMP). Work is being completed under the direction of the New York State Department of Environmental Conservation's Spill Department.

Fort Hamilton UST Removal and Cleanup Project – NYCSCA

Project included the removal of two (2) 15,000-gallon USTs from an underground vault directly adjacent to school building. Provided design of soil excavation, dewatering, UST decommissioning, and provided construction oversight. Also, created engineer's estimate for proposed remediation and construction.

PS 331K Remediation Design – NYCSCA

Prepared design documents for decommissioning of 2,500 gallon UST & removal of surrounding petroleum impacted soils. Also, prepared design plans for installation of gas vapor barrier and associated details. Performed inspections of gas vapor barrier during installation in the field.

Remedial Action Work Plan (RAWP) and Bid Spec – Con Edison

Provided design figures for RAWP and Bid Spec for shoreline remediation project along the East River. Remediation proposes to excavate upland soils and dredging of coastline contaminated soils. Authored individual sections for inclusion in DRAFT Bid Spec document.

Remedial Action Work Plan (RAWP) and Bid Spec – Con Edison

Provided design figures for RAWP and Bid Spec for remediation project alongside the Wallabout Channel. Remedial action proposed is the evacuation of

former ash pit and excavation disposal of impacted soils. Authored individual sections for inclusion in DRAFT Bid Spec document.

Sunset Park SSDS Start-up Inspections – NYCSCA

Developed a SSDS Operation & Maintenance Plan for newly installed active system. Conducted SSDS start-up inspection including vacuum testing of monitoring ports and prepared detailed lists of deficiencies to be corrected prior to approval.

PS 189X Conversion of SSDS – NYCSCA

Developed design plans conversion of a SSDS from a passive system to an active system. Provided an engineer's estimate for proposed environmental remediation and construction.

260Q Conversion of SSDS – NYCSCA

Developed design plans conversion of a SSDS from a passive system to an active system. Reviewed and approved submittals from contractors in regards to SSDS fan mounting on roof. Provided an engineer's estimate for proposed environmental remediation and construction.

Land Development, Stormwater Design and Permitting

Notable recent work includes:

Remedial Grading, Earthwork, and Drainage Design – Orleans Homebuilders

Assisted the client with two projects during site construction. Provided remedial grading plans for both sites, taking into account cut & fill amounts to balance the site. Design remedial drainage design for trouble areas discovered during construction. Authored Stormwater Pollution Prevention Plan (SWPPP) including erosion & sediment control plans for submission and review by NYSDEC.

Land Development & Construction – K. Hovnanian

Designed 275-Unit Townhouse Development on 50-acres in the Town of New Windsor, NY. Provided roadway profiling design, site grading design, stormwater & drainage design, water & sanitary design, and erosion control design. During construction, performed site visits to investigate construction progress and provide onsite solutions for various construction issues.

Erosion Control Inspections – Route 300 Realty

Performed weekly erosion control inspection reports as per NYSDEC regulations for construction of 20,000 square foot office building in the Town of Newburgh, NY. Inspections were to confirm proper installation of erosion control measures and drainage structures as per the approved site design plans. Provided weekly report with pictures for distribution to Town, NYSDEC, and client.

Remedial Grading and Drainage Investigation – Pulte Homes

Designed remedial grading plan to alleviate existing drainage concerns developed during construction. Also, performed drainage analysis of the two detention basins onsite for client based on daily irrigation use and seasonal groundwater elevations. Provided field solutions to various drainage issues discovered during construction.

Fleming Lee Shue

Environmental Management & Consulting

Susan Bianchetti, CPG
Senior Project Manager

Education

Boston College, Chestnut Hill, Massachusetts; Bachelors of Science in Geology, 1979
State University of Stony Brook, Stony Brook, NY; Masters in Aqueous Geochemistry, 1986
Colorado School of Mines, Groundwater Modeling Course, 1998.

Professional Registration

Certified Professional Geologist 1993

General Expertise

Susan Bianchetti is a Certified Professional Geologist with over 25 years of experience in the design, management, costing and implementation of Phase I and Phase II ESAs, and remedial investigations/feasibility studies. Project management experience includes client contact and proposal preparation; development and oversight of project budgeting; regulatory interactions and negotiations; selection and oversight of subcontractors; design of field operations; implementation of quality assurance/quality control measures; and site closure activities. Ms. Bianchetti has interacted with multiple regulatory agencies including NYS Department of Environmental Conservation, NYC Department of Environmental Protection and the Mayor's Office of Environmental Remediation. She has also managed large projects for the NYC Department of Design and Construction and NYC Housing Authority.

Project Experience

NYS Department of Environmental Conservation

On-call senior geologist for underground storage tank program for NYSDEC Regions 2 and 3. Managed multiple Phase II investigations for leaking USTs throughout the five boroughs and Rockland County. Tasks included design of sampling programs, delineation of soil and groundwater contamination, fingerprinting petroleum products and determining liability. Soil vapor samples were collected along with indoor air samples to determine potential impacts on existing buildings. Remedial measures were proposed for the type and extent of contamination. An oriented bedrock fracture zone was completed to determine the source of a gasoline plume from two adjacent service stations.

For the sites under a NYSDEC Consent Order, sampling plans for soil/groundwater disposal characterization were developed in addition to conducting aquifer tests, providing oversight for the installation of soil borings/monitoring wells, communicating with client and subcontractors, and preparing deliverables, including Remedial Investigation Work Plans, Remedial Action Work Plans and Health and Safety Plans.

NYC Department of Design and Construction
Designed and implemented multiple Phase I Environmental Site Assessments (ESA) and Phase II Environmental Site Investigations for the redevelopment of the proposed Hudson Yards property between from 34th to 36th Street and 10th and 11th Avenue. The project included a due diligence of an 11-story building complex, identification of fuel oil tanks, and the design and implementation of subsurface investigations. Where contamination was identified remedial measures were developed. A bedrock and groundwater investigation was designed and completed in the street to delineate potential contaminant migration pathways. Phase I and Phase II reports were completed for each building and submitted to the NYCDDC.

Additional investigations completed for the NYCDDC included corridor inspections to identify potential environmental concerns prior to utility installations, subsurface investigations and remedial recommendations for identified contaminants.

Mayor's Office of Environmental Remediation
Designed and implemented subsurface investigations on "e"-designated sites in NYC. Following completion of the field work, and submittal of required reports, initiated negotiations with regulatory agencies to obtain permits for development on these sites. The scopes included a subsurface investigation to determine potential contamination, typically from on-site USTs. Soil samples were collected and overburden or bedrock groundwater monitoring wells installed to delineate soil and groundwater contamination. The remedial actions included the removal of the tanks, excavation of impacted soils, endpoint sampling and backfilling. At another site, following the delineation of soil contamination with a soil vapor investigation, a vapor barrier was installed as part of the proposed renovation of an existing building.

NYC Housing Authority
Developed and implemented multiple tank investigations and soil vapor studies for housing projects throughout the five boroughs. Many of the sites included multiple buildings with fuel oil tanks located throughout basements. Typically, there was little to no information about these tanks or the potential existence of other tanks on the properties. Groundwater sampling and soil vapor surveys were conducted on a number of these sites.

Private Client, Lake Success, NY
Provided environmental consulting and peer review for the redevelopment of a 93-acre NYSDEC Class 2 Inactive Hazardous Waste Disposal Site on Long Island. The Site had historically been used by the military for manufacturing purposes and, as a result, the former operator entered into an Administrative Order on Consent with the NYSDEC. As a result of historical operations, contaminants were present in the groundwater, soil,

sediments and soil vapor. The source of the contamination found to be a series of dry wells located near the main building that were historically used for liquid chemical disposal. Responsibilities included the development of a subsurface soil and groundwater investigation, environmental assessment of onsite buildings, investigation and redesign of two onsite retention ponds, negotiations with town officials and the NYSDEC and peer review of ongoing groundwater remediation.

Private Client, Manhattan, NY
Provided oversight and management of an investigation and delineation of a multi-acre development site that was a former car rental facility with an associated 10,000-gallon gasoline UST. Tasks included waste characterization, on and off-site soil/groundwater delineation, and excavation and disposal of over 20,000 tons of petroleum-impacted soil and bedrock. In addition to the 10,000-gallon UST, eight additional USTs were located and removed from the property. Potential offsite sources of groundwater contamination were also identified. A delineation study was completed which identified on-site point sources of contamination and determined tenant liability. The initial remedial design included the removal and disposal of contaminated soil and bedrock. Additional remedial action included the installation of a vapor barrier and design and installation of a soil vapor extraction system. A cost analysis was done and required deliverables submitted to the regulatory agencies regarding site remediation.

Private Client, Hempstead, NY
Provided project management for subsurface investigation and remediation of a former military base located on Long Island. The site was used as an air base during World War II. The scope of work included abandonment of dry wells, removal and testing of impacted soil, removal and disposal of chlorine gas cylinders, and abandonment of a 500-foot deep water supply well.

Brooklyn Army Terminal, Brooklyn, NY
Designed, managed and implemented the investigation and remediation of a fuel oil spill adjacent to the East River. The spill was caused by the collapse of an old boiler in an abandoned boiler house. The initial cleanup focused on placing booms around the oil spill in the river. The U.S. Coast Guard conducted cleanup of the river. The focus of the remediation shifted to containing the remaining fuel oil in the boiler prior to removal. The scope included draining the fuel oil from the boiler before cutting it up for scrap removal. In addition to removal of this boiler, two 10,000-gallon ASTs were abandoned in place. Following removal of the point source, a series of groundwater remediation wells were installed between the boiler house and the river.

NYS Psychiatric Hospitals
Designed, scoped and executed an investigation of remote coal ash piles at the Wassaic and Harlem Valley Psychiatric Hospitals in Duchess County, NY and the Pilgrim Psychiatric Hospital on Long Island, NY. Psychiatric hospitals generally disposed of coal ash on a distant part of the property. This ash was typically in a pile and sometimes mixed with medical waste. Soil borings were advanced immediately adjacent to the piles for collection of soil and grab groundwater samples. Samples of ash were also collected.

Based on the results, interim remedial measures were developed for coal and ash piles, including removal and disposal at an approved facility.

Phase I ESAs

Completed numerous Phase I ESAs within the five boroughs of NYC, including several that required the completion of HUD-4128 Forms. Conducted Phase I ESAs along the East Coast that included large multi-purpose developments, hospitals and nursing homes, industrial complexes, abandoned warehouses and multi-acre national parks.

Publications

Bianchetti, Susan F. and Michael V. Tumulty, P.E., "Environmental Site Assessments", the Association of the Bar of the City of New York, 1992.

Bianchetti, Susan F. and Richard Reeder, "Variable Dissolution Rates of Deformed and Undeformed Calcite", USGS Annual National Meeting, Abstract and Presentation, November 1985.

APPENDIX B

Quality Assurance Project Plan

Former Time Warner Cable Site
511 West 21st Street
New York City, New York

QUALITY ASSURANCE PROJECT PLAN

510 West 22nd Street Partners, LLC
c/o Albanese Development Corporation
1050 Franklin Avenue
Garden City, New York 11530
BCP # C231080

FLS Project Number: 10173-002

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
1 Hunters Point Plaza
47-40 21st Street
Long Island City, NY 11101

May 2013

Arnold F. Fleming, P.E.
and

Fleming Lee Shue

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1.0 INTRODUCTION

The Quality Assurance Project Plan (QAPP) outlines the protocols and procedures that will be followed during the remedial investigation of 511 West 21st Street, New York (Manhattan), NY, Brownfield Cleanup Program (BCP) site # XXXXXX, located on Block 693, Lot 23 (hereafter referred to as the "Site"). A Site Location Map is included as Figure 1. The Site investigation will be conducted in accordance with the approved Remedial Investigation Work Plan (RIWP) for the Site. The QAPP has been prepared in order to ensure Quality Assurance/Quality Control (QA/QC) for the environmental sampling activities which will be conducted under the RIWP and to ensure the acquisition of defensible data.

2.0 PROJECT TEAM

The project team will consist of FLS personnel and subcontractors. All field personnel and subcontractors will have completed a 40-hour Hazardous Waste Operations (HAZWOPER) training course and the annual HAZWOPER 8-hour refresher in accordance with the Occupational Safety and Health Administration (OSHA) regulations and will have the training required for their respective duties as outlined for this investigation.

2.1 Remedial Engineer

The oversight of all aspects of the project will be conducted by the Remedial Engineer (RE). The RE is responsible for compliance with the RIWP. Mr. Arnold F. Fleming, P.E., will act as the RE for the remedial action at the Site.

2.2 Project Director

The general oversight of all aspects of the project will be conducted by the project director. Tasks will include the scheduling, budgeting, data management and decision-making for the field program. Mr. Peter Helseth, P.E.; will act as the Project Director for the remedial action at the Site.

2.3 Project Manager

All components of the Remedial Investigation will be directed and coordinated by the Project Manager. He/she will ensure a smooth flow of information between all parties involved in the investigation by communicating regularly with professionals from the New York State Department of Environmental Conservation (NYSDEC), the Site management personnel, and all members of the FLS project team. Mr. Jesse Mausner, P.G., will act as the Project Manager for the project.

2.4 Field Team Leader

Daily onsite sampling and health and safety activities will be supervised by a Field Team Leader. The team leader's responsibilities will include ensuring adherence to the work plan and Health and Safety Plan (HASP) and regularly reporting daily progress and deviations from the work plan to the Project Manager. FLS will assign the role of Field Team Leader to appropriate FLS personnel.

2.5 Project Quality Assurance / Quality Control Officer

Adherence to the QAPP will be ensured by a FLS QA/QC Officer. Tasks will include reviewing the QA procedures with all personnel before any fieldwork is conducted on-site as well as completing periodic site visits in order to assess the implementation of these procedures. Mr. Kevin McGuinness, P.G., Associate, will act as the QA/QC officer for the remedial investigation.

2.6 Laboratory Quality Assurance / Quality Control Officer

Quality control procedures will be ensured by a laboratory QA/QC officer in the designated laboratory. This officer will be responsible for the adherence to laboratory protocols, quality control procedures, and checks in the laboratory. The officer will track the movement of the samples from check in to issue of the analytical results, conducting a final check on the analytical calculations. The laboratory groups performing the respective analyses will complete their own QA/QC and sign off on the data. The Accutest QA/QC manual is attached to the end of this document.

The sample analytical reports will undergo a third-party review of the analyses conducted. The third-party will produce a Data Usability Summary Report (DUSR) which will be submitted to the NYSDEC.

3.0 LABORATORY PROCEDURES

3.1 Laboratory Methods

The sample container type, preservation, applicable holding time, and laboratory methods of analysis of the field samples have been included as Table 1. Holding times are based on the SW-846 analytical method which, when adjusted to account for an assumed 2-day sample shipping time, match NYSDEC Analytical Services Protocol (ASP) holding times. Sample analyses will be completed by a New York State Department of Health Environmental Laboratory Approval Program (NYSDOH-ELAP) certified laboratory and reported as NYSDEC ASP Category B deliverables.

3.2 Quality Control Sampling

Additional analysis will be conducted for quality control assurance in addition to the laboratory analysis of the field soil and ground water samples. Quality control samples will include: equipment rinsate blanks (for non-disposable sampling equipment), duplicate samples, matrix spike and matrix spike duplicate samples, and trip blanks. The quantities of field samples and quality control samples have been summarized in Table 2.

The equipment blank and duplicate samples will be analyzed for the same parameters as the samples, as shown on Table 1.

4.0 STANDARD OPERATING PROCEDURES

The standard operating procedures for post-excavation soil sampling, soil gas sampling, monitoring well installation and development, and sampling equipment decontamination are described in the following sections. Safety monitoring will be performed in accordance with the Site-Specific HASP, sections of which mandate that all field personnel wear the appropriate personal protective equipment.

4.1 Soil Sampling

Soil samples will be obtained using either a split-spoon soil sampler (with a hollow-stem auger drill rig), or a macro-core sampler (with a Geoprobe® rig). Split-spoon samples will be collected continuously at 2-foot intervals, and macro-core samples at 5-foot intervals, to retrieve relatively undisturbed soil cores down to approximately 15 feet. The borings will be advanced 7 to 10 feet into the saturated zone. To reduce the chance of cross-contamination during sampling, non-disposable sampling equipment will be decontaminated between uses a with non-phosphate detergent wash followed by a clean water rinse, followed by a final rinse with deionized water. The drilling equipment (cutting heads, augers and drill rods) will be cleaned between uses. The macro-core sampler will use disposable acetate sleeves to collect intact soil cores.

Soil samples will be collected and analyzed for the parameters included on Table 1 and will be subject to the QA/QC requirements listed in Table 2.

4.2 Soil Gas Sampling

Soil gas samples will be collected by driving a sample probe approximately 5 feet below grade (ft-bg) using a Geoprobe® rig or a portable hand-held roto-hammer, inserting a 5/8-inch-diameter steel shaft with a hardened point and retractable slotted intake attached to a length of dedicated Teflon or polyethylene tubing into the hole. Once the soil gas sampling probe is secured, the shaft will be retracted to expose the screen, the annulus sealed with clay and/or bentonite, and a vacuum applied to the sampling probe head and the system purged to allow the collection and subsequent analysis of a representative sample of soil gas. A minimum of one soil gas volume will be purged from the borehole

before collecting the sample according to NYSDOH requirements. With the vacuum maintained, four soil gas samples will be collected using Summa Canisters by attaching the tubing to the dedicated SUMMA canister flow controller set to a sampling rate of 0.2 liters/minute or less.

4.3 Groundwater Sampling

Groundwater samples will be collected from the monitoring wells at least 1 week following installation by applying the following procedures:

- As the well plug is removed, measure the vapor concentrations in the well using a photo-ionization detector (PID).

- Measure depth-to-water and check for light non-aqueous phase liquid (LNAPL) utilizing an oil/water interface probe. If measurable LNAPL is present, groundwater samples will not be collected.

- Connect dedicated tubing to either a submersible or peristaltic pump and lower such that the intake of the pump is set at a mid-point of the water column within the screened interval of the well. The intake should be a minimum of 2 feet above the bottom of the well screen. Record the depth of the intake in the field notes. Connect the discharge end of the tubing to the flow-through cell of a multi-parameter (or equivalent) meter, such as a Horiba U-22. Connect tubing to the output of the cell and place the discharge end of the tubing in a 5-gallon bucket.

- At its lowest flow rate setting, activate the pump.

- Measure the depth-to-water within the well. Increase the pump flow rate such that the water-level measurement does not deviate more than 0.3 feet compared to the initial static reading.

- Transfer discharged water from the 5-gallon buckets to 55-gallons drums designated for well-purge water.

- During purging, record periodic readings (every 5 minutes) of water-quality indicators (e.g., turbidity, pH, temperature, dissolved oxygen (DO), reduction-oxidation potential (ORP), and specific conductivity).

- Continue purging the well until water-quality indicators have stabilized (three successive readings) for the following parameters and criteria:

Parameter	Stabilization Criteria
pH	+/- 0.1 pH units
Specific Conductance	+/- 3% S / cm

ORP / Eh	+/- 10 mV
Turbidity	+/- 10% NTUs (< 50 NTUs,)
Dissolved Oxygen	+/- 0.3 mg/l

- If, after three well volumes, water-quality parameters are not stabilized, discontinue purging. Record all efforts to stabilize the water quality for the well in the field book, and then collect samples as described below.

- After purging, disconnect the tubing to the inlet of the flow-through cell. Collect groundwater samples directly from the discharge end of the tubing (first volatile organic compounds [VOCs] then semi-volatile organic compounds [SVOCs]) and place into the sample containers as described in Section 3.0. The containers are to be labeled as described in Section 4.4 and put in an ice-filled cooler. The samples should be maintained at 4° +/- 2° C in the field and during transport.

- Once sampling is complete, remove the pump and tubing from the well. Disconnect the tubing and place it back in the well for reuse during the next sampling event. Dispose of any sample filters in a 55-gallon drum designated for disposable sampling materials and personal protective equipment.

- Decontaminate the pump, oil/water interface probe and flow-through cell as described in Section 4.3.

- In the project logbook and field data sheet, record all measurements (depth-to-water, depth-to-NAPL, water-quality parameters, turbidity), calculations (well volume) and observations.

4.4 Decontamination Procedures

Decontamination will be performed on plastic sheeting or other containment area that is deemed to prevent runoff to the ground. Prior to use on-site and between sampling locations, the hand trowel, pump, oil/water interface probe, and other non-disposable sampling equipment will be decontaminated using the following protocol:

1. Scrub using tap water / non-phosphate detergent mixture and bristle brush.
2. Rinse with tap water.
3. Repeat step 1 and 2
4. Final rinse with distilled water.
5. Air-dry the equipment.

4.5 Sampling Handling

4.5.1 Sample Identification

All samples collected will be identified using an alphanumeric code. The following table identifies the various sample identification scheme for the Site:

Sample Type	Prefix	Suffix 1	Suffix 2	Example
Soil Gas	SG	Sequential Number / Location	Depth (ft-bg)	SG-01 (0-3)
Post Excavation Soil Sample (Bottom Sample)	BS	Alphanumeric Grid Location/ Unique Identifier	Depth (ft-bg)	BS-A1 (20)
Post Excavation Soil Sample (Wall Sample)	SW[1] WW[2]	Distance From Origin located at the Southeast Corner of Grid Section A-1	Depth (ft-bg)	SW-30 (15) WW-30 (15)
Groundwater Sample (Monitoring Well)	MW	Well ID Number	--	MW-01

1-North Wall
2-West Wall

4.5.2 Sample Labeling and Shipping

All sample containers must contain the following information on the label:

- Project identification
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- Samplers initials

Collected and labeled samples will be placed in ice-filled coolers away from direct sunlight to await shipment/delivery to the laboratory. Samples will be maintained at 4° +/- 2° C in the field and during transport.

To prepare the samples for shipment place each sample in a sealable plastic bag. Finally, add fresh ice in two sealable plastic bags, or "blue ice" blocks, and the chain-of-custody (COC) form. Samples may be shipped overnight (e.g., via Federal Express) or transported by a laboratory courier. All coolers shipped to the laboratory will be sealed with mailing tape and a COC seal to ensure that the coolers remain sealed during delivery.

4.5.3 Sample Custody

Field personnel will be responsible for maintaining the sample coolers in a secured area until arrival at the laboratory. Sample possession record from the

time of obtainment in the field to the time of delivery to the laboratory or shipping off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; signatures of individuals involved in sample transfer; and the dates and times of transfers. Laboratory personnel will examine the custody seal's condition at sample check-in.

4.6 Field Instrumentation

Equipment will be calibrated at the start of each day of field work in accordance with the manufacturer's specifications. In the instance that an instrument fails calibration, the Project Manager or QA/QC Officer must be contacted immediately so as to arrange repairs or obtain a replacement instrument. A calibration log will be maintained on-site in the field book in order to record specific details regarding instrument calibration, including: dates, problems, and corrective actions. The PID will be calibrated each day using a standard of 100 parts per million (ppm) isobutylene, zeroed as per manufacturer specifications.

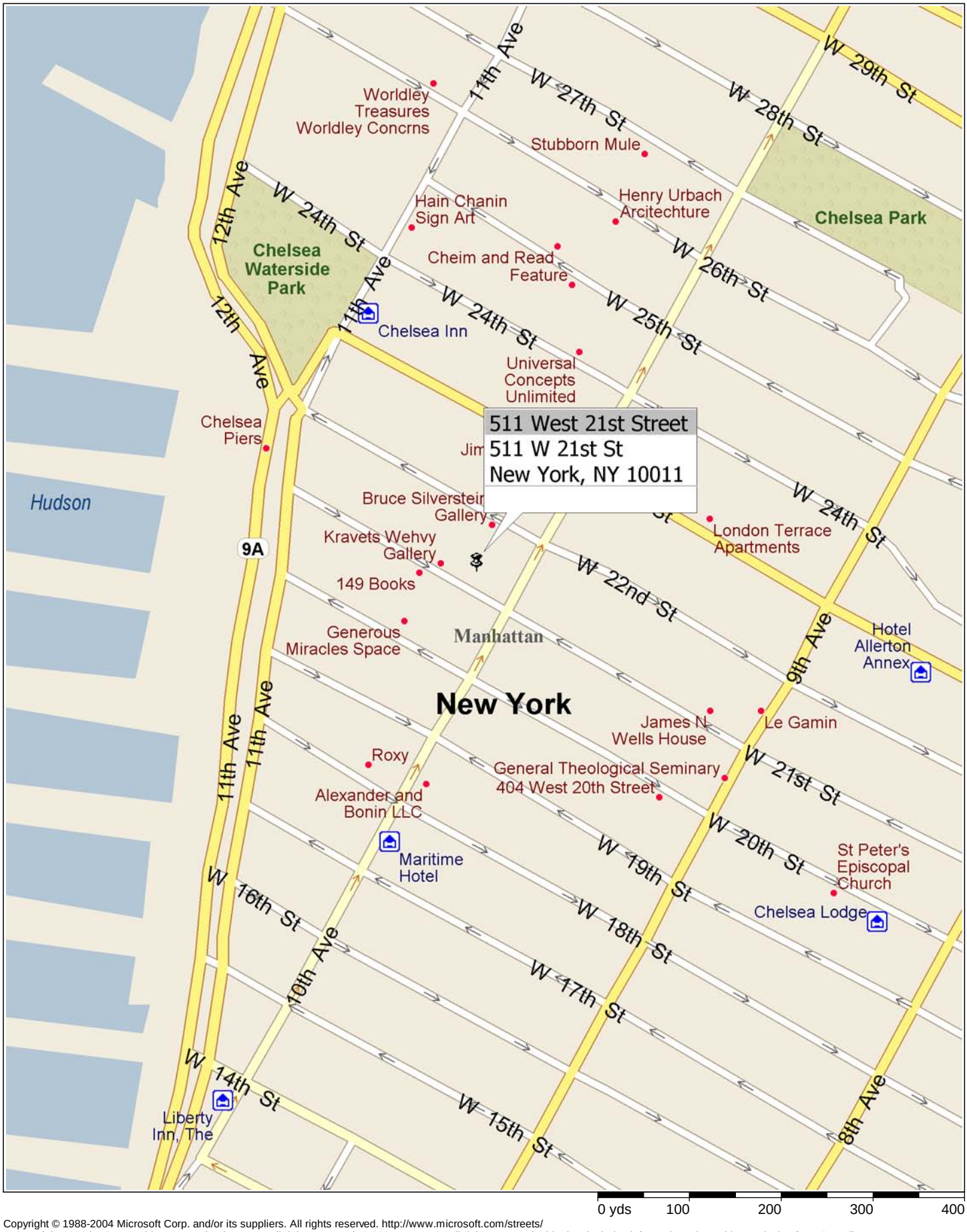
Field personnel will be trained in the proper operation of all field instruments at the start of the field program; however, instruction manuals for all equipment may be stored on-site as a reference of the proper procedures for operation, maintenance and calibration.

5.0 DATA VALIDATION

The sample analytical reports will undergo a third party review of the analyses conducted. The data validator will have the required qualifications as outlined in Appendix 2B in DER-10. The third party will produce a DUSR which will be submitted to the NYSDEC. Five percent of the soil and groundwater analytical data will undergo third party data review.

FIGURES

Site Location Map



TABLES

Table 1
Summary of Analytical Methods
511 West 21st Street
New York, New York

Sample Type	Sample Matrix	Analytical Parameter	No. of Samples[1]	Analytical Method	Sample Preservation	Holding Time[2]	Sample Container[3]
Soil Boring	Soil	TCL VOCS + 10 TICS	TBD	SW-846 Method 8260B	Cool to 4° C; no headspace	14 days to analysis	(2) 2 oz. glass jars
Soil Boring	Soil	TCL SVOCs + 20 TICS	TBD	SW-846 Method 9060A	Cool to 4° C	28 days to extraction	(1) 8 oz glass jar; H_2SO_4 to preserve
Soil Boring	Soil	Metals, TAL	TBD	SW-846 Method 6010B/7000 Series Hg –SW-846 7491A	Cool to 4° C	6 months to analysis	(1) 8 oz glass jar
Soil Boring	Soil	PCBs/Pesticides	TBD	SW-846 Method 8082 & 8081	Cool to 4° C	14 days to extraction	(1) 300 ml amber glass jar
Trip Blank	Aqueous	TCL VOCs	TBD	SW-846 Method 8260B	Cool to 4° C; no headspace, HCl	14 days to analysis	(2) 40mL VOA Vials
Groundwater	Aqueous	TCL VOCs + 10 TICs	TBD	SW-846 Method 8260B	Cool to 4° C; no headspace, HCl	14 days to analysis	(3) 40mL VOA Vials
Groundwater	Aqueous	TCL SVOCs + 20 TICs	TBD	EPA 200.7	Cool to 4° C	6 months	(1) 1 Liter amber glass jar w/HNO_3
Groundwater	Aqueous	TAL Metals	TBD	SW-846 Method 6010B/7000	Cool to 4° C HNO3	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 500 or 950 mL Polyethylene container

[1] Actual number of samples may vary depending on field conditions, sample material availability, and field observations

[2] From date of sample collection, based on SW-846 and consistent with NYSDEC ASP when assuming 2 days for sample shipping

TBD - To Be Determined

TCL – Target Compound List

TAL – Target Analyte List

Table 1 (Cont.)
Summary of Analytical Methods
511 West 21st Street
New York, New York

Sample Type	Sample Matrix	Analytical Parameter	No. of Samples[1]	Analytical Method	Sample Preservation	Holding Time[2]	Sample Container[3]
Waste Disposal/Post Excavation	Soil	TCL VOCS	TBD	SW-846 Method 8260B	Cool to 4° C; no headspace	7 days	(2) 2 oz. glass jars
Waste Disposal/Post Excavation	Soil	TCL SVOCs	TBD	SW-846 Method 8270	Cool to 4° C	14 days	(1) liter glass - amber
Waste Disposal/Post Excavation	Soil	Metals, TAL	TBD	SW-846 Method 6010B/7000 Series Hg –SW-846 7491A	Cool to 4° C	6 months	(1) 8 oz glass jar
Waste Disposal/Post Excavation	Soil	TCLP Metals	TBD	SW846	Cool to 4° C	28 days	(1) 8 oz glass jar
Waste Disposal/Post Excavation	Soil	Total Petroleum Hydrocarbons	TBD	SW846/8015	Cool to 4° C	14 days	(1) 8 oz glass jar
Trip Blank	Aqueous	VOCs, TCL	TBD	SW-846 Method 8260B	Cool to 4° C; no headspace, HCl	14 days	(2) 40mL VOA Vials

[1] – Actual number of samples may vary depending on field conditions, sample material availability and field observations.
[2] – From date of sample collection, based on SW-846 and consistent with NYSDEC ASP when assuming 2 days for sample shipping.
TBD – To Be Determined
TCL – Target Compound List
TAL – Target Analyte List

Table 2
Summary of Quality Control Samples
511 West 21st Street
New York, New York

Sample Type	Sample Matrix	Analytical Parameter	No. of QA/QC Samples
Trip Blank	Water	VOCs	1 per cooler
Duplicate	Soil/Water	VOC, Metals	1 per 20 samples
Equipment Blank	Water	VOC, Metals	1 per 20 samples per equipment type used

APPENDIX A

Accutest Quality Assurance/Quality Control Manual

Quality Systems Manual

Volume X, Revision II: March 2009

Effective Date: March 17, 2009

Document Control Number: 060

Vincent Pugliese, President

David Speis, Laboratory Director

Phillip Worby, Director, Quality Assurance

Nancy Cole, Technical Director - Inorganics

Wen Wen Chi, Technical Director - Organics

Accutest Laboratories
2235 U.S. Route 130

Dayton, New Jersey 08810
732.329.0200

Introduction

The Accutest Laboratories Quality Assurance System, detailed in this plan, has been designed to meet the quality program requirements of the National Environmental Laboratory Accreditation Conference (NELAC), ISO Guide 17025, ISO Guide 17011 and other National environmental monitoring programs. The plan establishes the framework for documenting the requirements of the quality processes regularly practiced by the Laboratory. The Quality Assurance Director is responsible for changes to the Quality Assurance Program, which are appended to the Quality System Manual (QSM) during the annual program review. The plan is also reviewed annually for compliance purposes by the Company President and Laboratory Director and edited if necessary. Changes that are incorporated into the plan are itemized in a summary of changes following the introduction. Plan changes are communicated to the general staff in a meeting conducted by the Director of Quality Assurance following the plan's approval.

The Accutest plan is supported by standard operating procedures (SOPs), which provide specific operational instructions on the execution of each quality element and assure that compliance with the requirements of the plan are achieved. Accutest employees are responsible for knowing the requirements of the SOPs and applying them in the daily execution of their duties. These documents are updated as changes occur and the staff is trained to apply the changes.

At Accutest, we believe that satisfying client requirements and providing a product that meets or exceeds the standards of the industry is the key to a good business relationship. However, client satisfaction cannot be guaranteed unless there is a system that assures the product consistently meets its design requirements and is adequately documented to assure that all procedural steps are executed, properly documented and traceable.

This plan has been designed to assure that this goal is consistently achieved and the Accutest product withstands the rigors of scrutiny that are routinely applied to analytical data and the processes that support its generation.

Summary of Changes
Accutest Laboratories Quality System Manual – January & March 2009

Section	Page	Description
---	---	Updated Volume Number, Revision Number and Date
		Revised Accutest Laboratories Organization Chart
2.1 & 2.2	7	Added California and Colorado as the 5th and 6th Operational Entity
3.3	14	Identification of samples and analytes in which manual integration had been necessary may be recorded in a report case narrative specific to a particular client and project requirement.
7.2	28	Added the frequency of calibration checks to working thermometers
9.4	36	Changed equilibration time for preservation from 16 to 24 hours
12.2	47	Target analyte(s) in method blanks at concentrations no greater than one-half of the reporting limit concentrations (metals) may be requested on a client or project specific basis.
12.2	47	Laboratory Control Samples (LCS) or Blank Spikes - All target components are included in the spike mixture over a two year period.
12.2	48	A copy of this summary shall be submitted to the NELAC Primary Accrediting Authority, NJDEP Office of Quality Assurance for review.
12.3	49	Laboratory Spikes and Spiked Duplicates - All target components are included in the spike mixture over a two year period.

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Appendices

1.0 QUALITY POLICY

1.1 ***Accutest Mission***:

Accutest Laboratories provides analytical services to commercial and government clients in support of environmental monitoring and remedial activities as requested. The Laboratory's mission is dedicated to providing reliable data that satisfies client's requirements as explained in the following:

"Provide easy access, high quality, analytical support to commercial and government clients which meets or exceeds data quality objectives and provides them with the data needed to satisfy regulatory requirements and/or make confident decisions on the effectiveness of remedial activities."

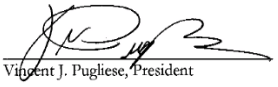
These services are provided impartially and are not influenced by undue commercial or financial pressures which might impact the staff's technical judgment. Coincidently, Accutest does not engage in activities that endanger the trust in our independent judgment and integrity in relation to the testing activities performed.

1.2 ***Policy Statement***:

The management and staff of Accutest Laboratories share the responsibility for product quality. Accordingly, Accutest's quality assurance program is designed to assure that all processes and procedures, which are components of environmental data production, meet established industry requirements, are adequately documented from a procedural and data traceability perspective, and are consistently executed by the staff. It also assures that analytical data of known quality, meeting the quality objectives of the analytical method in use and the data user's requirements, is consistently produced in the laboratory. This assurance enables the data user to make rational, confident, cost-effective decisions on the assessment and resolution of environmental issues.

The laboratory Quality System also provides the management staff with data quality and operational feedback information. This enables them to determine if the laboratory is achieving the established quality and operational standards, which are dictated by the client or established by regulation. The information provided to management, through the QA program, is used to assess operational performance from a quality perspective and to perform corrective action as necessary.

All employees of Accutest Laboratories participating in environmental testing receive quality system training and are responsible for knowing and complying with the system requirements. The entire staff shares Accutest's commitment to good professional practice.



Vincent J. Pugliese, President

March 17, 2009
Date

2.0 ORGANIZATION

2.1 ***Organizational Entity***. Accutest Laboratories is a privately held, independent testing laboratory founded in 1956 and registered as a New Jersey Corporation. The headquarters are located in Dayton, New Jersey where it has conducted business since 1987. Satellite laboratories are maintained in Marlborough, Massachusetts; Orlando, Florida, Houston, Texas, Santa Clara, California and Wheat Ridge, Colorado.

2.2 ***Management Responsibilities***

Requirement. Each laboratory facility has an established chain of command. The duties and responsibilities of the management staff are linked to the President/CEO of Accutest Laboratories who establishes the agenda for all company activities.

President/CEO. Primary responsibility for all operations and business activities. Delegates authority to laboratory directors, general managers, and the quality assurance director to conduct day to day operations and execute quality assurance duties. Each of the six operational entities (New Jersey, Florida, Massachusetts, Texas, California and Colorado) report to the President/CEO.

Vice President Operations/Laboratory Director. Executes day to day responsibility for laboratory operations including technical aspects of production activities and associated logistical procedures. Reports directly to the President/CEO.

Quality Assurance Director. Design, oversight, and facilitation responsibility for all Quality System elements identified in the Quality Program. Reports directly to the President/CEO.

Technical Directors (Organics/Inorganic). Responsible for day to day operations and activities of the organics and inorganics laboratories including scheduling, production and data quality. Reports directly to the Laboratory Director.

Department Managers. Executes day to day responsibility for specific laboratory areas including technical aspects of production activities and associated logistical procedures. Direct report to the laboratory director.

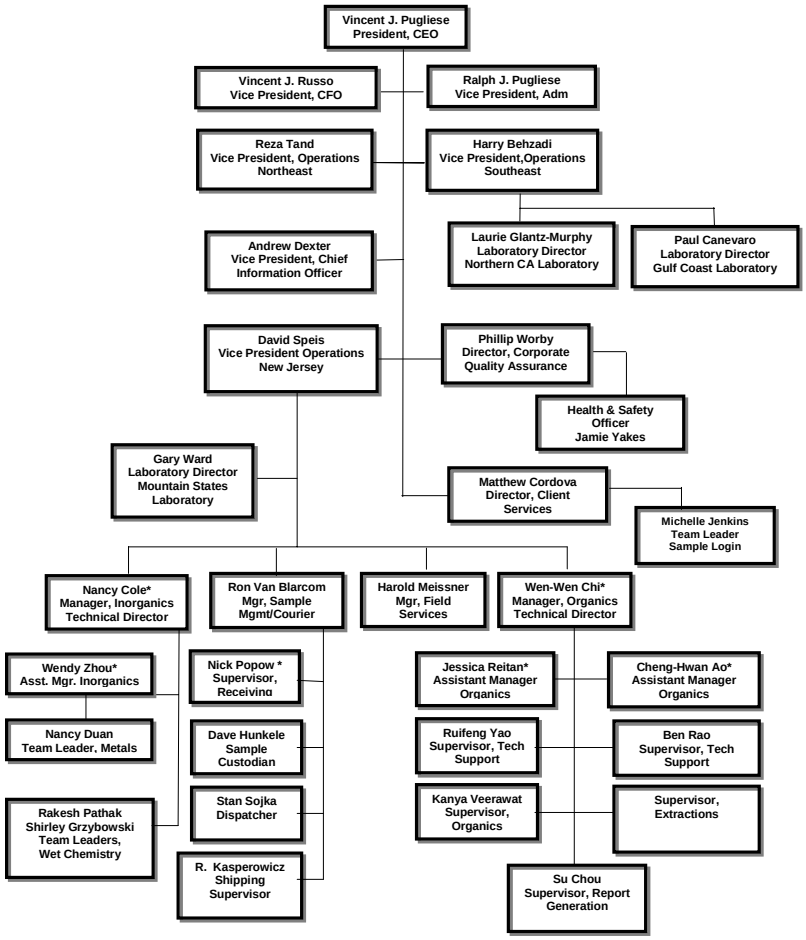
Section Supervisors. Executes day to day responsibility for specific laboratory units including technical aspects of production activities and associated logistical procedures. Direct report to the Department Manager.

2.3 ***Chain of Command***

The responsibility for managing all aspects of the Company's operation is delegated to specific individuals, who have been assigned the authority to act in the absence of the senior staff. These individuals are identified in the following Chain of Command:

Vince Pugliese; President and Chief Executive Officer
Vince Russo; Chief Financial Officer
David Speis; Vice President Laboratory Operations & Laboratory Director
Matt Cordova, Director, Client Services

Accutest Laboratories Organization Chart



3.0 QUALITY RESPONSIBILITIES OF THE MANAGEMENT TEAM

3.1 ***Requirement***. Each member of the management team has a defined responsibility for the Quality System. System implementation and operation is designated as an operational management responsibility. System design and implementation is designated as a Quality Assurance Responsibility.

President/CEO. Primary responsibility for all quality activities. Delegates program responsibility to the Quality Assurance Director. Serves as the primary alternate in the absence of the Quality Assurance Director. Has the ultimate responsibility for implementation of the Quality System.

Vice President Operations/Laboratory Director. Responsible for implementing and operating the Quality System in all laboratory areas. Responsible for the design and implementation of corrective action for defective processes. Has the authority to delegate Quality System implementation responsibilities.

Quality Assurance Director. Responsible for design, implementation support, training, and monitoring of the quality system. Identifies product, process, or operational defects using statistical monitoring tools and processes audits for elimination via corrective action. Empowered with the authority to halt production if quality issues warrant immediate action. Monitors implemented corrective actions for compliance.

Technical Directors. Responsible for overseeing the technical aspects of the quality assurance system as they are integrated into method applications and employed to assess analytical control on a daily basis. The Technical directors review and acknowledge the technical feasibility of proposed QA systems involving technical applications of applied methodology.

Department Managers. Responsible for applying the requirements of the Quality System in their section and assuring subordinate supervisors and staff apply all system requirements. Initiates, designs, documents, and implements corrective action for quality deficiencies.

Section Supervisors & Team Leaders. Responsible for applying the requirements of the Quality System to their operation and assuring the staff applies all system requirements. Initiates, designs, documents, and implements corrective action for quality deficiencies.

Quality Assurance Officers. Responsible for design support, implementation support, training, and monitoring support for the quality system. Conducts audits and product reviews to identify product, process, or operational defects using statistical monitoring tools and processes audits for elimination via corrective action. Provides monitors support for implemented corrective actions for compliance.

Bench Analysts. Responsible for applying the requirements of the Quality System to the analyses they perform, evaluating QC data and initiating corrective action for quality control deficiencies within their control. Implements global corrective action as directed by superiors.

3.2 ***Program Authority***. Authority for program implementation originates with the President/CEO who bears the ultimate responsibility for system design, implementation, and enforcement of requirements. This authority and responsibility is delegated to the Director of Quality Assurance who performs quality functions independently without the encumbrances or biases associated with operational or production responsibilities to ensure an honest, independent assessment of quality issues.

3.3 ***Data Integrity Policy***. The Accutest Data Integrity Policy reflects a comprehensive, systematic approach for assuring that data produced by the laboratory accurately reflects the outcome of the tests performed on field samples and has been produced in a bias free environment by ethical professionals. The policy includes a commitment to technical ethics, staff training in ethics and data integrity, an individual attestation to data integrity and procedures for evaluating data integrity. Senior management assumes the responsibility for assuring compliance with all technical ethics elements and operation of all data integrity procedures. The staff is responsible for compliance with the ethical code of conduct and for practicing data integrity procedures.

The Accutest Data Integrity Policy is as follows:

"Accutest Laboratories is committed to producing data that meets the data integrity requirements of the environmental regulatory community. This commitment is demonstrated through the application of a comprehensive data integrity program that includes ethics and data integrity training, data integrity evaluation procedures, staff participation and management oversight. Adherence to the specifications of the program assures that data provided to our clients is of the highest possible integrity and can be used for decision making processes with high confidence."

Data Integrity Responsibilities

Management. Senior management retains oversight responsibility for the data integrity program and retains ultimate responsibility for execution of the data integrity program elements. Senior management is responsible for providing the resources required to conduct ethics training and operate data integrity evaluation procedures. They also include responsibility for creating an environment of trust among the staff and being the lead advocate for promoting the data integrity policy and the importance of technical ethics. The Quality Assurance Director is the designated ethics officer for the Company.

Staff. The staff is responsible for adhering to the company ethics policy as they perform their duties and responsibilities associated with sample analysis and reporting. By executing this responsibility, data produced by Accutest Laboratories retains its high integrity characteristics and withstands the rigors of all data integrity checks.

The staff is also responsible for adhering to all laboratory requirements pertaining to manual data edits, data transcription and data traceability. These include the application of approved manual peak integration and documentation procedures. It also includes establishing traceability for all manual results calculations and data edits.

Ethics Statement. The Accutest ethics statement reflects the standards that are expected for businesses that provide environmental services to regulated entities and regulatory agencies on a commercial basis. The Ethics Policy is comprised of key elements that are essential to organizations that perform chemical analysis for a fee. As such, it focuses on elements related to personal, technical and business activities.

Accutest Laboratories provides analytical chemistry services on environmental matters to the regulated community. The data the company produces provides the foundation for determining the risk presented by a chemical pollutant to human health and the environment. The environmental industry is dependent upon the accurate portrayal of environmental chemistry data. This process is reliant upon a high level of scientific and personal ethics.

It is essential to the Company that each employee understands the ethical and quality standards required to work in this industry. Accordingly, Accutest has adopted a code of ethics, which each employee is expected to adhere to as follows:

- Perform chemical and microbiological analysis using accepted scientific practices and principles.
- Perform tasks in an honest, principled and incorruptible manner inspiring peers & subordinates.
- Maintain professional integrity as an individual.
- Provide services in a confidential, honest, and forthright manner.
- Produce results that are accurate and defensible.
- Report data without any considerations of self-interest.
- Comply with all pertinent laws and regulations associated with assigned tasks and responsibilities.

Data Integrity Procedures. Four key elements comprise the Accutest data integrity system. Procedures have been implemented for conducting data integrity training and for documenting that employees conform to the Accutest Data Integrity and Ethics policy.

The data integrity program consists of routine data integrity evaluation and documentation procedures to periodically monitor and document data integrity. These procedures are

documented as SOPs. SOPs are approved and reviewed annually following the procedures employed for all Accutest SOPs. Documentation associated with data integrity evaluations is maintained on file and is available for review.

Data Integrity Training. Accutest employees receive technical ethics training during new employee orientation. Employees are also required to refresh their ethical conduct agreement annually, which verifies their understanding of Accutest's ethics policy and their ethical responsibilities. A brochure summarizing the details of the Accutest Data Integrity Policy is distributed to all employees with the Ethical Conduct Agreement. The refreshed agreement is appended to each individual's training file.

The training focuses on the reasons for technical ethic training, explains the impact of data fraud on human health and the environment, and illustrates the consequences of criminal fraud on businesses and individual careers. Accutest's ethics policy and code of ethics are reviewed and explained for each new employee.

Training on data integrity procedures are conducted by individual departments for groups involved in data operations. These include procedures for manual chromatographic peak integration, traceability for manual calculations and data transcription.

Data Integrity Training Documentation. Records of all data integrity training are maintained in individual training folders. Attendance at all training sessions is documented and maintained in the training archive.

Accutest Data Integrity and Ethical Conduct Agreement. All employees are required to sign a Data Integrity and Ethical Conduct Agreement annually. This document is archived in individual training files, which are retained for duration of employment.

The Data Integrity and Ethical Conduct Agreement is as follows**:**

I. I understand the high ethical standards required of me with regard to the duties I perform and the data I report in connection with my employment at Accutest Laboratories.

II. I have received formal instruction on the code of ethics that has been adapted by Accutest Laboratories during my orientation and agree to comply with these requirements.

III. I have received formal instruction on the elements of Accutest Laboratories' Data Integrity Policy and have been informed of the following specific procedures:

a. Formal procedures for the confidential reporting of data integrity issues are available, which can be used by any employee,

b. A data integrity investigation is conducted when data issues are identified that may negatively impact data integrity.

c. *Routine data integrity monitoring is conducted on sample data, which may include an evaluation of the data I produce,*

IV. *I have read the brochure detailing Accutest Laboratories Data Integrity and Ethics Program as required.*

V. *I am aware that data fraud is a punishable crime that may include fines and/or imprisonment upon conviction.*

VI. *I also agree to the following:*

a. *I shall not intentionally report data values, which are not the actual values observed or measured.*

b. *I shall not intentionally modify data values unless the modification can be technically justified through a measurable analytical process.*

c. *I shall not intentionally report dates and times of data analysis that are not the true and actual times the data analysis was conducted.*

d. *I shall not condone any accidental or intentional reporting of inauthentic data by other employees and immediately report it's occurrence to my superiors.*

e. *I shall immediately report any accidental reporting of inauthentic data by myself to my superiors.*

Data Integrity Monitoring. Documented procedures are employed for performing data integrity monitoring. These include regular data review procedures by supervisory and management staff (Section 12.7), supervisory review and approval of manual integrations and periodic reviews of GALP audit trails from the LIMS and all computer controlled analysis.

Data Review. All data produced by the laboratory undergoes several levels of review, which includes two levels of management review. Detected data anomalies that appear to be related to data integrity issues are isolated for further investigation. The investigation is conducted following the procedures described in this section.

Manual Peak Integration Review and Approval. Routine data review procedures for all chromatographic processes includes a review of all manual chromatographic peak integrations. This review is performed by the management staff and consists of a review of the machine integration compared to the manual integration. Manual integrations, which have been performed in accordance with Accutest's manual peak integration procedures, are approved for further processing and release. Identification of samples and analytes in which manual integration had been necessary may be recorded in a report case narrative specific to a particular client and project requirement.

Manual integrations which are not performed to Accutest's specifications are set aside for corrective action, which may include analyst retraining or further investigation as necessary.

GALP Audit Trail Review. Good Automated Laboratory Practice (GALP) audits are comprehensive data package audits that include a review of raw data, process logbooks, processed data reports and GALP audit trails from individual instruments and LIMS. GALP audit trails, which record all electronic data activities, are available for the majority of computerized methodology and the laboratory information management system (LIMS). These audit trails are periodically reviewed to determine if interventions performed by technical staff constitute an appropriate action. The review is performed on a recently completed job and includes interviews with the staff who performed the analysis. Findings indicative of inappropriate interventions or data integrity issues are investigated to determine the cause and the extent of the anomaly.

Confidential Reporting Of Data Integrity Issues. Data integrity concerns may be raised by any individual to their supervisor. Employees with data integrity concerns should always discuss those concerns with their immediate supervisors as a first step unless the employee is concerned with the confidentiality of disclosing data integrity issues or is uncomfortable discussing the issue with their immediate supervisors. The supervisor makes an initial assessment of the situation to determine if the concern is related to a data integrity violation. Those issues that appear to be violations are documented by the supervisor and referred to the Director of Quality Assurance for investigation.

Documented procedures for the confidential reporting of data integrity issues in the laboratory are part of the data integrity policy. These procedures assure that laboratory staff can privately discuss ethical issues or report items of ethical concern without fears of repercussions with senior staff.

Employees with data integrity concerns that they consider to be confidential are directed to the Corporate Human Resources Manager in Dayton, New Jersey. The HR Manager acts as a conduit to arrange a private discussion between the employee and the Corporate QA Director or a local QA Officer.

During the employee - QA discussion, the QA representative evaluates the situation presented by the employee to determine if the issue is a data integrity concern or a legitimate practice. If the practice is legitimate, the QA representative clarifies the process for the employee to assure understanding. If the situation appears to be a data integrity concern, the QA representative initiates a Data Integrity Investigation following the procedures specified in SOP EQA059.

Data Integrity Investigations. Follow-up investigations are conducted for all reported instances of ethical concern related to data integrity. Investigations are performed in a confidential manner by senior management according to a documented procedure. The outcome of the investigation is documented and reported to the company president who has the ultimate responsibility for determining the final course of action in the matter. Investigation documentation includes corrective action records, client notification information and disciplinary action outcomes, which is archived for a period of five years.

The investigations are conducted by the senior staff and supervisory personnel from the affected area. The investigations team includes the Laboratory Director and the Quality Assurance Director. Investigations are conducted in a confidential manner until it is completed and resolved.

The investigation includes a review of the primary information in question by the investigations team. The team performs a review of associated data and similar historical data to determine if patterns exist. Interviews are conducted with key staff to determine the reasons for the observed practices.

Following data compilation, the investigations team reviews all information to formulate a consensus conclusion. The investigation results are documented along with the recommended course of action.

Corrective Action, Client Notification & Discipline. Investigations that reveal systematic data integrity issues will be referred for corrective action, resolution and disposition (Section 13). If the investigation indicates that an impact to data has occurred and the defective data has been released to clients, client notification procedures will be initiated following the steps in Section 17.6.

In all cases of data integrity violations, some level of disciplinary action will be conducted on the responsible individual. The level of discipline will be consistent with the violation and may range from retraining and/or verbal reprimand to termination. A zero tolerance policy is in effect for unethical actions.

4.0 JOB DESCRIPTIONS OF KEY STAFF

4.1 ***Requirement***: Descriptions of key positions within the organization are defined to ensure that clients and staff understand duties and the responsibilities of the management staff and the reporting relationships between positions.

President/Chief Executive Officer. Responsible for all laboratory operations and business activities. Establishes the company mission and objectives in response to business needs. Direct supervision of the Vice President of Operations, each laboratory director, client services, management information systems, quality assurance and health and safety.

Vice President, Operations/Laboratory Director. Reports to the company president. Establishes laboratory operations strategy. Direct supervision of organic chemistry, inorganic chemistry, field services, and sample management. Operational responsibility for Orlando, Florida, Marlborough, Massachusetts and Houston, Texas laboratories. Assumes the responsibilities of the CEO in his absence.

Vice President, Chief Information Officer. Reports to the company president. Develops the IT software and hardware agenda. Provides system strategies to compliment company objectives. Maintains all software and hardware used for data handling.

Director, Quality Assurance. Reports to the company president. Establishes the company quality agenda, develops quality procedures, provides assistance to operations on quality procedure implementation, coordinates all quality control activities, monitors the quality system, provides quality system feedback to management to be used for process improvement and oversees health and safety. Assumes the responsibilities of the CEO in the absence of the CEO and the Vice President Operations.

Director Client Services. Reports to the company president. Establishes and maintains communications between clients and the laboratory pertaining to client requirements which are related to sample analysis and data deliverables. Initiates client orders and supervises sample login operations.

Manager, Organics (Organics Technical Director). Reports to the laboratory director. Directs the operations of the organics group, consisting of organics preparation and instrumental analysis. Establishes daily work schedule. Supervises method implementation, application, and data production. Responsible for following Quality System requirements. Maintains laboratory instrumentation in an operable condition. Assumes the responsibilities of the Vice President Operations in his absence.

Manager, Inorganics (Inorganics Technical Director). Reports to the laboratory director. Directs the operations of the inorganics group, consisting of wet chemistry and the metals laboratories. Establishes daily work schedule. Supervises method implementation, application, and data production. Responsible for following Quality System requirements. Maintains laboratory instrumentation in an operable condition. Assumes the responsibilities of the Vice President Operations in his absence.

Manager, Field Services. Reports to the laboratory director. Conducts field sampling and analysis of "analyze immediately" parameters in support of ongoing field projects. Responsible for proper collection, preservation, documentation and shipment of field samples. Maintains field sampling and field instrumentation required to perform primary responsibilities.

Manager, Sample Management. Reports to the laboratory director. Develops, maintains and executes all procedures required for receipt of samples, verification of preservation, and chain of custody documentation. Responsible for maintaining and documenting secure storage, delivery of samples to laboratory units on request and courier services.

Health & Safety Officer. Reports to the Director of Quality Assurance. Responsible for developing company safety program and chemical hygiene plan. Reviews and updates these plans annually. Responsible for employee training on relevant health and safety topics. Documents employee training. Manages laboratory waste management program.

Supervisor, Wet Chemistry. Reports to the inorganics manager. Executes daily analysis schedule. Supervises the analysis of samples for wet chemistry parameters using valid, documented methodology. Maintains instrumentation in an operable condition. Reviews data for compliance to quality and methodological requirements. Assumes the responsibilities of the Inorganics Manager in his absence.

Supervisor, Metals. Reports to the inorganics manager. Executes daily analysis schedule. Supervises the analysis of samples for metallic elements using valid, documented methodology. Documents all procedures and data production activities. Maintains instrumentation in an operable condition. Reviews data for compliance to quality and methodological requirements.

Supervisor, Organic Preparation. Reports to the organics manager. Executes the daily sample preparation schedule. Performs the extract of multi-media samples for organic constituents using valid, documented methodology. Prepares documentation for extracted samples. Assumes custody until transfer for analysis.

Technical Support Supervisor, Organics. Reports to the organic manager. Oversees all instrument maintenance and new equipment installation. Conducts method development and implementation tasks.

Assistant Manager, Organics. Reports to the organics manager. Expedites the analysis of samples and sample extracts. Executes daily analysis schedule. Supervises the analysis of samples for organic parameters using valid, documented methodology. Documents all data and data production activities. Maintains instrumentation in an operable condition. Reviews data for compliance to quality and methodological requirements. Assumes the responsibilities of the Organics Manager in his absence.

Supervisor, Report Generation. Reports to the organics manager. Compiles raw and processed sample data and assembles into client-ready reports. Initiates report scanning for archiving purposes. Maintains raw batch data in accessible storage. Mails completed reports to clients according to specified report turnaround schedule.

Quality Assurance Officers. Reports to the Director, Quality Assurance. Performs quality control data review for trend monitoring purposes. Conducts internal audits and prepares reports for management review. Oversees proficiency testing program. Process quality control data for statistical purposes. Assumes the responsibilities of the Quality Assurance Director in his absence.

4.2 ***Employee Screening, Orientation, and Training***.

All potential laboratory employees are screened and interviewed by human resources and technical staff prior to their hire. The pre-screen process includes a review of their qualifications including education, training and work experience to verify that they have adequate skills to perform the tasks of the job.

Newly hired employees receive orientation training beginning the first day of employment by the Company. Orientation training consists of initial health and safety training including general laboratory safety, personal protection and building evacuation. Orientation also includes quality assurance program training, data integrity training, and an overview of the Company's goals, objectives, mission, and vision.

All technical staff receives training to develop and demonstrate proficiency for the methods they perform. New analysts work under supervision until the supervisory staff is satisfied that a thorough understanding of the method is apparent and method proficiency has been demonstrated, through a precision and accuracy study that has been documented, reviewed and approved by the QA Staff. Data from the study is compared to method acceptance limits. If the data is unacceptable, additional training is required. The analyst may also demonstrate proficiency by producing acceptable data through the analysis of an independently prepared proficiency sample.

Individual proficiency is demonstrated annually for each method performed. Data from initial and continuing proficiency demonstrations are archived in the individual's training folder.

4.3 ***Training Documentation***. The human resources department prepares a training file for every new employee. All information related to qualifications, experience, external training courses, and education are placed into the file. Verification documentation for orientation, health & safety, quality assurance, and ethics training is also included in the file.

Additional training documentation is added to the file as it is developed. This includes documentation of SOP understanding, data for initial and continuing demonstrations of proficiency, performance evaluation study data and notes and attendance lists from group training sessions.

The Quality Assurance Department maintains the employee training database. This database is a comprehensive inventory of training documentation for each individual employee. The database enables supervisors to obtain current status information on training data for

individual employees on a job specific basis. It also enables the management staff to identify training documentation in need of completion.

Employee specific database records are created by human resources on the date of hire. Data base fields for job specific requirements such as SOP documentation of understanding and annual demonstration of analytical capability are automatically generated when the supervisor assigns a job responsibility. Employees acknowledge that their SOP responsibilities have been satisfied using a secure electronic process which updates the database record. Reports are produced which summarize the qualifications of individual employees or departments.

5.0 SIGNATORY APPROVALS

Requirement. Procedures have been developed for establishing the traceability of data and documents. The procedure consists of a signature hierarchy, indicating levels of authorization for signature approvals of data and information within the organization. Signature authority is granted for approval of specific actions based on positional hierarchy within the organization and knowledge of the operation that requires signature approval. A log of signatures and initials of all employees is maintained by the HR Staff for cross-referencing purposes.

5.1 *Signature Hierarchy*

President/Chief Executive Officer. Authorization for contracts and binding agreements with outside parties. Approval of final reports, quality assurance policy, SOPs, project specific QAPs, data review and approval in lieu of technical managers. Note: Contract signature authority resides with Company officers only, which include the President/CEO, Chief Financial Officer and Vice President Administration.

Vice President, Operations/Laboratory Director. Approval of final reports and quality assurance policy in the absence of the President. Approval of SOPs, project specific QAPs, data review and approval in lieu of technical managers. Establishes and implements technical policy.

Vice President, Chief Information Officer. Department specific supplies purchase. MIS policy.

Director, Quality Assurance. Approval of final reports and quality assurance policy in the absence of the President. Approval of SOPs, project specific QAPs, data review and approval in lieu of technical managers.

Director, Client Services. QAP and sampling and analysis plan approval. Project specific contracts, pricing, and price modification agreements. Approval and acceptance of incoming work, Client services policy.

Managers, Technical Departments. Methodology and department specific QAPs. Data review and approval, department specific supplies purchase. Technical approval of SOPs.

Manager, Sample Management. Initiation of laboratory sample custody and acceptance of all samples. Approval of department policies and procedures. Department specific supplies purchase.

Manager, Health & Safety. Approval of health and safety policy in the absence of the President and QA Director. Approval of health and safety SOPs. Waste manifesting and approval.

Assistant Managers: Technical Departments. Data review approval, purchasing of expendable supplies.

Supervisor, Field Services. Sampling plan design and approval. Data review for field parameters. State form certification. Department policies and procedures. Department specific supplies purchase.

Supervisors, Technical Departments. Data review approval, purchasing of expendable supplies.

5.2 ***Signature Requirements***. All laboratory activities related to sample custody and generation or release of data must be approved using either initials, signatures or electronic, password protected procedures. The individual, who applies his signature initial or password to an activity or document, is authorized to do so within the limits assigned to them by their supervisor. All written signatures and initials must be applied in a readable format that can be cross-referenced to the signatures and initials log if necessary.

5.3 ***Signature and Initials Log***. The HR group maintains a signature and initials log. New employee signatures and initials are appended to the log on the first day of employment. Signature of individuals no longer employed by the company are retained, but annotated with their date of termination.

6.0 DOCUMENTATION & DOCUMENT CONTROL

Requirement. Document control policies have been established which specify that any document used as an information source or for recording analytical or quality control information must be managed using defined document control procedures. Accordingly, policies and procedures required for the control, protection, and storage of any information related to the production of analytical data and the operation of the quality system to assure its integrity and traceability have been established and implemented in the laboratory. The system contains sufficient controls for managing, archiving and reconstructing all process steps which contributed to the generation of an analytical test result. Using this system, an audit trail for reported data can be produced, establishing complete traceability for the result.

6.1 ***Administrative Records***. Administrative (non-analytical) records are managed by the quality assurance department. These records consist of electronic documents which are retained in a limited access electronic directory or paper documents, which are released to the technical staff upon specific request.

Form Generation, Modification & Control. The quality assurance group approves and manages all forms used as either stand-alone documents or in logbooks to ensure their traceability. Forms are generated as computer files only and are maintained in a limited access master directory. The QA staff also manages and approves modifications to existing forms. Obsolete editions of modified forms are retained for seven years.

Approved forms are assigned a 5-character alphanumeric code. The first two alpha characters designate the department that uses the form; the next three digits are sequentially assigned number.

New forms must include the name Accutest Laboratories and appropriate spaces for signatures of approval and dates. Further design specifications are the responsibility of the originating department.

The technical staff is required to complete all forms to the maximum extent possible. If information for a specific item is unavailable, the analyst is required to "Z" the information block. The staff is also required to "Z" the uncompleted portions of a logbook or logbook form if the day's analysis does not fill the entire page of the form.

Logbook Control. All laboratory logbooks are controlled documents that are comprised of approved forms used to document specific processes. New logs are numbered and issued to a specific individual who is assigned responsibility for the log. Old logs are returned to QA for entry into the document archive system where they are retained for seven (7) years. Laboratory staff may hold a maximum of two consecutively dated logbooks of the same type in the laboratory including the most recently issued book to simplify review of recently completed analysis.

Controlled Documents. Key laboratory documents that are distributed internally and externally are numbered for tracking purposes. Individuals receiving documents, who must be

informed when changes occur receive controlled copies of those documents. Controlled status simplifies document updates and retrieval of outdated documents. Control is maintained through a document numbering procedure and document control logbook which identifies the individual receiving the controlled document and the date of receipt. Key documents are also distributed as uncontrolled documents if the recipient does not require updated copies when changes occur. Key documents in uncontrolled status are numbered and tracked using the same procedures as controlled documents.

Quality Systems Manual (QSM). All QSMs are assigned a number prior to distribution. The number, date of distribution, and identity of the individual receiving the document are recorded in the document control logbook. The numbering system is restarted with each new volume, which corresponds to the annual revision of the QSM. Electronic versions are distributed as read only files that are password protected.

Standard Operating Procedures (SOPs). SOPs are maintained by pre-designating the numbers of official copies of documents that are placed into circulation within the laboratory. Official documents are copied to green paper and placed into the appropriate laboratory section as follows:

Administrative: One master copy for the administrative file.

Sample Management: One controlled green copy for the sample management file.

Organics Laboratories: Two controlled green copies, one for the affected laboratory area, and one for the organics laboratory file.

Inorganics Laboratories: Two controlled green copies, one for the affected laboratory area, and one for the inorganics laboratory file.

Field Services: One controlled green copy for each field sampling team (generally a single field technician).

The original, signed copy of the SOP is maintained in the master SOP binder by the QA staff. The QA staff collects outdated versions of SOPs as they are replaced and archived for a period of seven (7) years in the QA archives. Electronic versions of outdated SOPs are moved from the active SOP directory to the inactive directory.

6.2 ***Technical Records***. All records related to the analysis of samples and the production of an analytical result are archived in secure document storage or on electronic media and contain sufficient detail to produce an audit trail which re-creates the analytical result. These records include information related to the original client request, bottle order, sample login and custody, storage, sample preparation, analysis, data review and data reporting.

Each department involved in this process maintains controlled documents which enable them to maintain records of critical information relevant to their department's process.

6.3 ***Quality Control Support Data & Records***. All information and data related to the quality system is stored in a restricted access directory on the network server. Information on this directory is backed-up daily. Users of the quality assurance information and data have "read-only" access to the files contained in the directory. The QA staff and the laboratory director have write capability in this directory.

This directory contains all current and archived quality system manuals, SOPs, control limits, MDL studies, precision and accuracy data, official forms, internal audit reports, proficiency test scores and metrics calibration information.

The following information is retained in the directory:

Quality System Manuals	Inactive Standard Operating Procedures
Standard Operating Procedures	Method Detection Limit Data
ASTM & NIST Methods	Metrics Inventory & Calibration Data
Bottleware & Preservative QC Data	Microbiology Reagent Data
Certification Documentation	Performance Limits
Change Management Data	Proficiency Test Scores & Statistics
External Audit Reports	Project Specific Analytical Requirements
Internal Audit Reports	QC Report Reviews
Corrective Action Database	Regulatory Agency Quality Documents
Laboratory Forms Directory	Staff Bios And Job Descriptions
Health & Safety Manuals	State Specific Methods

6.4 ***Analytical Records***. All data related to the analysis of field samples are retained as either paper or electronic records that can be retrieved to compile a traceable audit trail for any reported result. All information is linked to the client job and sample number, which serves as a reference for all sample related information tracking.

Critical times in the life of the sample from collection through analysis to disposal are documented. This includes date and time of collection, receipt by the laboratory, preparation times and dates, analysis times and dates and data reporting information. Analysis times are calculated in hours for methods where holding time is specified in hours (≤72 hours).

Sample preparation information is recorded in a separate controlled logbook. It includes sample identification numbers, types of analysis, preparation and cleanup methods, sample weights and volumes, reagent lot numbers and volumes and any other information pertinent to the preparation procedure.

Information related to the identification of the instrument used for analysis is permanently attached to the electronic record. The record includes an electronic data file that indicates all instrument conditions employed for the analysis, including the type of analysis conducted. The analyst's identification is electronically attached to the record. The instrument tuning and calibration data is electronically linked to the sample or linked though paper logs which were used in the documentation of the analysis. Quality control and performance criteria are permanently linked to the paper archive or electronic file.

Paper records for the identity, receipt, preparation and evaluation of all standards and reagents used in the analysis are documented in prepared records and maintained in controlled documents or files. Lot number information linking these materials to the analysis performed is recorded in the logbooks associated with the samples in which they were used.

Manual calculations or peak integrations that were performed during the data review are retained as paper or scanned documents and included as part of the electronic archive. Signatures for data review are retained on paper or as scanned versions of the paper record for the permanent electronic file.

6.5 ***Confidential Business Information (CBI).*** Operational documents including SOPs, Quality Manuals, personnel information, internal operations statistics, and laboratory audit reports are considered confidential business information. Strict controls are placed on the release of this information to outside parties.

Release of CBI to outside parties or organizations may be authorized upon execution of a confidentiality agreement between Accutest and the receiving organization or individual. CBI information release is authorized for third party auditors and commercial clients in electronic mode as Adobe Acrobat .PDF format only.

6.6 ***Software Change Documentation & Control.*** Changes to software are documented as text within the code of the program undergoing change. Documentation includes a description of the change, reason for change and the date the change was placed into effect. Documentation indicating the adequacy of the change is prepared following the evaluation by the user who requested the change.

6.7 ***Report and Data Archiving*** Accutest Laboratories produces digital files of all raw and processed data which is maintained for a minimum period of seven (7) years. The archived files consist of all raw data files and source documents associated with the analysis of field samples and proficiency test samples. Data files and source documents associated with method calibration and project and method quality control are also archived. After seven years, the files are discarded unless contractual arrangements exist which dictate different requirements. Client or regulatory agency specific data retention practices are employed for several government organizations such as the Department of Defense and the Massachusetts Department of Environmental Protection that require a retention period of ten (10) years. Data archiving may also be extended up to ten (10) years for specific commercial clients in response to contractual requirements.

Complete date and time stamped PDF reports are generated automatically from the laboratory information management system (LIMS) using the source documents archived on the document server. These source documents are maintained on a document server and archived to primary and clone tapes. The primary tapes remain on premises while the clone tapes are taken to a secure offsite location for permanent storage. Both the primary and clone tapes remain in storage for the remainder of the archive period.

6.8 ***Training***. The company maintains a training record for all employees that documents that they have received instruction on administrative and technical tasks that are required for the job they perform. Training records for individuals employed by the company are retained for a period of six months following their termination of employment.

Training File Origination. The Human Resources Group (HR) initiates training files. The QA staff, through the Assistant Quality Assurance officer, retains the responsibility for the maintenance and tracking of all training related documentation in the file. The file is begun on the first day of employment. Information required for the file includes a copy of the individual's most current resume, detailing work experience and a copy of any college diplomas and transcript(s). Information added on the first day includes documentation of health and safety training, quality assurance training and a signed data integrity training and ethical conduct agreement.

Training documentation, training requirements, analyst proficiency information and other training related support documentation is tracked using a customized database application (Section 4.3). Database extracts provide an itemized listing of specific training requirements by job function. Training status summaries for individual analysts portray dates of completion for job specific training requirements.

6.9 ***Technical Training***. The supervisor of each new employee is responsible for developing a training plan for each new employee. The supervisor evaluates the employees training progress at regular frequencies. Supporting documentation, including demonstration of capability and precision and accuracy studies, which demonstrate an analyst's proficiency for a specific test, are added to the training file as completed. Employees and supervisors verify documentation of understanding (DOU) for all assigned standard operating procedures in the training database. Certificates or diplomas for any off-site training are also added to the file.

7.0 REFERENCE STANDARD TRACEABILITY

Requirement: Documented procedures, which establish traceability between any measured value and a national reference standard, are established by the laboratory as required. All metric measurements are traceable to NIST reference weights or thermometers that are calibrated on a regular schedule. All chemicals used for calibration of a quantitative process are traceable to an NIST reference that is documented by the vendor using a certificate of traceability. The laboratory maintains a documentation system that establishes the traceability links. The procedures for verifying and documenting traceability are documented in standard operating procedures.

7.1 ***Traceability of Metric Measurements - Thermometers***. Accutest uses NIST thermometers to calibrate commercially purchased thermometers prior to their use in the laboratory and annually thereafter for liquid in glass thermometers or quarterly for electronic temperature measuring devices.. If necessary, thermometers are assigned correction factors that are determined during their calibration using an NIST thermometer as the standard. The correction factor is documented in a thermometer calibration database and on a tag attached to the thermometer. The correction factor is applied to temperature measurements before recording the measurement in the temperature log. Calibration of each thermometer is verified and documented on a regular schedule. The NIST thermometer is checked for accuracy by a qualified vendor every five (5) years following the specifications for NIST thermometer calibration verification detailed in the united States Environmental Protection Agency's "Manual for the Certification of Laboratories Analyzing Drinking Water", Fifth Edition, January 2005.

7.2 ***Traceability of Metric Measurements – Calibration Weights***. Accutest uses calibrated weights, which are traceable to NIST standard weights to calibrate all balances used in the laboratory. Balances are calibrated to specific tolerances within the intended use range of the balance. Calibration checks are required on each day of use. If the tolerance criteria are not achieved, corrective action specified in the balance calibration SOP is applied before the balance can be used for laboratory measurements. Recalibration of all calibration weights is conducted and documented on a biannual basis.

7.3 ***Traceability of Chemical Standards***. All chemicals, with the exception of bulk dry chemicals and acids, purchased as reference standards for use in method calibration must establish traceability to NIST referenced material through a traceability certificate. Process links are established that enable a calibration standard solution to be traced to its NIST reference certificate.

Chemical standards used for analysis must meet the purity specifications of the method. These specifications must be stated in the reagents section of the method SOP.

7.4 ***Assignment of Reagent and Standard Expiration Dates.*** Expiration date information for all purchased standards, prepared standard solutions and selected reagents is provided to Accutest by the vendor as a condition of purchase. Neat materials and inorganic reagents are not required to be purchased with expiration dates. Prepared solutions are labeled with the

expiration date provided by the manufacturer. In-house prepared solutions are assigned expiration dates that are consistent with the method that employs their use unless documented experience indicates that an alternate date can be applied. If alternate expiration dates are employed, their use is documented in the method SOP. Expiration dates for prepared inorganic reagents, which have not exhibited instability, are established at two years from the date of preparation for tracking purposes.

The earliest expiration date has been established as the limiting date for assigning expiration dates to prepared solutions. The assignment of expiration dates that are later than the expiration date of any derivative solution or material are prohibited.

7.5 ***Documentation of Traceability***. Traceability information is documented in individual logbooks designated for specific measurement processes. The quality assurance group maintains calibration documentation for metric references in separate logbooks.

Balance calibration verification is documented in logbooks that are assigned to each balance. The individual conducting the calibration is required to initial and date all calibration activities. Any defects that occur during calibration are also documented along with the corrective action applied and a demonstration of return to control. Annual service reports and certificates are retained on file by the QA staff.

Temperature control is documented in logbooks assigned to the equipment being monitored. A calibrated thermometer is assigned to each individual item. Uncorrected and corrected measurements are recorded along with date and initials of the individual conducting the measurement on a daily or as used basis. Corrective action, if required, is also documented including the demonstration of return to control.

Initial traceability of chemical standards is documented via a vendor-supplied certificate (not available for bulk dry chemicals and acids) that includes lot number, expiration date and certified concentration information. Solutions prepared using the vendor supplied chemical standards are documented in logbooks assigned to specific analytical processes. Alternatively, documentation may be entered into the electronic standards and reagent tracking log. The documentation includes links to the vendor's lot number, an internal lot number, dates of preparation, expiration date, and the preparer's initials.

Accutest employs commercially prepared standard solutions whose traceability can be demonstrated through a vendor supplied certificate of analysis that includes an experimental verification of the standard's true concentration. The test value for the verification analysis must agree within 1% of the vendor's true value before it can be employed for calibration purposes. If the test value differs from the nominal value by more than 1%, then the test value is used as the true value in laboratory calibrations and calculations. Purchased standards which do not have a certificate of analysis cannot be used for calibration or calibration verification purposes and are rejected or returned to the vendor.

Supervisors conduct regular reviews of logbooks, which are verified using a signature and date.

8.0 TEST PROCEDURES, METHOD REFERENCES, AND REGULATORY PROGRAMS

Requirements: The laboratory employs client specified or regulatory agency approved methods for the analysis of environmental samples. A list of active methods is maintained, which specifies the type of analyses performed and cross-references the methods to applicable environmental regulations. Routine procedures used by the laboratory for the execution of a method are documented in standard operating procedures. Method performance and sensitivity are demonstrated annually where required. Defined procedures for the use of method sensitivity limits for data reporting purposes are established by the Director of Quality Assurance and used consistently for all data reporting purposes.

8.1 ***Method Selection & Application***. Accutest employs methods for environmental sample analysis that are consistent with the client's application, which are appropriate and applicable to the project objectives. Accutest informs the client if the method proposed is inappropriate or outdated and suggests alternative approaches.

Accutest employs documented, validated regulatory methods in the absence of a client specification and informs the client of the method selected. These methods are available to the client and other parties as determined by the client. Documented and validated in-house methods may be applied if they are appropriate to the project. The client is informed of the method selection.

8.2 ***Standard Operating Procedures***. Standard operating procedures (SOP) are prepared for routine methods executed by the laboratory, processes related to laboratory operations and sample or data handling. All SOPs are formatted to meet the specifications established by the National Environmental Laboratory Accreditation Conference, which are detailed in Chapter Five – Quality Systems of the established Standards. The procedures describe the process steps in sufficient detail to enable an individual, who is unfamiliar with the procedure to execute it successfully.

SOPs are evaluated annually and edited if necessary. Reviewed SOPs that do not require modification include an evaluation summary form indicating that an evaluation was conducted and modifications were not needed. SOPs can be edited on a more frequent basis if changes are required for any reason. These may include a change to the methodology, elimination of systematic errors that dictate a need for process changes or modifications to incorporate a new version of the method promulgated by the originating regulatory agency. Procedural modifications are indicted using a revision number. SOPs are available for client review at the Accutest facility upon request.

The complete list of the laboratories SOPs available as of the date of publication of this QSM version are detailed in Appendix II.

8.3 ***Method Validation***. Standard methods from regulatory sources are primarily used for all analysis. Standard methods do not require validation by the laboratory. Non-standard, in-house methods are validated prior to use. Validation is also performed for standard methods

applied outside their intended scope of use. Validation is dependent upon the method application and may include analysis of quality control samples to develop precision and accuracy information for the intended use. A final method validation report is generated, which includes all data in the validation study. A statement of adequacy and/or equivalency is included in the report. A copy of the report is archived in the quality assurance directory of the company server.

Non-standard methods are validated prior to use. This includes the validation of modified standard methods to demonstrate comparability with existing methods. Demonstrations and validations are performed and documented prior to incorporating technological enhancements and non standard methods into existing laboratory methods used for general applications. The demonstration includes method specific requirements for assuring that significant performance differences do not occur when the enhancement is incorporated into the method. Validation is dependent upon method application and may include the analysis of quality control samples to develop precision and accuracy information for intended use.

The study procedures and specifications for demonstrating validation include comparable method sensitivity, calibration response, method precision, method accuracy and field sample consistency for several classes of analytical methods are detailed in this document. These procedures and specifications may vary depending upon the method and the modification.

8.4 ***Estimated Uncertainty.*** A statement of the estimated uncertainty of an analytical measurement accompanies the test result when required. Estimated uncertainty is derived from the performance limits established for spiked samples of similar matrices. The degree of uncertainty is derived from the negative or positive bias for spiked samples accompanying a specific parameter. When the uncertainty estimate is applied to a measured value, the possible quantitative range for that specific parameter at that measured concentration is defined. Well recognized regulatory methods that specify values for the major sources of uncertainty and specify the data reporting format do not require a further estimate of uncertainty.

8.5 ***Demonstration of Capability***. Confirmation testing is conducted to demonstrate that the laboratory is capable of performing the method before its application to the analysis of environmental samples. The results of the demonstration tests are compared to the quality control specifications of the method to determine if the performance is acceptable.

Capability demonstrations are conducted initially for each method on every instrument and annually on a method specific basis thereafter. Acceptable demonstrations are documented for individual training files and retained by the QA staff. New analytes, which are added to the list of analytes for an accredited method, are evaluated for applicability through a demonstration of capability similar to those performed for accredited analytes.

8.6 ***Method Detection Limit Determination***. Annual method detection limit (MDL) studies are performed as appropriate for routine methods used in the laboratory. MDL studies are also performed when there is a change to the method that affects how the method is performed or when an instrumentation change that impacts sensitivity occurs. The procedure used for determining MDLs is described in 40 CFR, Part 136, Appendix B. Studies are performed for

each method on water, soil and air matrices for every instrument that is used to perform the method. MDLs are established at the instrument level. The highest MDL of the pooled instrument data is used to establish a laboratory MDL. MDLs are experimentally verified through the analysis of spiked quality control samples at 2-4 times the concentration of the experimental MDL. The verification is performed on every instrument used to perform the analysis. The quality assurance staff manages the annual MDL determination process and is responsible for retaining MDL data on file. Approved MDLs are appended to the LIMS and used for data reporting purposes.

8.7 ***Instrument Detection Limit Determination***. Instrument detection limits (IDLs) are determined for all inductively coupled argon plasma emission spectrophotometers and mass spectrometers. The IDL is determined for the wavelength (emission) of each element and the ion (mass spectrometry) of each element used for sample analysis. The IDL data is used to estimate instrument sensitivity in the absence of the sample matrix. IDL determinations are conducted at the frequency specified in the appropriate SOPs' for ICP and ICP/MS analysis.

8.8 ***Method Reporting Limit.*** The method reporting limit for organic methods is determined by the concentration of the lowest calibration standard in the calibration curve. This value is adjusted based on several sample preparation factors including sample volume, moisture content (soils), digestion, distillation or dilution. The low calibration standard is selected by department managers as the lowest concentration standard that can be used for calibration while continuing to meet the calibration linearity criteria of the method being used. The validity of the method reporting limits are confirmed through the analysis of a spiked quality control sample at the method reporting limit concentration. By definition, detected analytes at concentrations below the low calibration standard cannot be accurately quantitated and are qualified as estimated values.

The reporting limit for inorganics methods is defined as the concentration which is greater than or equal to the MDL where method quality control criteria has been achieved. The reporting limit for general chemistry methods employing multiple point calibrations must be greater than or equal to the concentration of the lowest standard of the calibration range.

8.9 ***Reporting of Quantitative Data.*** Analytical data for all methods is reported without qualification to the reporting limit established for each method. Data, for organic methods may be reported to the established method detection limit depending upon the client's requirements provided that all qualitative identification criteria for the detected parameter have been satisfied. All parameters reported at concentrations between the reporting limit and the method detection limit are qualified as estimated.

Data for inorganic methods are reported to the established method reporting limits. Inorganic data for specific methods may also be reported to the established method detection limit at client request. However, this data is always qualified as estimated.

Measured concentrations of detected analytes that exceed the upper limit of the calibration range are either diluted into the range and reanalyzed or qualified as an estimated value. The

only exception to this applies to ICP and ICP/MS analysis, which can be reported to the upper limit of the experimentally determined linear range without qualification.

8.10 ***Precision and Accuracy Studies***. Annual precision and accuracy (P&A) studies, which demonstrate the laboratories ability to generate acceptable data, are performed for all routine methods used in the laboratory. The procedure used for generating organic P&A data is referenced in the majority of the regulatory methodology in use. The procedure requires quadruplicate analysis of a sample spiked with target analytes at a concentration in the working range of the method. This data may be compiled from a series of existing blank spikes or laboratory control samples. Accuracy (percent recovery) of the replicate analysis is averaged and compared to established method performance limits. Values within method limits indicate an acceptable performance demonstration. Precision and accuracy date is also used to annually demonstrate analytical capability for individual analysts. Annual demonstration of capability data is archived in individual training files.

8.11 ***Method Sources & References.*** The Quality Assurance Staff maintains a list of active methods used for the analysis of samples. This list includes valid method references from sources such as USEPA, ASTM or Standard Methods designations and the current version and version date.

Updated versions of approved reference methodology are placed into use as changes occur. The Quality Assurance Director informs operations management of changes in method versions as they occur. The operations management staff selects an implementation date. The operations staff is responsible for completing all method use requirements prior to the implementation date. This includes modification of SOPs, completion of MDL and precision and accuracy studies and staff training. Documentation of these activities is provided to the QA staff who retains this information on file. The updated method is placed into service on the implementation date and the old version is de-activated.

Multiple versions of selected methods may remain in use to satisfy client specific needs. In these situations, the default method version becomes the most recent version. Client specific needs are communicated to the laboratory staff using method specific analytical method codes, which clearly depict the version to be used. The old method version is maintained as an active method until the specified client no longer requires the use of the older version.

Accutest will not use methodology that represents significant departures from the reference method unless specifically directed by the client. If clients direct the laboratory to use a method modification that represents a significant departure from the reference method, the request will be documented in the project file.

8.12 ***Analytical Capabilities***. Appendix III provides a detailed listing of the methodology employed for the analysis of test samples.

9.0 SAMPLING, SAMPLE MANAGEMENT, LOGIN, CUSTODY, STORAGE AND DISPOSAL

Requirement. The laboratory must employ a system which ensures that client supplied product or supplied product (the sample) is adequately evaluated, acknowledged, and secured upon delivery to the laboratory. The system also assures that product chain of custody is maintained and that sample receipt conditions and preservation status are documented and communicated to the client and internal staff. The login procedure assigns, documents, and maps the specifications for the analysis of each unique sample to assure that the requested analysis is performed on the correct sample and enables the sample to be tracked throughout the laboratory analytical cycle. The system includes procedures for reconciling defects in sample condition or client provided data, which are identified at sample arrival. The system specifies the procedures for proper sample storage, transfer to the laboratory, and disposal after analysis. The system is also documented in standard operating procedures.

9.1 ***Order Receipt and Entry***. New orders are initiated and processed by the client services group (See Chapter 14, Procedures for Executing Client Specifications). The new order procedure includes mechanisms for providing bottles to clients, which meet the size, cleanliness, and preservation specifications for the analysis to be performed.

For new orders, the project manager prepares a bottle request form, which is submitted to sample management. This form provides critical project details to the sample management staff, which are used to prepare and assemble the sample bottles for shipment to the client prior to sampling.

The bottle order is assembled using bottles that meet USEPA specifications for contaminant free sample containers. Accutest uses a combination of commercially supplied pre-cleaned bottles and bottles that have been tested for residual contamination and verified to meet USEPA specifications prior to use. Sterile bottles for microbiological samples are purchased from commercial sources.

Bottles, which are not purchased pre-cleaned, are checked to assure that they are free of contamination from targeted analytes before being released for use. Sterile bottles are checked for contamination with each lot. The QA staff retains a copy of the documentation of in-house contamination and sterility checks and maintains the responsibility for approving and releasing bottle lots for use following a review of the check data.

Preservative solutions that are specified for the analysis requested are dispensed into the sample bottle prior to shipment. All preservative solutions are prepared in the laboratory or purchased from commercial suppliers. Each solution is checked to assure that it is free of contamination from the compounds being analyzed before being released for use.

Reagent water for trip and field blanks is poured into appropriately labeled containers. All bottles are packed into ice chests with blank chain of custody forms and the original bottle order form. Completed bottle orders are delivered to clients using Accutest couriers or commercial carriers for use in field sample collection.

9.2 ***Sampling***. Documented procedures are employed by the field staff for field sample collection and are accessible during sample collection activities. Field activities are documented in controlled notebooks which detail relevant field conditions, site data and the results of field measurements. Appropriate custody procedures for collected samples are initiated by the field staff at the time of sample collection. Samples are documented, labeled and preserved according to the specifications of the method and/or regulatory program prior to being shipped to the laboratory.

9.3 ***Sample Receipt and Custody***. Samples are delivered to the laboratory using a variety of mechanisms including Accutest couriers, commercial shippers, and client self-delivery. Documented procedures are followed for arriving samples to assure that custody and integrity are maintained and handling/ preservation requirements are documented and maintained.

Sample custody documentation is initiated when the individual collecting the sample collects field samples. Custody documentation includes all information necessary to provide an unambiguous record of sample collection, sample identification, and sample collection chronology. Initial custody documentation employs either Accutest or client generated custody forms.

Accutest generates a chain of custody in situations where the individuals who collected the sample did not generate custody documentation in the field.

Accutest defines sample custody as follows:

∴ The sample is in the actual custody or possession of the assigned responsible person,

∴ The sample is in a secure area.

The Accutest facility is defined as a secure facility. Perimeter security has been established, which limits access to authorized individuals only. Visitors enter the facility through the building lobby and must register with the receptionist prior to entering controlled areas. While in the facility, visitors are required to wear a visitor's badge and must be accompanied by their hosts at all times. After hours, building access is controlled using a computerized passkey reader system. This system limits building access to individuals with a pre-assigned authorization status. After hours visitors are not authorized to be in the building. Clients delivering samples after hours must make advanced arrangements through client services and sample management to assure that staff is available to take delivery and maintain custody.

Upon arrival at Accutest, the sample custodian reviews the chain of custody for the samples received to verify that the information on the form corresponds with the samples delivered. This includes verification that all listed samples are present and properly labeled, checks to verify that samples were transported and received at the required temperature, verification that the sample was received in proper containers, verification that sufficient volume is available to conduct the requested analysis, and a check of individual sample containers to verify test

specific preservation requirements including the absence of headspace for volatile compound analysis.

Sample conditions and other observations are documented on the chain of custody by the sample custodian prior to completing acceptance of custody and in an online database that creates a permanent record of all sample login activities. The sample custodian accepts sample custody upon verification that the custody document is correct. Discrepancies or non-compliant situations are documented and communicated to the Accutest project manager, who contacts the client for resolution. The resolution is documented and communicated to sample management for execution.

The sample management staff maintains an electronic sample receipt log. This log details all sample-related information in a searchable database that is updated upon data entry and backed up daily. The log records include critical date information, numbers of samples, numbers of bottles for each parameter, descriptions of bottles for each parameter, preservation conditions, bottle refrigerator location, and bottle conditions. Data entry into the log is secured using individual passwords.

During initial login, each bottle is assigned a unique number and is labeled with a barcode corresponding to that number. A bar-coding and scanning system electronically tracks sample custody transfers between individuals within the laboratory. Internal custody documentation may be required for compliance with regulatory agency or contractual specifications. A documented, chronological record of each sample transfer identifying each individual having possession of the sample is created in the laboratory information management system, which can be printed and included in data reports to demonstrate continuous custody.

9.4 ***Laboratory Preservation of Improperly Preserved Field Samples.*** Accutest will attempt to preserve field samples that were received without proper preservation to the extent that it is feasible and supported by the methods in use. Laboratory preservation of improperly preserved or handled field samples is routinely performed for metals samples. Special handling procedures may also be applied to improperly preserved volatile organics.

Aqueous metals samples that were not nitric acid preserved to pH 2 in the field are laboratory preserved and held for twenty (24) hours to equilibrate prior to analysis. Aqueous metals samples requiring field filtration may be filtered in the laboratory within seventy-two (72) hours of receipt provided that the sample has not been acid preserved.

Unpreserved volatile organics samples may be analyzed within seven (7) days to minimize degradation of volatile organics if the laboratory is notified in advance of the failure to preserve upon collection. Laboratory preservation of unpreserved aqueous samples is not possible. A pH check of volatile organic samples prior to analysis will compromise the sample by allowing volatile organics to escape during the check. If the laboratory is not notified of the failure to field preserve an aqueous volatile organic sample, the defect will not be identified until sample analysis has been completed and the data is qualified accordingly.

9.5 ***Sample Tracking Via Status Change.*** An automated, electronic LIMS procedure records sample exchange transactions between departments and changes in analytical status. This system tracks all preparation, analytical, and data reporting procedures to which a sample is subjected while in the possession of the laboratory. Each individual receiving samples must acknowledge the change in custody and operational status in the LIMS. This step is required to maintain an accurate electronic record of sample status, dates of analytical activity, and custody throughout the laboratory.

Sample tracking is initiated at login where all chronological information related to sample collection dates and holding times are entered into the LIMS. This information is entered on an individual sample basis.

9.6 ***Sample Acceptance Policy***. Incoming samples must satisfy Accutest's sample acceptance criteria before being logged into the system. Sample acceptance is based on the premise that clients have exercised proper protocols for sample collection. This includes complete documentation, sufficient volume, proper chemical preservation, temperature preservation, sample container sealing and labeling, and appropriate shipping container packing.

The sample management staff will make every attempt to preserve improperly preserved samples upon arrival. However, if preservation is not possible, the samples may be refused unless the client authorizes analysis. No samples will be accepted if holding times have been exceeded or will be exceeded before analysis can take place unless the client authorizes analysis.

Sample acceptance criteria include proper custody and sample labeling documentation. Proper custody documentation includes an entry for all physical samples delivered to the laboratory with an identification code that matches the sample bottle and a date and signature of the individual who collected the sample and delivered them to the laboratory.

Accutest reserves the right to refuse any sample which in its sole and absolute discretion and judgment is hazardous, toxic and poses or may pose a health, safety or environmental risk during handling or processing. The company will not accept samples for analysis using methodology that is not performed by the laboratory or for methods that lab does not hold valid accreditations unless arrangements have been made to have the analysis conducted by a qualified subcontractor.

9.7 ***Assignment of Unique Sample Identification Codes***. Unique identification codes are assigned to each sample bottle to assure traceability and unambiguously identify the tests to be performed in the laboratory.

The sample identification coding process begins with the assignment of a unique alphanumeric job number. A job is defined as a group of samples received on the same day, from a specific client pertaining to a specific project. A job may consist of groups of samples received over a multi-day period. The first character of the job number is an alpha-character that identifies the laboratory facility. The next characters are numeric and sequence by one number with each new job.

Unique sample numbers are assigned to each bottle collected as a discrete entity from a designated sample point. This number begins with the job number and incorporates a second series of numbers beginning at one and continuing chronologically for each point of collection. The test to be performed is clearly identified on the bottle label. Multiple sample bottles collected for analysis of the same parameter are numbered bottle 1, 2, … etc.

Alpha suffixes may be added to the sample number to identify special designations such as subcontracted tests, in-house QC checks, or re-logs. Multiple sample bottles for a specific analysis are labeled Bottle 1, Bottle 2, etc.

9.8 ***Subcontracted Analysis***. Subcontract laboratories are employed to perform analysis not performed by Accutest. The quality assurance staff evaluates subcontract laboratories to assure their quality processes meet the standards of the environmental laboratory industry prior to engagement. Throughout the subcontract process, Accutest follows established procedures to assure that sample custody is maintained and the data produced by the subcontractor meets established quality criteria.

Subcontracting Procedure. Subcontracting procedures are initiated through several mechanisms, which originate with sample management. Samples for analysis by a subcontractor are logged into the Accutest system using regular login procedures. If subcontract parameters are part of the project or sample management has received subcontracting instructions for a specific project, a copy of the chain of custody is given to the appropriate project manager with the subcontracted parameters highlighted. This procedure triggers the subcontract process at the project management level. The project manager contacts an approved subcontractor that carries accreditation in the venue of the project location to place the subcontract order. A subcontract order form (SOF) is simultaneously prepared in electronic format, by the project manager and filed with the original chain of custody. The SOF and the subcontract chain of custody are forwarded to sample management, via E-Mail, for processing. A copy is filed with the original CoC.

Sample management signs the subcontract chain of custody and ships the sample(s) to the subcontractor. The subcontract CoC is filed with the original CoC and the request for subcontract. Copies are distributed to the login department, the project manager, sample management and the client.

Clients are verbally notified of the need to subcontract analysis as soon as the need is identified by the client services staff. This may occur during the initial project setup or at the time of login if the project setup had not been initiated through the client services staff. Copies of the subcontract CoC and the original CoC, which are electronically distributed to clients, constitutes documented client notification of the laboratories intent to subcontract analysis.

Subcontractor data packages are reviewed by the QA Staff to assess completeness and quality compliance. If completeness defects are detected, the subcontractor is asked to immediately upgrade the data package. If data quality defects are detected, the QA staff retains the package for further review. The QA staff will pursue a corrective action solution before releasing defective data to the client.

Approved subcontract data is entered into the laboratory information management system (LIMS) if possible and incorporated into the final report. All subcontract data is footnoted to provide the client with a clear indication of its source. Copies of original subcontract data are included in the data report depending on the reporting level specified by the client. Applicable subcontractor accreditation information is provided with the subcontractor data.

*Subcontract Laboratory Evaluation***.** The QA staff evaluates subcontract laboratories prior to engagement. The subcontract laboratory must provide Accutest with proof of a valid certification to perform the requested analysis for the venue where they were collected, a copy of the laboratory's Quality Systems Manual, copies of SOPs used for the subcontracted analysis, a copy of the most recent performance evaluation study for the subcontracted parameter, copies of the internal data integrity policy and copies of the most recent regulatory agency or third party accreditor audit report. Certification verification, audit reports and performance evaluation data must be submitted to Accutest annually. If possible, the QA staff may conduct a site visit to the laboratory to inspect the quality system. Accutest Laboratories assumes the responsibility for the performance of all subcontractors who have successfully demonstrated their qualifications. Qualification of a subcontract laboratory may be bypassed if the primary client directs Accutest to employ a specific subcontractor.

9.9 ***Sample Storage***. Following sample transfer to the sample custodian, samples are assigned to various secured, refrigerated storage areas depending upon the test to be performed and the matrix of the samples. The location (refrigerator and shelf) of each sample is recorded on the chain of custody adjacent to the line corresponding to each sample number and also entered into the LIMS. Samples remain in storage until the laboratory technician requests that they be transferred into the laboratory for analysis.

Second shift staff is authorized to retrieve samples from storage and initiate custody transfer. All sample request forms must be completed regardless of who performs the transfer.

Samples for volatile organics analysis are placed in storage in designated refrigerators by the sample custodian and immediately transferred to the organics group control. Sample custody is transferred to the department designee. These samples are segregated according to matrix to limit opportunities for cross contamination to occur.

Organics staff is authorized to retrieve samples from these storage areas for analysis. When analysis is complete, the samples are placed back into storage.

9.10 ***Sample Login***. Following sample custody transfer to the laboratory, the documentation that describes the clients analytical requirements are delivered to the sample login group for coding and entry to the Laboratory Information Management System (LIMS). This process translates all information related to collection time, turnaround time, sample analysis, and deliverables into a code which enables client requirements to be electronically distributed to the various departments within the laboratory for scheduling and execution.

The technical staff is alerted to client or project specific requirements through the use of a unique project code that is electronically attached to the job during login. The unique project code directs the technical staff to controlled specifications documents detailing the unique requirements.

9.11 ***Sample Retrieval for Analysis***. Individual laboratory departments prepare and submit written requests to the sample custodian to retrieve samples for analysis. The sample custodian retrieves all samples except volatile organics and delivers them to the requesting department. Retrieval priorities are established by the requesting department and submitted to the sample custodian when multiple requests are submitted. Internal custody transfers using the bar code scanning system occur whenever the samples change hands or locations.

After sample analysis has been completed, the department requests pick-up and return of the sample to the storage area. The sample custodian retrieves the sample and completes the custody transfer from the department of the transfer back to sample management or sample storage.

9.12 ***Sample Disposal*** Accutest retains all samples and sample extracts under proper storage for a minimum of 30 days following completion of the analysis report. Longer storage periods are accommodated on a client specific basis if required. Samples may also be returned to the client for disposal.

Accutest disposes of all laboratory wastes following the requirements of the Resource Conservation and Recovery Act (RCRA). The Company has obtained and maintains a waste generator identification number, NJD982533622.

Sample management generates a sample disposal dump sheet from the LIMS tracking system each week, which lists all samples whose holding period has expired. Data from each sample is compared to the hazardous waste criteria established by the New Jersey Department of Environmental Protection (NJDEP).

Samples containing constituents at concentrations above the criteria are labeled as hazardous and segregated into four general waste categories for disposal as follows:

- Waste Oil
- Soil (solids – positive and negative hazardous characteristics)
- Mixed Aqueous
- Sludges (semi-solids)
- PCB Hazardous Waste (USEPA 40 CFR 761 criteria).

Non-hazardous aqueous samples are diluted and disposed directly into the laboratory sink. All aqueous liquids pass through a neutralization system before entering the municipal system. Solid samples are emptied into consolidation drums and disposed as hazardous waste or non-hazardous wastes depending upon the results of hazardous characteristics determination. Samples classified as PCB hazardous wastes are labeled and packaged according to the requirements in 40 CFR 761.

Empty glass and plastic bottles from aqueous and solid samples are segregated for recycling. Recycled materials are collected by a commercial contractor and transferred to a county transfer facility for separation into various materials categories. These operations are classified as secure facilities employing cameras, security guards and fiber optic security systems.

The recyclable material is transported to a recycling facility for further processing. Separated glass is transported to a processing facility where it is acid washed in two, separate wash baths, rinsed in boiling water and ground into ½ inch chunks. The chunks are transported to an end product user for re-manufacturing into a glass product.

Separated plastic is transported to a processing facility where it is acid washed to remove the labels and adhesives and boiled for sterilization. The sample containers and any remaining labels are shredded and ground resulting in complete destruction of remaining labels the ground material is sent by rail car or tractor-trailer to various end users that melt and reform the material into useful products of their industry. The recycling facility employs a Code of Ethics in which all client names are confidential and are not divulged to any individual or corporation without written permission from the client.

Laboratory wastes are collected by waste stream in designated areas throughout the laboratory. Waste streams are consolidated twice each week by the waste custodian and transferred to stream specific drums for disposal through a permitted waste management contractor. Filled, consolidated drums are tested for hazardous characteristics and scheduled for removal from the facility for appropriate disposal based on the laboratory data.

All solvent extracts and digestates are collected for disposal following the thirty-day holding period and drummed according to their specific waste stream category. Chlorinated solvent extracts are drummed as chlorinated wastes (i.e., Methylene Chloride). Non-chlorinated solvent extracts are drummed as non-chlorinated wastes (i.e., acetone, hexane, methanol, and mixed solvents). Digestates are collected for disposal following the thirty-day holding period and drummed as corrosive liquid containing metals.

10.0 LABORATORY INSTRUMENTATION AND MEASUREMENT STANDARDS

Requirement. The laboratory has established procedures, which assure that instrumentation is performing to a pre-determined operational standard prior to the analysis of any samples. In general, these procedures follow the regulatory agency requirements established in promulgated methodology. The instrumentation selected to perform specified analysis are capable of providing the method specified uncertainty of measurement needed. These procedures are documented and incorporated into the standard operating procedures for the method being executed.

10.1 ***Mass Tuning – Mass Spectrometers***. The mass spectrometer tune and sensitivity is monitored to assure that the instrument is assigning masses and mass abundances correctly and that the instrument has sufficient sensitivity to detect compounds at low concentrations. This is accomplished by analyzing a specific mass tuning compound at a fixed concentration. If the sensitivity is insufficient to detect the tuning compound, corrective action must be performed prior to the analysis of standards or samples. If the mass assignments or mass abundances do not meet criteria, corrective action must be performed prior to the analysis of standards or samples.

10.2 ***Wavelength Verification – Spectrophotometers***. Spectrophotometer detectors are checked on a regular schedule to verify proper response to the wavelength of light needed for the test in use. If the detector response does not meet specifications, corrective action (detector adjustment or replacement) is performed prior to the analysis of standards or samples.

10.3 ***Inter-element Interference Checks (Metals)***. Inductively Coupled Plasma Emission Spectrophotometers (ICP) are subject to a variety of spectral interferences, which can be minimized or eliminated by applying interfering element correction factors and background correction points. Interfering element correction factors are checked on a specified frequency through the analysis of check samples containing high levels of interfering elements. Analysis of single element interferant solutions is also conducted at a specified frequency.

If the check indicates that the method criteria have not been achieved for any element in the check standard, the analysis is halted and data from the affected samples are not reported. Sample analysis is resumed after corrective action has been performed and the correction factors have been re-calculated.

New interfering element correction factors are calculated and applied whenever the checks indicate that the correction factors are no longer meeting criteria. At a minimum, correction factors are replaced once a year.

Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) also is subject to isobaric elemental and polyatomic ion interferences. These interferences are corrected through the use of calculations. The accuracy of corrections is dependent on the sample matrix and instrument conditions and is verified by quality control checks on individual runs.

10.4 ***Calibration and Calibration Verification***. Many tests require calibration using a series of reference standards to establish the concentration range for performing quantitative analysis. Instrument calibration is performed using standards that are traceable to national standards. Method specific procedures for calibration are followed prior to any sample analysis.

Calibration is performed using a linear regression calculation or calibration factors calculated from the curve. The calibration must meet method specific criteria for linearity or precision. If the criteria are not achieved, corrective action (re-calibration or instrument maintenance) is performed. The instrument must be successfully calibrated before analysis of samples can be conducted.

Initial calibration for metals analysis performed using inductively coupled plasma (ICP) employs the use of a single standard and a calibration blank to establish linearity. Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) can be calibrated using either a two point or a mulit-point calibration, as long as all quality control criteria for the analysis can be achieved. The calibration blank contains all reagents that are placed into the calibration standard with the exception of the target elements. Valid calibration blanks must not contain any target elements.

Initial calibrations must be verified using a single concentration calibration standard from a second source (i.e. separate lot or different provider). The continuing validity of existing calibrations must be regularly verified using a single calibration standard. The response to the standard must meet pre-established criteria that indicate the initial calibration curve remains valid. If the criteria are not achieved corrective action (re-calibration) is performed before any additional samples may be analyzed.

Calibration verification is also performed whenever it appears that the analytical system is out of calibration or no longer meets the calibration requirements. It is also performed when the time period between calibration verifications has expired.

10.5 ***Linear Range Verification and Calibration (ICP & ICP/MS Metals)***. Linear range verification is performed for all ICP and ICP/MS instrumentation. The regulatory program or analytical method specifies the verification frequency. A series of calibration standards are analyzed over a broad concentration range. The data from these analyses are used to determine the valid analytical range for the instrument. ICP instrument calibration is routinely performed using a single standard at a concentration within the linear range and a blank.

Some methods or analytical programs require a low concentration calibration check to verify that instrument sensitivity is sufficient to detect target elements at the reporting limit. The analytical method or regulatory program defines the criteria used to evaluate the low concentration calibration check. If the low calibration check fails criteria, corrective action is performed and verified through reanalysis of the low concentration calibration check before continuing with the field sample analysis. . ICP-MS instrument calibration is normally performed using multiple standards within the linear range and a blank, but may be done with a single standard at a concentration within the linear range and a blank.

10.6 ***Retention Time Development and Verification (GC).*** Chromatographic retention time windows are developed for all analysis performed using gas chromatographs with conventional detectors. An initial experimental study is performed, which establishes the width of the retention window for each compound. The retention time width of the window defines the time ranges for elution of specified target analytes on the primary and confirmation columns. Retention time windows are established upon initial calibration, applying the retention time range from the initial study to each target compound. Retention times are regularly confirmed through the analysis of an authentic standard during calibration verification. If the target analytes do not elute within the defined range during calibration verification, the instrument must be recalibrated and new windows defined. New studies are performed when major changes, such as column replacement are made to the chromatographic system.

10.7 ***Equipment List.*** See Appendix IV for a listing of all equipment used for measurement and/or calibration in laboratory processes.

11.0 INSTRUMENT MAINTENANCE

Requirement. Documented procedures have been established for conducting equipment maintenance. The procedure includes maintenance schedules if required or documentation of daily maintenance activities. All instrument maintenance activities are documented in instrument specific logbooks.

11.1 ***Routine, Daily Maintenance***. Routine, daily maintenance is required on an instrument specific basis and is performed each time the instrument is used. Daily maintenance includes activities to insure a continuation of good analytical performance. This may include performance checks that indicate if non-routine maintenance is needed. If performance checks indicate the need for higher level maintenance, the equipment is taken out of service until maintenance is performed. Analysis cannot be continued until all performance checks meet established criteria and a return to operational control has been demonstrated and documented. The individual assigned to the instrument is responsible for daily maintenance.

11.2 ***Non-routine Maintenance***. Non-routine maintenance is initiated for catastrophic occurrences such as instrument failure. The need for non-routine maintenance is indicated by failures in general operating systems that result in an inability to conduct required performance checks or calibration. Equipment in this category is taken out of service, tagged accordingly and repaired before attempting further analysis. Before initiating repairs, all safety procedures for safe handling of equipment during maintenance, such as lock-out/tag-out are followed. Analysis is not resumed until the instrument meets all operational performance check criteria, is capable of being calibrated and a return to operational control has been demonstrated and documented. Section supervisors are responsible for identifying non-routine maintenance episodes and initiating repair activities to bring the equipment on-line. This may include initiating telephone calls to maintenance contractors if necessary. They are responsible for documenting all details related to the occurrence and repair.

11.3 ***Scheduled Maintenance***. Modern laboratory instrumentation rarely requires regular preventative maintenance. If required, the equipment is placed on a schedule, which dictates when maintenance is needed. Examples include annual balance calibration by an independent provider or ICP preventative maintenance performed by the instrument manufacturer. Section supervisors are responsible for initiating scheduled maintenance on equipment in this category. Scheduled maintenance is documented using routine documentation practices.

11.4 ***Maintenance Documentation***. Routine and non-routine maintenance activities are documented in logbooks assigned to instruments and equipment used for analytical measurements. The logbooks contain preprinted forms, which specify the required maintenance activities. The analyst or supervisor performing or initiating the maintenance activity is required to check the activity upon its completion and initial the form. This includes documenting that the instrument has been returned to operational control following the completion of the activity. Non-routine maintenance (repairs, upgrades) is documented on the back page of the service log.

12.0 QUALITY CONTROL PARAMETERS, PROCEDURES, AND CORRECTIVE ACTION

Requirement. All procedures used for test methods incorporate quality control parameters to monitor elements that are critical to method performance. Each quality parameter includes acceptance criteria that have been established by regulatory agencies for the methods in use. Criteria may also be established through client dictates or through the accumulation and statistical evaluation of internal performance data. Data obtained for these parameters during routine analysis must be evaluated by the analyst, and compared to the method criteria in use. If the criteria are not achieved, the procedures must specify corrective action and conformation of control before proceeding with sample analysis. QC parameters, procedures, and corrective action must be documented within the standard operating procedures for each method. In the absence of client specific objectives the laboratory must define qualitative objectives for completeness and representativeness of data.

12.1 ***Procedure***. Bench analysts are responsible for methodological quality control and sample specific quality control. Each method specifies the control parameters to be employed for the method in use and the specific procedures for incorporating them into the analysis. These control parameters are analyzed and evaluated with every designated sample group (batch).

The data from each parameter provides the analyst with critical decision making information on method performance. The information is used to determine if corrective action is needed to bring the method or the analysis of a specific sample into compliance. These evaluations are conducted throughout the course of the analysis. Each control parameter is indicative of a critical control feature. Failure of a methodological control parameter is indicative of either instrument or batch failure. Failure of a sample control parameter is indicative of control difficulties with a specific sample or samples.

Sample Batch. All samples analyzed in the laboratory are assigned to a designated sample batch, which contains all required quality control samples and a defined maximum number of field samples that are prepared and/or analyzed over a defined time period. The maximum number of field samples in the batch is 20. Accutest has incorporated the NELAP batching policy as the sample-batching standard. This policy incorporates the requirement for blanks and spiked blanks as a time based function as defined by NELAP. Accordingly, the specified time period for a sample batch is 24 hours. Matrix spike/matrix spike duplicate, matrix spikes and duplicates are defined as sample frequency based functions and may be applied to several batches until the frequency requirement has been reached. A matrix spike/matrix spike duplicate, matrix spikes and/or duplicate is required every 20 samples.

Client criteria that defines a batch as a time based function which includes a matrix spike/matrix spike duplicates as a contractual specification will be honored. The typical batch contains a blank and a laboratory control sample (LCS or spiked blank). Batch documentation includes lot specifications for all reagents and standards used during preparation of the batch.

12.2 ***Methodological Control Parameters and Corrective Action***. Prior to the analysis of field samples the analyst must determine that the method is functioning properly. Specific control parameters indicate whether critical processes meet specified requirements before continuing with the analysis. Method specific control parameters must meet criteria before sample analysis can be conducted. Each of these parameters is related to processes that are under the control of the laboratory and can be adjusted if out of control.

Method Blank. A method blank is analyzed during the analysis of any field sample. The method blank is defined as a sample. It contains the same standards (internal standards, surrogates, matrix modifiers, etc.) and reagents that are added to the field sample during analysis, with the exception of the sample itself. If the method blank contains target analytes(s) at concentrations that exceed method detection limit concentrations (organics) or reporting limit concentrations (inorganics), the source of contamination is investigated and eliminated before proceeding with sample analysis. Target analyte(s) in method blanks at concentrations no greater than one-half of the reporting limit concentrations (metals) may be requested on a client or project specific basis. Systematic contamination is documented for corrective action and resolved following the established corrective action procedures.

Laboratory Control Samples (LCS or Spiked Blanks). A laboratory control sample (spiked blank or commercially prepared performance evaluation sample) is analyzed along with field samples to demonstrate that method accuracy is within acceptable limits. These spike solutions may be from different sources than the sources of the solutions used for method calibration depending upon the method requirements. All target components are included in the spike mixture over a two year period. The performance limits are derived from published method specifications or from statistical data generated from the analysis of laboratory method performance samples. Spiked blanks are blank matrices (reagent water or clean sand) spiked with target parameters and analyzed using the same methods used for samples. Accuracy data is compared to laboratory derived limits to determine if the method is in control. Laboratory control samples (LCS) are commercially prepared spiked samples in an inert matrix. Performance criteria for recovery of spiked analytes are pre-established by the commercial entity preparing the sample. The sample is analyzed in the laboratory as an external reference.

Accuracy data is compared to the applicable performance limits. If the spike accuracy exceeds the performance limits, corrective action, as specified in the SOP for the method is performed and verified before continuing with a field sample analysis. In some cases, decisions are made to continue with sample analysis if performance limits are exceeded, provided the unacceptable result has no negative impact on the sample data.

Blanks and spikes are routinely evaluated before samples are analyzed. However, in situations where sample analysis is performed using an autosampler, they may be evaluated after sample analysis has occurred. If the blanks and spikes do not meet criteria, sample analysis is repeated.

Proficiency Testing. Proficiency test samples (PTs) are single or double blind spikes, introduced to the laboratory to assess method performance. PTs may be introduced as double blinds submitted by commercial clients, single or double blinds from regulatory agencies, or internal blinds submitted by the QA group.

A minimum of two single blind studies must be performed each year for every parameter in aqueous and solid matrices for each field of testing for which the laboratory maintains accreditation. Proficiency samples must be purchased as blinds from an A2LA accredited vendor. Data from these studies are provided to the laboratory by the vendor and reported to accrediting agencies. If unsatisfactory performance is noted, corrective action is performed to identify and eliminate any sources of error. A new single blind must be analyzed if required to demonstrate continuing proficiency.

PT samples performed for accrediting agencies or clients, which do not meet performance specifications, require a written summary that documents the corrective action investigation, findings, and corrective action implementation. A copy of this summary shall be submitted to the NELAC Primary Accrediting Authority, NJDEP Office of Quality Assurance for review.

Single or double blind proficiency test samples may be employed for self-evaluation purposes. Data from these analyses are compared to established performance limits. If the data does not meet performance specifications, the system is evaluated for sources of acute or systematic error. If required, corrective action is performed and verified before initiating or continuing sample analysis.

Trend Analysis for Control Parameters. The quality assurance staff is responsible for continuous analytical improvement through quality control data trend analysis. Accuracy data for spiked parameters in the spiked blank are statistically evaluated daily for trends indicative of systematic problems. Data from LCS parameters and surrogates are pooled on a method, matrix, and instrument basis. This data is evaluated by comparison to existing control and warning limits. Trend analysis is performed automatically as follows:

- Any point outside the control limit
- Any three consecutive points between the warning and control limits
- Any eight consecutive points on the same side of the mean.
- Any six consecutive points increasing or decreasing

The results of the trend analysis are transmitted as .PDF files for supervisory evaluation prior to sample analysis. Trends that indicate the potential loss of statistical control are further evaluated to determine the impact on data quality and to determine if corrective action is necessary. If corrective action is indicated, the supervisor informs the analysts of the corrective actions to be performed. Return to control is demonstrated before analysis resumes.

12.3 ***Sample Control Parameters and Corrective Action***. The analysis of samples can be initiated following a successful demonstration that the method is operating within established controls. Additional controls are incorporated into the analysis of each sample to determine if the method is functioning within established specifications for each individual sample. Sample QC data is evaluated and compared to established performance criteria. If the criteria are not achieved the method or the SOP specifies the corrective action required to continue sample analysis. In many cases, failure to meet QC criteria is a function of sample matrix and cannot

be remedied. Each parameter is designed to provide quality feedback on a defined aspect of the sampling and analysis episode.

Duplicates. Duplicate sample analysis is used to measure analytical precision. This can also be equated to laboratory precision for homogenous samples. Precision criteria are method dependent. If precision criteria are not achieved, corrective action or additional action may be required. Recommended action must be completed before sample data can be reported.

Laboratory Spikes & Spiked Duplicates. Spikes and spiked duplicates are used to measure analytical precision and accuracy for the sample matrix selected. Precision and accuracy criteria are method dependent. If precision and accuracy criteria are not achieved, corrective action or additional action may be required. Recommended action must be completed before reporting sample data. All target components are included in the spike mixture over a two year period.

Serial Dilution (Metals). Serial dilutions of metals samples are analyzed to determine if analytical matrix effects may have impacted the reported data. If the value of the serially diluted samples does not agree with the undiluted value within a method-specified range, the sample matrix may be causing interferences, which may lead to either a high or low bias. If the serial dilution criterion is not achieved, it must be flagged to indicate possible bias from matrix effects.

Post Digestion Spikes. Digested samples are spiked and analyzed to determine if matrix interferences are biasing the results when the pre-digestion spike (matrix spike) recovery falls outside the control limits. It may also be used to determine potential interferences per client's specification. The sample is spiked at the concentration specified in the method SOP. No action is necessary if the post digestion spike is outside of the method criteria, unless a preparation problem is suspected with the spike, in which case the post digestion spike should be re-prepared and reanalyzed.

Surrogate Spikes (Organics). Surrogate spikes are organic compounds that are similar in behavior to the target analytes but unlikely to be found in nature. They are added to all quality control and field samples to measure method performance for each individual sample. Surrogate accuracy limits are derived from published method specifications or from the statistical evaluation of laboratory generated surrogate accuracy data. Accuracy data is compared to the applicable performance limits. If the surrogate accuracy exceeds performance limits, corrective action, as specified in the method or SOP is performed before sample data can be reported.

Internal Standards (Organic Methods). Internal standards are retention time and instrument response markers added to every sample to be used as references for quantitation. Their response is compared to reference standards and used to evaluate instrument sensitivity on a sample specific basis. Internal standard retention time is also compared to reference standards to assure that target analytes are capable of being located by their individual relative retention time.

If internal standard response criteria are not achieved, corrective action or additional action may be required. The recommended action must be completed before sample data can be reported.

If the internal standard retention time criteria are not achieved corrective action or additional action may be required. This may include re-calibration and re-analysis. Additional action must be completed before sample data is reported.

Internal Standards (ICP and ICP/MS Metals). Internal standards are used on ICP instruments to compensate for variations in response caused by differences in sample matrices. Multiple internal standards are used for each sample on ICP/MS instruments to compensate for variations in response caused by differences in sample matrices. This adjustment is performed automatically during sample analysis. The internal standard response of replicated sample analysis is monitored to detect potential analytical problems. If analytical problems are suspected, then the field samples may be reanalyzed or reanalyzed upon dilution to minimize the interferences. A different internal standard may be employed for quantitation in situations where the field sample contains the element typically used as the internal standard.

12.4 ***Laboratory Derived Quality Control Criteria.*** Control criteria for in-house methods and client specific modifications that exceed the scope of published methodology are defined and documented prior to the use of the method. The Quality Assurance Director is responsible for identifying additional control criteria needs. Control parameters and criteria, based on best technical judgment are established using input provided by the operations staff. These control parameters and criteria are documented and incorporated into the method.

The laboratory-derived criteria are evaluated for technical soundness on spiked samples prior to the use of the method on field samples. The technical evaluation is documented and archived by the Quality Assurance Staff.

When sufficient data from the laboratory developed control parameter is accumulated, the data is statistically processed and the experimentally derived control limits are incorporated into the method.

12.5 ***Bench Review & Corrective Action***. The bench chemists are responsible for all QC parameters. Before proceeding with sample analysis, they are required to successfully meet all instrumental QC criteria. They have the authority to perform any necessary corrective action before proceeding with sample analysis. Their authority includes the responsibility for assuring that departures from documented policies and procedures do not occur.

The bench chemists are also responsible for all sample QC parameters. If the sample QC criteria are not achieved, they are authorized and required to perform the method specified corrective action before reporting sample data.

12.6 ***Data Qualifiers***. An alpha character coding system is employed for defining use limitations for reported data. These limitations are applied to analytical data by the analyst to clarify the

usefulness of the reported data for data user. Common data qualifiers and their definitions are as follows:

Organics.

J: Indicates an estimated value. Applied to calculated concentrations for tentatively identified compounds and qualitatively identified compounds whose concentration is below the reporting limit, but above the MDL.

N: Indicates qualitative evidence of a tentatively identified compound whose identification is based on a mass spectral library search and is applied to all TIC results.

C: Applied to pesticide data that has been qualitatively confirmed by GC/MS.

B: Used for analytes detected in the sample and its associated method blank.

E: Applied to compounds whose concentration exceeds the upper limit of the calibration range.

Metals and Inorganics.

B: Applied if the reported concentration value was less than the reporting limit but greater than the MDL.

U: Applied if the reading is less than the MDL (or IDL if IDL reporting is being used).

E: Estimated concentration caused by the presence of interferences, normally applied when the serial dilution is out.

N: Spike sample recovery not within control limits.

*: Duplicate or matrix spike duplicate analysis not within control limits.

12.7 ***QA Monitoring***. The QA staff conducts a spot review of completed data packages prior to client release for specified projects. This review includes an examination of QC data for compliance and trends indicative of systematic difficulties. If non-conformances are detected, the QA staff places an immediate stop on the release of the data and initiates corrective action to rectify the situation. The data package is released when the package becomes compliant with all quality requirements. If compliance is not possible, the data is qualified and an appropriate case narrative is generated for inclusion in the data package.

If the review reveals trends indicative of systematic problems, QA initiates an investigation to determine the cause. If process defects are detected, a corrective action is implemented and monitored for effectiveness.

Performance Limits. The Quality Assurance Director is responsible for compilation and maintenance of all precision and accuracy data used for performance limits. Quality control data for all test methods are accumulated and stored in the laboratory information

management system (LIMS). Parameter specific QC data is extracted annually and statically processed to develop laboratory specific warning limits and control limits. The new limits are reviewed and approved by the supervisory staff prior to their use for data assessment. The new limits are used to evaluate QC data for compliance with method requirements for a period of one year. Laboratory generated limits appear on all data reports.

12.8 ***Data Package Review***. Accutest employs multiple levels of data review to assure that reported data has satisfied all quality control criteria and that client specifications and requirements have been met. Each production department has developed specific data review procedures, which must be completed before data is released to the client.

Analytical Review. The analyst conducts the primary review of all data. This review begins with a check of all instrument and method quality control and progresses through sample quality control, concluding with a check to assure that the client's requirements have been executed. Analyst checks focus on a review of qualitative determinations and checks of precision and accuracy data to verify that existing laboratory criteria have been achieved. Checks at this level may include comparisons with project specific criteria if applicable. The analyst has the authority and responsibility to perform corrective action for any out-of-control parameter or nonconformance at this stage of review.

Analysts who have met the qualification criteria for the method in use perform secondary, peer level data reviews. Analyst qualification requirements include a valid demonstration of capability and demonstrated understanding of the method SOP. Section supervisors may perform secondary review in-lieu of a peer review. Supervisors review 100% of the data produced by their department. It includes a check of all manual calculations; an accuracy check of manually transcribed data from bench sheets to the LIMS, a check of calibration and continuing calibration, all QC criteria and a comparison of the data package to client specified requirements. Also included are checks to assure the appropriate methodology was applied and that all anomalous information was properly flagged for communication in the case narrative. Supervisors have the authority to reject data and initiate re-analysis, corrective action, or reprocessing.

All laboratory data requiring manual entry into LIMS system is double-checked by the analysts performing initial data entry and the section supervisor. Verification of supervisory review is indicated on the raw data summary by the supervisor's initials and date.

Electronic data that is manually edited at the bench by the primary analyst is automatically flagged by the instrument data system indicating an override by the analyst. All manual overrides must be verified and approved by a supervisor who initials and dates all manual changes.

Hard copies of manually integrated chromatographic peaks are printed that clearly depict the manually drawn baseline. The hard copy is reviewed and approved by the section supervisor (initialed and dated) and included in the data package of all full tier reports or the archived batch records of commercial report packages.

A manager or supervisor only has permission to edit electronic data that has been committed to the LIMS. These edits may be required if needs for corrections are indicated during the final review. A GALP audit record for all electronic changes in the LIMS is automatically appended to the record.

The group manager performs a tertiary review on a spot check basis. This review includes an evaluation of QC data against acceptance criteria and a check of the data package contents to assure that all analytical requirements and specifications were executed.

Report Generation Review. The report generation group reviews all data and supporting information delivered by the laboratory for completeness and compliance with client specifications. Missing deliverables are identified and obtained from the laboratory. The group also reviews the completed package to verify that the delivered product complies with all client specifications. Non-analytical defects are corrected before the package is sent to the client.

Project Management/Quality Control Review. Spot-check data package reviews are performed by the project management staff. Project management reviews focus on project specifications. If the project manager identifies defects in the product prior to release, he initiates immediate corrective action to rectify the situation.

The QA staff performs a post-delivery check of completed data packages to verify completeness and compliance with established quality control procedures. Approximately 10% of Full-Deliverables data packages are reviewed. A formal checklist is used to assess data report completeness and accuracy. Detected deficiencies are documented on the checklist and corrective actions initiated as necessary. Data review checklists are electronic documents, which are archived in the QA Directory of the network server.

The QA review focuses on all elements of the deliverable including the client's specifications and requirements, analytical quality control, sample custody documentation and sample identification. QA reviews at this step in the production process are geared towards systematic process defects, which require procedural changes to effect a corrective action. However, if defects are identified that have an adverse affect on data, the client is immediately informed following standard notification procedures. QA data review is not used in lieu of a peer level review or a supervisory review.

Data Reporting. Analytical data is released to clients following a secondary review by the group supervisor. Data release at this stage of the process is limited to electronic information, which is released to clients through a secure, encrypted, password protected, Internet connection. Hard copy support data is compiled by the report generation group and assembled into the final report. The report is sent to the client following reviews by the report generation staff.

All data reports include specified information, which is required to identify the report and its contents. This information includes a title, name and address of the laboratory, a unique report number, total number of pages in the report, clients name and address, analytical

method identification, arriving sample condition, sample and analysis dates, test results with units of measurement, authorized signature of data release, statement of applicability, report reproduction restrictions and NELAC requirements certification.

12.9 ***Electronic Data Reduction.*** Raw data from sample analysis is entered into the laboratory information management system (LIMS) using automated processes or manual entry. Final data processing is performed by the LIMS using procedures developed by the Company.

All LIMS programs are tested and validated prior to use to assure that they consistently produce correct results. The Information Technology Staff performs software validation testing. The testing procedures are documented in an SOP. Software programs are not approved for use until they have demonstrated that they are capable of performing the required calculations.

12.10 ***Representativeness***. Data representativeness is based on the premise that qualitative and quantitative information developed for field samples is characteristic of the sample that was collected by the client and analyzed in the laboratory. The laboratory objective for representativeness defines data as representative if the criteria for all quality parameters associated with the analysis of the sample are achieved.

12.11 ***Comparability***. Analytical data is defined as comparable when data from a sample set analyzed by the laboratory is representatively equivalent to other sample sets analyzed separately regardless of the analytical logistics. The laboratory will achieve 100% comparability for all sample data which meets the criteria for the quality parameters associated with its analysis using the method requested by the client.

13.0 CORRECTIVE ACTION SYSTEM

Requirement. The laboratory employs polices and procedures for correcting defective processes, systematic errors, and quality defects enabling the staff to systematically improve product quality. The system includes procedures for communicating items requiring corrective action to responsible individuals, corrective action tracking procedures, corrective action documentation, monitoring of effectiveness, and reports to management. The system is fully documented in a standard operating procedure. Individual corrective actions and responses are documented in a dedicated database.

13.1 ***Procedure***. Corrective action is the step that follows the identification of a process defect. The type of defect determines the level of documentation, communication, and training necessary to prevent re-occurrence of the defect or non-conformance. The formal system is maintained by the quality assurance department. Operations management is responsible for working within the system to resolve identified deficiencies.

Routine Corrective Action. Routine corrective action is defined as the procedures used to return out of control analytical systems back to control. This level of corrective action applies to all analytical quality control parameters or analytical system specifications.

Bench analysts have full responsibility and authority for performing routine corrective action. The resolution of defects at this level does not require a procedural change or staff re-training. The analyst is free to continue work once corrective action is complete and the analytical system has been returned to control. Documentation of routine corrective actions is limited to logbook comments for the analysis being performed.

Process Changes. Corrective actions in this category require procedural modifications. They may be the result of systematic defects identified during audits, the investigation of client inquiries, failed proficiency tests, product defects identified during data review, or method updates. Resolution of defects of this magnitude requires formal identification of the defect, development and documentation of a corrective action plan, and staff training to communicate the procedural change.

Technical Corrective Action. Technical corrective action encompasses routine corrective action performed by bench analysts for out of control systems and corrective actions performed for data produced using out of control systems. Technical corrective action for routine situations is conducted using the procedures detailed above.

Non-routine corrective actions apply to situations where the bench analysts failed to perform routine corrective action before continuing analysis. Supervisors and Department Managers perform corrective action in these situations. Documentation of all non-routine corrective actions is performed using the corrective action system.

Sample re-analysis is conducted if sufficient sample and holding time remain to repeat the analysis using an in-control system. If insufficient sample or holding time remains, the data is processed and qualifiers applied that describe the out of control situation. The occurrence is

further documented in the case narrative and in the corrective action response. The corrective action must include provisions for retraining the analysts who failed to perform routine corrective action.

13.2 ***Documentation & Communication***. Routine corrective actions are documented as part of the analytical record. Notations are made in the comments section of the analytical chronicle or data sheet detailing the nonconformance and corrective action. Continuation of the analysis indicates that return to control was successful.

Corrective actions for process changes are documented, tracked and monitored for effectiveness. Supervisors or senior staff members may initiate corrective actions by generating a corrective action using the corrective action database application.

The corrective action database is an Access application. The initiator generates the corrective action investigation form, which is documented, tracked, distributed to responsible parties and archived through the application. The application assigns a tracking number, initiation data and due date to each action and copies the corrective action form to the database. E-mail message containing the form is automatically distributed to the responsible parties for resolution.

The responsible party identifies the root cause of the defect, initiates the immediate fix and develops and implements the procedural change. Existing documentation such as SOPs are edited to reflect the change. The affected staff is informed of the procedural change through a formal training session. The training is documented and copies are placed into individual training files. The corrective action form is completed by the responsible party and returned to the QA staff via e-mail using the database application.

Initial and completed corrective action forms are maintained in the corrective action database. This entire database is backed up and archived daily. The corrective action tracking form is maintained as an active report in the database.

Monitoring. The QA Staff monitors the implemented corrective action until it is evident that the action has been effective and the defect has been eliminated. The corrective action database is updated by QA to reflect closure of the corrective action. The QA staff assigns an error code to the corrective action for classification of the type of errors being committed. Additional monitoring of the corrective action is conducted during routine laboratory audits.

If QA determines that the corrective action response has not effectively remedied the deficiency, the process continues with a re-initiation of the corrective action. Corrective action continues until the defect is eliminated. If another procedural change is required, it is treated as a new corrective action, which is documented and monitored using established procedures.

Client Notification. Defective processes, systematic errors, and quality defects, detected during routine audits may have negative impacts on data quality. In some cases, data that has been released to clients may be affected. If defective data has been released for use, Accutest will notify the affected clients of the defect and provide specific details regarding the magnitude of the impact to their data.

14.0 PROCEDURES FOR EXECUTING CLIENT SPECIFICATIONS

Requirement. Systems have been established for evaluating and processing client specifications for routine and non-routine analytical services. The systems enable the client services staff to identify, evaluate, and document the requested specifications to determine if adequate resources are available to perform the analysis. The system includes procedures for communicating the specifications to the laboratory staff for execution and procedures for verifying the specifications have been executed.

14.1 ***Client Specific Requirements***. The project manager is the primary contact for clients requesting laboratory services. Client specifications are communicated using several mechanisms. The primary sources of information are the client's quality assurance project plan (QAPjP) and the analytical services contract both of which detail the analytical, quality control and data reporting specifications for the project. In the absence of a QAPjP, projects specifications can also be communicated using contracts, letters of authorization, or letters of agreement, which may be limited to a brief discussion of the analytical requirements and the terms and conditions for the work. These documents may also include pricing information, liabilities and scope of work, in addition to the analytical requirements. QAPjPs include detailed analytical requirements and data quality objectives, which supersede those found in the referenced methods. This information is essential to successful project completion.

The client services staff provides additional assistance to clients who are unsure of the specifications they need to execute the sampling and analysis requirements of their project. They provide additional support to clients who require assistance in results interpretation as needed, provided they possess the expertise required to render an opinion.

The project manager is responsible for obtaining project documents, which specify the analytical requirements. Following project management review, copies are distributed to the QA Director and the appropriate departmental managers for review and comment. The original QAPjP is filed in a secure location.

14.2 ***Requirements for Non-Standard Analytical Specifications***. Client requirements that specify departures from documented policies, procedures, or standard specifications must be submitted to Accutest in writing. These requirements are reviewed and approved by the technical staff before the project is accepted. Once accepted, the non-standard requirements become analytical specifications, which follow the routine procedure for communicating client specifications. Departures from documented policies, procedures, or standard specifications that do not follow this procedure are not permitted.

14.3 ***Evaluation of Resources.*** A resource evaluation is completed prior to accepting projects submitted by clients. The evaluation is initiated by the client services staff who prepares a brief synopsis that includes the logistical requirements of the project. Logistical specifications for new projects are summarized in writing for evaluation by the affected departments. The specifications are evaluated by the department manager from a scheduling and hardware resources perspective. The project is not accepted unless the department managers have the necessary resources to execute the project according to client specifications.

14.4 ***Documentation***. New projects are initiated using a project set up form, which is completed prior to the start of the project. This form details all of the information needed to correctly enter the specifications for each client sample into the laboratory information management system (LIMS). The form includes data reporting requirements, billing information, data turnaround times, QA level, state of origin, and comments for detailing project specific requirements. The project manager is responsible for obtaining this information from the client and completing the form prior to sample arrival and login.

Sample receipt triggers project creation and the login process. The information on the set-up form is entered into the LIMS immediately prior to logging in the first sample. The set up form may be accompanied by a quotation, which details the analytical product codes and sample matrices. These details are also entered into the LIMS during login.

Special information is distributed to the laboratory supervisors and login department in electronic or hardcopy format upon project setup. All, project specific information is retained by the project manager in a secure file. The project manager maintains a personal telephone log, which details conversations with the client regarding the project.

Department managers prepare summary sheets that detail client specific analytical requirements for each test. Bench analysts use these sheets to obtain information regarding client specific analytical requirements before analyzing samples. A program code is established for each client that links the client specifications to a client project. This code is attached to a project by the project manager at login and listed on the work list for each work group conducting analysis for clients with standing requirements.

14.5 ***Communication***. A pre-project meeting is held between client services and the operations managers to discuss the specifications described in the QAPjP, contract and/or related documents. Project logistics are discussed and finalized and procedures are developed to assure proper execution of the client's analytical specifications and requirements. Questions, raised in the review meeting, are discussed with the client for resolution. Exceptions to any requirements, if accepted by the client, are documented and incorporated into the QAPjP or project documentation records.

Non-standard specifications for individual clients are documented in the LIMS at the client account level or program level. Simple specifications are documented as comments for each project. Once entered into the LIMS, these specifications become memorialized for all projects related to the client account. Complex specifications are assigned program codes that link the specification to detailed analytical specifications.

Upon sample arrival, these specifications are accessed through a terminal or printed as a hard copy and stored in a binder for individuals who require access to the specification. Specifications that are not entered into the LIMS are prohibited unless documented in an interdepartmental memo, which clearly identifies the project, client and effective duration of the specification.

14.6 ***Operational Execution***. A work schedule is prepared for each analytical department on a daily basis. Analytical specifications or program codes from recently arrived samples have now been entered into the LIMS database. The database is sorted by analytical due date and holding time, into product specific groups. Samples are scheduled for analysis by due date and holding time. The completed schedule, which is now defined as a work list, is printed. The list contains the client requested product codes, program codes and specifications required for the selected sample(s). Special requirements are communicated to the analyst using the comments section or relayed through verbal instructions provided by the supervisor. The bench analyst assumes full responsibility for performing the analysis according to the specifications printed on the work sheet.

14.7 ***Verification***. Prior to the release of data to the client, laboratory section managers and the report generation staff review the report and compare the completed product to the client specifications documentation to assure that all requirements have been met. Project managers perform a spot check of projects with unique requirements to assure that the work was executed according to specifications.

15.0 CLIENT COMPLAINT RESOLUTION PROCEDURE

Requirement. The laboratory follows a formal system for managing and reconciling client complaints. The system includes procedures for documenting the complaint and communicating it to the appropriate department for resolution. The system also includes a quality assurance evaluation to determine if the complaint is related to systematic defects requiring corrective action and process changes.

15.1 ***Procedure***. Client complaints are communicated to client services representatives, quality assurance staff, or senior management staff for resolution. The individual receiving the complaint retains the responsibility for documentation and communicating the nature of the complaint to the responsible department(s) for resolution. The responsible party addresses the complaint. The resolution is communicated to quality assurance (QA) and the originator for communication to the client. QA reviews the complaint and resolution to determine if systematic defects exist. If systematic defects are present, QA initiates a corrective action for the responsible party who develops and implements a response that eliminates the defect.

15.2 ***Documentation***. Client's complaints are documented by the individual receiving the complaint using the Data Query and Corrective Action Inquiry Process. This process generates an E-Mail message that contains detailed information essential to the complaint resolution. A record of the telephone conversation is maintained by client services. The message is distributed to the QA staff and the party bearing responsibility for resolution by E-Mail. The complaint resolution is documented on the message by the responsible party and returned to the originator. A copy is sent to QA for review and database archiving.

15.3 ***Corrective Action***. Responses to data queries are required from the responsible party. At a minimum, the response addresses the query and provides an explanation to the complaint. Formal corrective action may focus on the single issue expressed in the complaint. Corrective action may include reprocessing of data, editing of the initial report, and re-issue to the client. If the QA review indicates a systematic error, process modification is required. The defective process at the root of the complaint is changed. SOPs are either created or modified to reflect the change. The party responsible for the process implements process changes.

15.4 ***QA Monitoring***. Process changes, implemented to resolve systematic defects, are monitored for effectiveness by QA. If monitoring indicates that the process change has not resolved the defect, QA works with the department management to develop and implement an effective process. If monitoring indicates that the defect has been resolved, monitoring is slowly discontinued and the corrective action is closed. Continued monitoring is incorporated as an element of the annual system audit.

16.0 CONTROL OF NONCONFORMING PRODUCT

Requirement: Policies and procedures have been developed and implemented that describe the procedures employed by the laboratory when any aspect of sample analysis or data reporting do not conform to established procedures or client specifications. These procedures include steps to ensure that process defects are corrected and affected work is evaluated to assess its impact to the client.

Procedure. Nonconforming product is identified through routine internal review and audit practices or through client inquiry. The individuals who identify the nonconformance or receiving a nonconformance inquiry immediately inform the Laboratory Director and the Quality Assurance Director. The Laboratory Director initiates an evaluation of the nonconformance through the Quality Assurance Department and takes full responsibility for managing the process and identifying the course of action to take, initiating corrective action and mitigating the impact of the nonconformance to the client.

16.1 ***Corrective Action.*** The outcome of the evaluation dictates the course of action. This includes client notification when the quality of data reported has been impacted and may also include corrective action if applicable. Immediate corrective action is performed using the procedures specified in Accutest SOP EQA011. However, additional action may be required including cessation of analysis and withholding and or recalling data reports. If the evaluation indicates that nonconforming data may have been issued to clients, the client is immediately notified and data may be recalled following the procedures specified in SOP EQA011. If work has been stopped because of a nonconformance, the Laboratory Director is the only individual authorized to direct a resumption of analysis.

Nonconformances caused by systematic process defects require retraining of the personnel involved as an element of the corrective action solution.

17.0 CONFIDENTIALITY PROTECTION PROCEDURES

Requirement: Policies and procedures have been developed to protect client data from release to unauthorized parties or accidental release of database information through accidental electronic transmission or illegal intrusion. These policies have been communicated to clients and staff. Electronic systems are regularly evaluated for effectiveness.

17.1 ***Client Anonymity***. Information related to the Company's clients is granted to employees on a "need to know" basis. An individual's position within the organization defines his "need to know". Individuals with "need to know" status are given password access to systems that contain client identity information and access to documents and document storage areas containing client reports and information. Access to client information by individuals outside of the Company is limited to the client and individuals authorized by the client.

Individuals outside of the Company may obtain client information through subpoena issued by a court of valid jurisdiction. Clients are informed when subpoenas are received ordering the release of their information.

Client information may be released directly to regulatory agencies without receiving client authorization under specified circumstances. These circumstances require that the regulatory agency have statutory authority under the regulations for laboratory certification and that Accutest's operations fall under the purview of the regulation. In these situations, Accutest will inform the client of the regulatory agencies request for information pertaining to his data and proceed with the delivery of the information to the regulatory agency.

17.2 ***Documents***. Access to client documents is restricted to employees in need to know positions. Copies of all client reports are stored in secure electronic archives with restricted access. Reports and report copies are distributed to individuals who have been authorized by the client to receive them. Data reports or data are not released to third parties without verbally expressed or written permission from the client.

17.3 ***Electronic Data***.

Database Intrusion. Direct database entry is authorized for employees of Accutest only on a need to know basis. Entry to the database is restricted through a user specific multiple password entry system. Direct access to the database outside of the facility is possible through a dial-up connection. A unique password is required for access to the local area network. A second unique password is required to gain access to the database. The staff receives read or write level authorization on a hierarchical privilege basis.

Internet Access. Access to client information is through an HTTP Web application only. It does not contain a mechanism that allows direct access to the database. Clients can gain access to their data only using a series of Accutest assigned client and user specific passwords. The viewable data, which is encrypted during transmission, consists of an extraction of database information only.

Client Accessibility. Accessibility to client data delivered via electronic means follows strict protocols to insure confidentiality. Clients accessing electronic data are assigned a company account. The account profile, which is established by the MIS staff, grants explicit access to specific information pertaining to the client's project activity. Passwords are assigned on an individual basis within a client account. These accounts can be activated or deactivated by the MIS staff only.

17.4 ***Information Requests***. Client specific data or information is not released to third parties without verbally expressed or written permission from the client. Written permission is required from third parties, who contact the Company directly for the release of information. Verbal requests will be honored only if they are received directly from the client. These requests must be documented in a record of communication maintained by the authorized recipient.

17.5 ***Transfer of Records***. Archived data, which has previously been reported and transmitted to clients, is the exclusive property of Accutest Laboratories. In the event of a cessation of business activities due to business failure or sale, The Company's legal staff will be directed to arrange for the final disposition of archived data.

The final disposition of archived data will be accomplished using the approach detailed in the following sequence:

1. All data will be transferred to the new owners for the duration of the required archive period as a condition of sale.

2. If the new owners will not accept the data or the business has failed, letters will be sent to clients listed on the most recent active account roster offering them the option to obtain specific reports (identified by Accutest Job Number) at their own expense.

3. A letter will be sent to the NELAC accrediting authority with organizational jurisdiction over the company offering them the option to obtain all unclaimed reports at their own expense.

4. All remaining archived data will be recycled using the most expedient means possible.

18.0 QUALITY AUDITS AND SYSTEM REVIEWS

Requirement. The quality assurance group conducts regularly scheduled audits of the laboratory to assess compliance with quality system requirements, technical requirements of applied methodology, and adherence to documentation procedures. The information gathered during these audits is used to provide feedback to senior management and perform corrective action where needed for quality improvement purposes.

18.1 ***Quality System Reviews***. Quality system reviews are performed annually by the Quality Assurance Director for the Company President. In this review, the laboratory is evaluated for compliance with the laboratory Quality Systems Manual (QSM) and the quality system standards of the National Environmental Laboratory Accreditation Conference. Findings, which indicate non-compliance or deviation from the QSM, are flagged for corrective action. Corrective actions require either a return to compliance or a plan change to reflect an improved quality process. The Quality Assurance Director is responsible for making and documenting changes to the QSM. These changes are reviewed by the Company President and The Laboratory Director prior to the approval of the revised system.

18.2 ***Quality System Audits.*** Quality system audits are conducted to evaluate the effectiveness and laboratory compliance with individual quality system elements. These audits are conducted on an established schedule. Audit findings are documented and communicated to the management staff and entered into the corrective action system for resolution. If necessary, retraining is conducted to assure complete understanding of the system requirements.

18.3 ***Test Method Assessments.*** Test Method Assessments are performed throughout the year following an established schedule. Selected analytical procedures are evaluated for compliance with standard operating procedures (SOPs) and method requirements. If non-conformances exist, the published method serves as the standard for compliance. SOPs are edited for compliance if the document does not reflect method requirements. Analysts are trained to the new requirements and the process is monitored by quality assurance. Analysts are retrained in method procedures if an evaluation of bench practices indicates non-compliance with SOP requirements.

18.4 ***Documentation Audits***. Documentation audits are conducted monthly. This audit includes a check of measurement processes that require manual documentation. It also includes checks of data archiving systems and a search to find and remove any inactive versions of SOPs that may still be present in the laboratory and being accessed by the analysts. Non-conformances are corrected on the spot. Procedural modifications are implemented if the evaluation indicates a systematic defect.

18.5 ***Corrective Action Monitoring***. Defects or non-conformances that are identified during client or internal audits are documented in the corrective action systems and corrected through process modifications and/or retraining. Once a corrective action has been designed and implemented, it is monitored for compliance on a regular basis by the QA staff. Spot

corrections are performed if the staff is not following the new procedure. Monitoring of the corrective action continues until satisfactory implementation has been verified.

18.6 ***Preventive Action.*** Laboratory systems or processes, which may be faulty and pose the potential for nonconformances, errors, confusing reports or difficulties establishing traceability may be identified during internal audits. These items are highlighted for systematic change using the corrective action system and managed to resolution using the procedures for corrective action identified in EQA011.

18.7 ***Client Notification***. Defective processes, systematic errors, and quality defects, detected during routine audits may have negative impacts on data quality. In some cases, data that has been released to clients may be affected. If defective data has been released for use, Accutest will immediately notify the affected clients of the defect and provide specific details regarding the magnitude of the impact to their data.

18.8 ***Management Reports.*** Formal reports of all audit and proficiency testing activity are prepared for the management staff and presented as they occur. Additional reports may be presented orally at regularly scheduled staff meetings

Management reports may also address the following topics:

- Status and results of internal and external audits,
- Status and results of internal and external proficiency testing,
- Identification of quality control problems in the laboratory,
- Discussion of corrective action program issues,
- Status of external certifications and approvals,
- Status of staff training and qualifications,
- Discussion of new quality system initiatives.
- Recommendations for further action on listed items are included in the report.

19.0 HEALTH AND SAFETY

Requirement. The company operates a formal health and safety program that complies with the requirements of the Occupational Health and Safety Administration. The program consists of key policies and practices that are essential to safe laboratory operation. All employees are required to receive training on the program elements. Job specific training is conducted to assure safe practices for specific tasks. All employees are required to participate in the program, receive initial and annual training, and comply with the program requirements. All plan and program requirements are detailed in the Health and Safety Program Manual.

19.1 **Policy.** Accutest Laboratories will provide a safe and healthy working environment for its employees and clients while protecting the public and preserving the Company's assets and property. The company will comply with all applicable government regulations pertaining to safety and health in the laboratory and the workplace.

The objective of the Accutest Health and Safety Program is to promote safe work practices that minimize the occurrence of injuries and illness to the staff through proper health and safety training, correct laboratory technique application and the use of engineering controls.

19.2 **Responsibilities.** The Health and Safety Program assists managers, supervisors and non-supervisory employees in control of hazards and risks to minimize the potential for employee and client injuries, damage to client's property and damage or destruction to Accutest's facility.

The Health, Safety and Facilities Manager is responsible for implementing the Program's elements and updating its contents as necessary. He also conducts periodic audits to monitor compliance and assess the program's effectiveness. The Health, Safety and Facilities Manager is also responsible for creating and administering safety training for all new and existing employees.

The employee is responsible for following all safety rules established for their protection, the protection of others and the proper use of protective devices provided by the Company. The employee is also expected to comply with the requirements of the program at all times. Department Managers and Supervisors are responsible for ensuring the requirements of the Safety Program are practiced daily. The Company President retains the ultimate responsibility for the program design and implementation.

19.3 **Program Elements.** The Accutest Health and Safety Program consists of key program elements that compliment the company's health and safety objective. These elements form the essence of the health and safety policy and assure that the objectives of the program are achieved.

Safety Education and Training and Communication. Training is conducted to increase the staff's awareness of laboratory hazards and their knowledge of the safety practices and procedures required to protect them from those hazards. It is also used to communicate general safety procedures required for safe operation in a chemical laboratory.

Initial health and safety training for new employees is conducted during orientation. The training focuses on the Accutest Safety and Health Program and includes specific training for the hazards that may be associated with the employees duties. Training is also conducted for all program elements focusing on general, acceptable, laboratory safety procedures. Targeted training is conducted to address hazards or safety procedures that are specific to individual employee's work assignments. All training activities are documented and archived in individual training folders, A health and safety training inventory is maintained in the training database.

Safety Committee. The safety committee provides the employee with an opportunity to express their views and concerns on safety issues in a forum where those concerns will be addressed. This committee meets monthly to assure that the interests of the company and the well being of the employee are protected. They also serve as a catalyst for elevating the level of safety awareness among their peers.

Hazard Identification and Communication. The hazard communication program enables employees to readily identify laboratory hazards and the procedures to protect themselves from those hazards. This program complies with OSHA's Hazard Communication Standard, Title 29 Code of Federal Regulations 1910.1200 that requires the company to adopt and adhere to the following key elements:

- Material Safety Data Sheets (MSDS) must be available to any employee wishing to view them,
- The Company must maintain a Hazardous Chemicals Inventory (by location), which is updated on an annual basis,
- Containers are properly labeled,
- All employees must be provided with annual Hazard Communication and Right to Know training,

The hazard communication program also complies with the requirements of the New Jersey Worker and Community Right to Know Law, NJAC 8:95.

Identification of Workplace Hazards. The workplace hazard identification procedures have been designed to assure that hazards that have the potential to cause personnel injury or destruction of property are identified, managed and/or systematically eliminated from the operation. This system eliminates hazards, limits the potential for injury and increases the overall safety of the work environment.

Employee Exposure Assessment. Employee exposure assessment is performed to identify and evaluate potential exposure hazards associated with the employees work station. The exposure assessment data is used to determine if changes or modifications to the work station are needed to limit exposure to laboratory conditions that could negatively affect an employee's existing medical conditions.

Bloodborne Pathogens. Accutest has implemented the OSHA Bloodborne Pathogen Standard, 29CFR1910.1030 to reduce occupational exposure to Hepatitis B Virus (HBV), Human Immunodeficiency Virus (HIV) and other bloodborne pathogens that employees may encounter in their workplace.

Respiratory Protection Plan. The respiratory protection plan assures that Accutest employees are protected from exposure to respiratory hazards. This program is used in situations where engineering controls and/or safe work practices do not completely control the identified hazards. In these situations, respirators and other protective equipment are used. Supplemental respiratory protection procedures are applied to specified maintenance personnel, employees who handle hazardous wastes in the hazardous waste storage area, and any employee that voluntarily elects to wear a respirator.

Chemical Hygiene Plan. The Chemical Hygiene Plan complies with the requirements of the Occupational Safety and Health Administration's Occupational Exposure to Hazardous Chemicals in the Laboratory Standard, 29 CFR 1910.1450. This plan establishes procedures, identifies safety equipment, personal protective equipment, and work practices that protect employees from the potential health hazards presented by hazardous chemicals in the laboratory if properly used and/or applied.

Chemical Spill Response Plan. The chemical spill response plan has been designed to minimize the risks from a chemical spill or accidental chemical release in the laboratory. Risk minimization is accomplished through a planned response that follows a defined procedure. The staff has been trained to execute spill response procedures according to the specifications of the plan, which identifies the appropriate action to be taken based on the size of the spill.

Emergency Action & Evacuation Plan. The Emergency Action and Evacuation Plan details the procedures used to protect and safeguard Accutest's employees and property during emergencies. Emergencies are defined as fires or explosions, gas leaks, building collapse, hazardous material spills, emergencies that immediately threaten life and health, bomb threats and natural disasters such as floods, hurricanes or tornadoes, terrorism or terrorist actions. The plan identifies and assigns responsibility for executing specific roles in situations requiring emergency action. It also describes the building security actions coinciding with the "Alert Condition", designated by the Department of Homeland Security.

Lockout/Tagout Plan. Lockout/tagout procedures have been established to assure that laboratory employees and outside contractors take steps to render equipment inoperable and/or safe before conducting maintenance activities. The plan details the procedures for conducting maintenance on equipment that has the potential to unexpectedly energize, start up, or release energy or can be operated unexpectedly or accidentally resulting in serious injury to employees. The plan ensures that employees performing maintenance render the equipment safe through lock out or tag out procedures.

Personal Protection Policy. Policies have been implemented which detail the personal protection requirements for employees. The policy includes specifications regarding engineering controls, personal protective equipment (PPE), hazardous waste, chemical exposures, working

with chemicals and safe work practices. Safety requirements specific to processes or equipment are reviewed with the department supervisor or the Health and Safety Manager before beginning operations.

Visitor and Contractor Safety Program. A safety brochure is given to all visitors and contractors who visit or conduct business at the facility. The brochure is designed to inform anyone who is not an employee of Accutest Laboratories of the laboratories safety procedures. The brochure directs them to follow all safety programs and plans while on Accutest property. This program also outlines procedures for visitors and contractors in the event of an emergency. Visitors are required to acknowledge receipt and understanding of the Accutest policy annually.

Appendix I

Glossary of Terms

GLOSSARY OF TERMS

Acceptance Criteria: specified limits placed on characteristics of an item, process, or service defined in requirement documents.

Accuracy: the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator.

Analyst: the designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.

Audit: a systematic evaluation to determine the conformance to quantitative *and qualitative* specifications of some operational function or activity.

Batch: environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same NELAC-defined matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An analytical batch is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group.

Blank: a sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results.

Blind Sample: a sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.

Calibration: to determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter, instrument, or other device. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements.

Calibration Curve: the graphical relationship between the known values, such as concentrations of a series of calibration standards and their instrument response.

Calibration Method: a defined technical procedure for performing a calibration.

Calibration Standard: a substance or reference material used to calibrate an instrument.

Certified Reference Material (CRM): a reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation, which is issued by a certifying body.

Chain of Custody: an unbroken trail of accountability that ensures the physical security of samples and includes the signatures of all who handle the samples.

Confirmation: verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to second column confirmation, alternate wavelength, derivatization, mass spectral, interpretation, alternative detectors or, additional cleanup procedures.

Corrective Action: the action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence.

Data Reduction: the process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form.

Demonstration of Capability: a procedure to establish the ability of the analyst to generate acceptable accuracy.

Document Control: the act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed.

Duplicate Analyses: the analyses or measurements of the variable of interest performed identically on two sub-samples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory.

Field of Testing: NELAC's approach to accrediting laboratories by program, method and analyte. Laboratories requesting accreditation for a program-method-analyte combination or for an up-dated/improved method are required submit to only that portion of the accreditation process not previously addressed (see NELAC, section 1.9ff).

Laboratory Control Sample (such as laboratory fortified blank, spiked blank, or QC check sample): a sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes from a source independent of the calibration standards or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

Matrix: the component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

Aqueous: any aqueous sample excluded from the definition of Drinking Water matrix or Saline/Estuarine source. Includes surface water, groundwater, effluents, and TCLP or other extracts.

Drinking Water: any aqueous sample that has been designated a potable or potential potable water source. Saline/Estuarine: any aqueous sample from an ocean or estuary, or other salt-water source such as the Great Salt Lake. Non-aqueous Liquid: any organic liquid with <15% settleable solids.

Solids: includes soils, sediments, sludges and other matrices with >15% settlable solids.

Chemical Waste: a product or by-product of an industrial process that results in a matrix not previously defined.

Air: whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbent tube, impinger solution, filter, or other device.

Biota: animal or plant tissue, consisting of entire organisms, homogenates, and/or organ or structure specific subsamples.

Matrix Spike (spiked sample or fortified sample): a sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Matrix Spike Duplicate (spiked sample or fortified sample duplicate): a second replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.

Method Blank: a sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest, which is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.

Method Detection Limit: the minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

National Environmental Laboratory Accreditation Program (NELAP): the overall National Environmental Laboratory Accreditation Program.

NELAC Standards: the plan of procedures for consistently evaluating and documenting the ability of laboratories performing environmental measurements to meet nationally defined standards established by the National Environmental Laboratory Accreditation Conference.

Performance Audit: the routine comparison of independently obtained *qualitative and quantitative* measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory.

Precision: the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.

Preservation: refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample.

Proficiency Testing: a means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source.

Proficiency Test Sample (PT): a sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria.

Quality Assurance: an integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence.

Quality Control: the overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users.

Quality Manual: a document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.

Quality System: a structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC.

Reporting Limits: the maximum or minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be quantified with the confidence level required by the data user.

Reagent Blank (method reagent blank or method blank): a sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps.

Reference Material: a material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.

Reference Method: a method of known and documented accuracy and precision issued by an organization recognized as competent to do so.

Reference Standard: a standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived.

Replicate Analyses: the measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval.

Sample Duplicate: two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method including sampling and analysis.

Spike: a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.

Standard: the document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of NELAC and meets the approval requirements of NELAC procedures and policies.

Traceability: the property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons.

Validation: the process of substantiating specified performance criteria.

Work Cell: A defined group of analysts that together perform the method analysis. Members of the group and their specific functions within the work cell must be fully documented. A "work cell" is considered to be all those individuals who see a sample through the complete process of preparation, extraction, or analysis. The entire process is completed by a group of capable individuals; each member of the work cell demonstrates capability for each individual step in the method sequence.

Appendix II

Standard Operating Procedures Directory

Accutest Laboratories
Standard Operating Procedures

Section	Standard Operating Procedure Title	Number
Air Toxics	Air Analysis by TO-15	EAT001
Air Toxics	Summa Canister Cleaning and Certification	EAT002
Air Toxics	Air Analysis of Tedlar Bag/Summa Canister by TO-3	EAT003
Air Toxics	Laboratory Analysis of Dissolved Gases in Aqueous Samples	EAT004
Air Toxics	Air Analysis by NJDEP – SRWM Low Level USEPA TO-15	EAT005
Air Toxics	Calibration of Flow Controllers	EAT006
General Chem	Percent Solids - EPA 160.3, ASTM D4643-00	EGN007
General Chem	Anionic Surfactants As MBAS	EGN008
General Chem	Nonionic Surfactants as CTAS	EGN009
General Chem	Total Solids, 160.3	EGN010
General Chem	Composite Sample	EGN015
General Chem	Total Dissolved Solids (Total Filterable Residue)	EGN020
General Chem	Settlable Solids, 160.5	EGN021
General Chem	Nitrate/Nitrite & Nitrate Only By Cad. Red. Analysis	EGN026
General Chem	Total Volatile Solids, 160.4	EGN030
General Chem	Chlorine, Total Residual And Free	EGN033
General Chem	Total Alkalinity, 310.1	EGN037
General Chem	Acidity (pH 8.2)	EGN044
General Chem	Bicarbonate, Carbonate, Free Carbon Dioxide	EGN045
General Chem	Petroleum Hydrocarbons By IR	EGN062
General Chem	Viscosity	EGN067
General Chem	Total Suspended Solids (Non-Filterable Residue)	EGN087
General Chem	Chemical Oxygen Dem: Hach 8000, Aqueous Samples - Soil Modified	EGN099
General Chem	Hardness As Caco3 By Titration	EGN101
General Chem	Orthophosphate	EGN102
General Chem	Nitrogen, Nitrite -Total-Waters/Soluble-Soils	EGN103
General Chem	Turbidity, 180.1	EGN116
General Chem	Sulfide	EGN118
General Chem	Sulfite.	EGN119
General Chem	Apparent Color By Visual Comparison Method	EGN120
General Chem	Specific Conductance At 25.0 C	EGN124
General Chem	Chloride	EGN131
General Chem	Turbidity for Metals Drinking Waters	EGN132
General Chem	Odor & Odor at Elevated Temp.(Threshold Odor Test)	EGN133
General Chem	Biological Oxygen Demand (5 Day BOD)	EGN134
General Chem	Winkler Titration For DO Standardization	EGN135
General Chem	Dissolved Oxygen	EGN136
General Chem	Reactive Sulfide And Reactive Cyanide	EGN137
General Chem	Ignitability	EGN140
General Chem	TCLP - Semivolatiles/Metals Extraction	EGN141
General Chem	TCLP- Volatiles Extraction	EGN142

Accutest Laboratories
Standard Operating Procedures

Section	Standard Operating Procedure Title	Number
General Chem	Paint Filter Test	EGN143
General Chem	Cyanides Amenable To Chlorination Preparation	EGN144
General Chem	Temperature	EGN146
General Chem	Iodine, Colorimetric Analysis	EGN148
General Chem	pH by Electrode – Water	EGN151
General Chem	Salinity - SM182520B	EGN158
General Chem	pH & Corrosivity for Soils/ Solid Wastes SW486 9045	EGN200
General Chem	BTU (Gross Calorific Value)	EGN202
General Chem	Percent Sulfur	EGN203
General Chem	Bulk Density (Dry Basis)	EGN204
General Chem	Percent Ash (Dry Basis)	EGN205
General Chem	Total Organic Content	EGN206
General Chem	Cyanide (Lachat Autoanalyzer)	EGN207
General Chem	Total Chlorine ASTM D808-91	EGN208
General Chem	Total Organic Chlorine ASTM D808-91	EGN209
General Chem	Total Kjeldahl Nitrogen (Lachat Autoanalyzer)	EGN210
General Chem	Specific Gravity	EGN211
General Chem	Hexavalent Chromium (Soils)	EGN214
General Chem	Moisture, Karl Fisher	EGN215
General Chem	Ammonia (Lachat Autoanalyzer)	EGN216
General Chem	Phenols (Lachat Autoanalyzer)	EGN217
General Chem	Total Organic Halides	EGN218
General Chem	Total Organic Halides, Solid And Oil Matrices	EGN219
General Chem	Pour Point	EGN221
General Chem	Base Sediment In Petroleum Samples	EGN222
General Chem	Water Content In Petroleum Samples	EGN223
General Chem	Ignitability, Bunsen Burner Method	EGN226
General Chem	Organic Matter (Loss on Ignition)	EGN227
General Chem	Sulfide Analysis For Reactive Sulfides	EGN228
General Chem	Hexavalent Chromium In Waters by EPA 7196a Mod.	EGN230
General Chem	Hexavalent Chromium In Waters by SM18 4500 CR D	EGN231
General Chem	Total Petroleum Hydrocarbons by IR With ASE Extract.	EGN232
General Chem	Total Organic Carbon In Soil Samples	EGN233
General Chem	Total Organic Carbon In Aqueous Samples	EGN234
General Chem	Synthetic Precipitation Leaching Procedure for Non-Volatile Anal.	EGN239
General Chem	Synthetic Precipitation Leaching Procedure for Volatile Analytes	EGN240
General Chem	Cation Exchange Capacity Of Soils (Sodium Acetate)	EGN242
General Chem	Ferrous Iron	EGN243
General Chem	Freon-113 Recycling Procedure	EGN246
General Chem	Specific Gravity (For Sludges And Solids)	EGN247
General Chem	N-Hexane Extract. Mat. & Silica Gel Treatment by Gravimetric Anal.	EGN249
General Chem	Oil & Grease – Gravimetric Anal. (So & Sl) – Hexane Extraction	EGN250
General Chem	Determination of Inorganic Anions By Ion Chromatography	EGN251

Accutest Laboratories
Standard Operating Procedures

Section	Standard Operating Procedure Title	Number
General Chem	Neutral Leaching of Solid Waste Sam. Using Shake Extraction	EGN252
General Chem	Oxidation-Reduction Potential	EGN253
General Chem	Sulfate By Gravimetric Method	EGN254
General Chem	Titrametric Method For Free Carbon Dioxide	EGN255
General Chem	Total Phosphorous EPA 365.3	EGN256
General Chem	Dissolved Silica	EGN257
General Chem	Grain Size and Sieve Testing	EGN258
General Chem	Hardness By Calculation	EGN259
General Chem	Spectrophotometer Calibration Check	EGN260
General Chem	Weak Acid Dissociable Cyanide Preparation	EGN263
General Chem	Volatile Suspended Solids	EGN264
General Chem	Unburned Combustibles (Volatile Solids)	EGN266
General Chem	Particulate Matter	EGN267
General Chem	Elutriate Preparation	EGN268
General Chem	Phosphorus, Hydrolyzable	EGN271
General Chem	Perchlorate by Ion Chromatography in Groundwater and Soil	EGN272
General Chem	Percent Lipids by Gravimetric Analysis	EGN273
General Chem	Cyanide Distillation/Aqueous Samples/Micro Method	EGN275
General Chem	Cyanide Distillation/Soil Samples/Micro Method	EGN276
General Chem	Calibration of General Chemistry Distillation Tubes	EGN277
General Chem	Cyanide Distillation/Aqueous Samples for Ohio VAP	EGN278
General Chem	Phenols Distillation, Water Samples	EGN279
General Chem	Phenols Micro Distillation, Soil Samples	EGN280
General Chem	Inorganic Anions Determination by ion chromatography using IC 2000	EGN281
General Chem	Silica Gel Treated N-Hexane Extractable Material in soils by EPA 1664	EGN282
General Chem	Leaching of Solid Waste Samples using China Leaching Procedure	EGN283
General Chem	Ammonia Distillation, Water & Solid samples	EGN284
General Chem	Weak Acid Dissociable Cyanide / Micro-Distillation Method	EGN286
General Chem	Ferrous Iron for Hexavalent Chromium Sample Characterization	EGN288
General Chem	Inorganic Carbon by Calculation	EGN289
General Chem	Procedure for Homogenization of Biota Samples	EGN290
General Chem	Hexavalent Chromium in Water by Ion Chromatography	EGN291
General Chem	Hexavalent Chromium in Soils by Ion Chromatography	EGN292
General Chem	Procedure for Wand Mixer Homogenization of Soil Samples	EGN293
General Chem	Hydrogen Sulfide	EGN294
General Chem	TCLPME-Multiple Extractions Procedure	EGN295
General Chem	Modified Elutriate Preparation	EGN296
General Chem	Procedure for Particle Size Reduction (Crushing) of Solid Matrices	EGN297
Information Tech	Information Security & Integrity Procedure	EMI001
Information Tech	Procedures for Requesting Software or Software Revisions	EMI002
Information Tech	Development, Implementation, Delivery, & Revision of EDDs	EMI003

Accutest Laboratories
Standard Operating Procedures

Section	Standard Operating Procedure Title	Number
Metals Analysis	Mercury Analysis In Aqueous samples	EMA055
Metals Analysis	Mercury Analysis of Solid Samples: SW7471A	EMA072
Metals Analysis	Mercury Analysis of Solid Samples: ILM04.0, EPA245.5M	EMA073
Metals Analysis	Metals Waste Water ICP, EPA 200.7	EMA206
Metals Analysis	Metals: ICP Emission Spec. SW846 6010B	EMA207
Metals Analysis	Mercury Analysis of Drinking Water Samples	EMA215
Metals Analysis	Metals by ICP-MS: EPA 200.8	EMA216
Metals Analysis	Metals by ICP-MS: SW846 6020	EMA217
Metals Analysis	Metals by ICP-MS using Ultrasonic Nebulization	EMA221
Metals Analysis	Metals by ICP Atomic Emission Spectrometry using Solid State ICP	EMA222
Metals Analysis	Metals by ICP Atomic Emission Spectrometry – EPA 200.7	EMA223
Metals Prep	Digestion of DW for ICP Analysis	EMP048
Metals Prep	Non-Potable Waters Digestion For ICP/Flame Analysis	EMP070
Metals Prep	Soil Digestion For ICP Analysis	EMP073
Metals Prep	Non-Potable Water Digestion for Flame/ICP(Total & Dissolved)	EMP081
Metals Prep	Digestion Of Non-Potable Waters For Total Recoverable Metals	EMP200
Metals Prep	Metals Spiking Solution and Standards Preparation and Use	EMP202
Metals Prep	Calibration of Metals Digestion Tubes	EMP203
Metals Prep	Digestion of DW and NP Waters for Total Metals for ICP/MS Analysis	EMP204
Microbiology	Microbiological Quality Control	EMB001
Microbiology	Coliform, Total By Colilert, SM18 9223 B	EMB002
Microbiology	Total Coliform: Membrane Filtration/Fecal Coliform Confirmation	EMB003
Microbiology	Total Plate Count SM18 9215B	EMB008
Microbiology	General Petroleum Degraders	EMB009
Microbiology	Calibration of Microbiology Coliform Collection Bottles	EMB010
Microbiology	Coliform, Fecal	EMB127
Organics- GC	Acetylene Analysis by Gas Chromatography	EGC010
Organics- GC	Semi-Volatile Petroleum Products in H2O-NJOQA25	EGC101
Organics- GC	Volatile Organic Screen by Headspace	EGC3810
Organics- GC	Volatile Organics by EPA 502.2	EGC502
Organics- GC	EDB, DBCP, 123-TCP by EPA 504	EGC504
Organics- GC	Pesticides in Drinking Water by EPA 508	EGC508
Organics- GC	Chlorinated Herbicides by EPA 515	EGC515
Organics- GC	Volatile Halocarbons by EPA 601	EGC601
Organics- GC	Volatile Aromatics in Wastewater by EPA-602	EGC602
Organics- GC	Acrolein and Acrylonitrile by EPA 603	EGC603
Organics- GC	Pesticides & PCBs in Wastewater by EPA 608	EGC608
Organics- GC	1,2-DBE, 1,2-DB-3-CP & 1,2,3-TCP by Micro-extraction and GC	EGC8011
Organics- GC	Volatile Aromatics Halocarbons by SW8021	EGC8021B
Organics- GC	Pesticides Analysis by SW8081	EGC8081

Accutest Laboratories
Standard Operating Procedures

Section	Standard Operating Procedure Title	Number
Organics- GC	PCB Analysis SW8082	EGC8082
Organics- GC	PAHs by SW846-8100	EGC8100
Organics- GC	Herbicides by SW846 – 8151	EGC8151
Organics- GC	Analysis of Explosives by GC/ECD	EGC8330M
Organics- GC	Conn. Total Semi-volatile Petroleum Hydrocarbons	EGCCTGRO
Organics- GC	Alcohols by Direct Aqueous Injection GC/FID SW 8015	EGCALDAI
Organics- GC	Connecticut Extractable Petroleum Hydrocarbon Analysis	EGCCTETPH
Organics- GC	Petroleum Range Organics Analysis By GC/FID (Florida)	EGCFLPRO
Organics- GC	Massachusetts Extractable Petroleum Hydrocarbons	EGCMAEPH
Organics- GC	Massachusetts Volatile Petroleum Hydrocarbons	EGCMAVPH
Organics- GC	Oil Identification by Gas Chromatography Fingerprint	EGCOILID
Organics- GC	Diesel Range Organics by SW8015	EGCTPHS
Organics- GC	Gasoline Range Organics by SW8015	EGCTPHV
Organics-GC/MS	Volatile Organics in Drinking Water by EPA 524	EMS524
Organics-GC/MS	Volatile Organics in Wastewater by EPA 624	EMS624
Organics-GC/MS	Semi-Volatile Organics by EPA 625	EMS625
Organics-GC/MS	Volatile Organics by SW8260B	EMS8260B
Organics-GC/MS	Ethylene/Propylene Glycol Analysis DAI-GC/MS(SIM)	EMS8260DAI
Organics-GC/MS	Semi-Volatile Organics by SW8270	EMS8270
Organics Prep	Prep of Base Neutral/Acid Extractables: Water Matrices	EOP001
Organics Prep	Prep of Base Neutrals/Acid Extractables in Solids	EOP002
Organics Prep	Water Extraction For Organochlorine Pesticides/PCBs	EOP004
Organics Prep	Alumina Cleanup of Organic Extracts: SW3610	EOP005
Organics Prep	Continuous Liquid/Liquid Extraction Water: SW3520C	EOP007
Organics Prep	Sulfur Cleanup of Organic Extracts: SW846 3660B	EOP011
Organics Prep	Testing & Approval Of Organics Solvents	EOP013
Organics Prep	Preparation & Use of MDL Check Solution	EOP014
Organics Prep	Calibration Standard Solution Preparation for Organics Analysis	EOP015
Organics Prep	Preparation of Petroleum Oils & Organic Wastes for PCBs by SW 8082	EOP017
Organics Prep	Removal of Sulfur from Extracts with Tetrabutylammonium Sulfite	EOP018
Organics Prep	Soxhlet Extraction of Solids For Semi-Volatile Organics	EOP020
Organics Prep	Pressurized Fluid Extraction (ASE) SW846-3545	EOP040
Organics Prep	Alumina Column Cleanup SW3611	EOP3611
Organics Prep	Florisil Column Cleanup SW3620	EOP3620
Organics Prep	Silica Gel Cleanup SW3630	EOP3630
Organics Prep	Acid Base Partitioning SW3650	EOP3650
Organics Prep	Sulfuric Acid/Permanganate Cleanup SW3665	EOP3665
Organics Prep	Purge-And-Trap Extraction Of Aqueous Samples	EOP5030
Organics Prep	Collection/Preservation of Solids for VO Analysis: 5035	EOP5035
Organics Prep	NJDEP Methanol Extraction/Preservation of Soils	EOPNJMEOH

Accutest Laboratories
Standard Operating Procedures

Section	Standard Operating Procedure Title	Number
Organics - LC	PAHs By HPLC Using SW-846 Method 8310	ELC8310
Project Mgmt	Procedure For The Management Of Client Projects	EPM001
Project Mgmt	Client Specific Method Modifications	EPM002
Project Mgmt	Procedure For The Notification Of DW Exceedences	EPM003
Project Mgmt	Data Entry for Sample Log-In	EPM004
Quality Assurance	Preparation, Approval, Distribution & Archiving of SOPs	EQA001
Quality Assurance	Calibration of Analytical Balances	EQA002
Quality Assurance	Calibration of Thermometers	EQA003
Quality Assurance	Calibration and Use of Auto-Pipettes	EQA004
Quality Assurance	Temperature Monitoring-	EQA005
Quality Assurance	Sample Container Cleaning & Quality Control	EQA006
Quality Assurance	Calibration of Kuderna-Danish Collection Tubes	EQA007
Quality Assurance	Preparation and Analysis of Sample Preservatives	EQA008
Quality Assurance	Personnel Training and Analyst Proficiency	EQA009
Quality Assurance	Sample Batching Procedure	EQA010
Quality Assurance	Corrective Action Procedure	EQA011
Quality Assurance	Glassware Preparation For Inorganic Lab Use	EQA012
Quality Assurance	Preparation Of Glassware For Organics Extraction	EQA013
Quality Assurance	Standards Traceability Documentation Procedure	EQA014
Quality Assurance	Management/Reporting Of Proficiency Test (PT) Samples	EQA017
Quality Assurance	Creating/Distributing/Tracking Internal Chains Of Custody	EQA018
Quality Assurance	Creating New Projects	EQA020
Quality Assurance	Creating Product Codes	EQA021
Quality Assurance	Procedures For The Purchase Of Laboratory Supplies	EQA023
Quality Assurance	Control & Archiving Of Laboratory Documents	EQA025
Quality Assurance	Air Quality Monitoring of Extraction Laboratory	EQA026
Quality Assurance	Confidentiality Protection Procedures	EQA027
Quality Assurance	Quality System Review	EQA028
Quality Assurance	Contract Review	EQA029
Quality Assurance	Procedure for the Development and Application of MDLs and RLs	EQA030
Quality Assurance	Subcontracting Procedures	EQA031
Quality Assurance	Signature Authority	EQA032
Quality Assurance	Review of Inorganic Data	EQA034
Quality Assurance	Review of Organic Data	EQA035
Quality Assurance	Documentation of Equipment Maintenance	EQA036
Quality Assurance	Client Complaints Resolution Procedure	EQA038
Quality Assurance	Employee Technical Ethics Responsibilities	EQA039
Quality Assurance	Internal Audit Procedure	EQA041
Quality Assurance	Procedure for Obtaining Representative Sample Aliquots	EQA042
Quality Assurance	Procedure for Development &use of In-House Q C Criteria	EQA043
Quality Assurance	Manual Integration of Chromatographic Peaks	EQA044

Accutest Laboratories
Standard Operating Procedures

Section	Standard Operating Procedure Title	Number
Quality Assurance	Deionized Water Quality Control	EQA046
Quality Assurance	Management and Control of Change	EQA047
Quality Assurance	Laboratory Equipment Purchase and Removal From Service	EQA048
Quality Assurance	Calibration of Microliter Syringes	EQA049
Quality Assurance	Autosampler Vial Labeling Procedure (formally EOP041-01)	EQA050
Quality Assurance	pH for Volatile Samples	EQA051
Quality Assurance	Semivolatile Spike Solution Accuracy Verification	EQA053
Quality Assurance	Quality Control Review of Data Packages	EQA054
Quality Assurance	Procedures for Determining Method Comparability	EQA055
Quality Assurance	Refrigerator Storage Holding Blank Procedure	EQA056
Quality Assurance	Data Integrity Training Procedure	EQA057
Quality Assurance	Data Integrity Monitoring Procedure	EQA058
Quality Assurance	Procedure for Conducting Data Integrity Investigations	EQA059
Quality Assurance	Procedure for the Confidential Reporting of Data Integrity Issues	EQA061
Quality Assurance	Calibration of Volumetric Dispensers for Volume Critical Processes	EQA062
Quality Assurance	Calibration of Volumetric Dispensers / Non-Critical Volumes Processes	EQA063
Quality Assurance	Glassware Preparation for use in VOA analysis	EQA064
Quality Assurance	Control of Non-Conforming Product	EQA065
Quality Assurance	Client Notification of Key Personnel Changes	EQA066
Quality Assurance	Review of Inorganic Notebooks	EQA067
Quality Assurance	Disposal of Spent Semi-Volatile Organic Extracts	EQA068
Sample Mgmt.	Sample Storage	ESM001
Sample Mgmt.	Chain Of Custody And Log In Procedure	ESM002
Sample Mgmt.	Temperature Maintenance Of Shipping Coolers	ESM004
Sample Mgmt.	Cooler Packaging And Shipping Procedure	ESM008
Sample Mgmt.	Procedures for Sample Couriers	ESM011
Sample Mgmt.	Summa Canister Shipment & Retrieval: NJDEP 03-X-35135	ESM012
Health & Safety	Contamination Avoidance Procedure	EHS001
Health & Safety	Measuring Face Velocities in Laboratory Fume Hoods	EHS002
Health & Safety	Proper Handling of Compressed Gas Cylinders	EHS003
Health & Safety	Sample and Waste Disposal (Formerly ESM003)	EHS004
Health & Safety	Handling and Management of Inorganic Wastes (Formerly EGN265)	EHS005
Health & Safety	Handling, Treatment, and Disposal of Foreign Soils	EHS006
Field Operations	Aqueous Grab Sampling Procedures	EFP001
Field Operations	Use of Automatic Wastewater Sampler	EFP002
Field Operations	Free and Total residual Chlorine	EFP003
Field Operations	Decontamination of Sampling Equipment	EFP004
Field Operations	Dissolved Oxygen	EFP005
Field Operations	Dissolved Oxygen by Winkler Titration	EFP006
Field Operations	Metal Sample Field Filtering Procedure	EFP008

Accutest Laboratories
Standard Operating Procedures

Section	Standard Operating Procedure Title	Number
Field Operations	Sampling Procedure for Monitoring Wells	EFP013
Field Operations	Subsurface Soil Sampling Procedure	EFP016
Field Operations	Surface Soil Sampling Procedure	EFP017
Field Operations	Residential Potable Well Sampling Procedure	EFP018
Field Operations	Potable Water Line Sampling Procedure	EFP019
Field Operations	Sampling for NJ Private Well Testing Act	EFP020
Field Operations	Field Sampling Coordinates by GPS	EFP021
Field Operations	Sampling Drinking Water Wells for Volatile Organics	EFP022
Field Operations	Sampling Drinking Water Wells for Metals	EFP023
Field Operations	Sampling Drinking Water Wells for Nitrates & Nitrites	EFP024
Field Operations	Sampling Drinking Water Wells for Gross Alpha	EFP025
Field Operations	Sampling Drinking Water Wells for Coliform Bacteria	EFP026
Field Operations	Sampling Drinking Water Wells for pH	EFP027
Field Operations	Field Oxidation-Reduction Potential	EFP029
Field Operations	Turbidity, Field Test	EFP030
Field Operations	Analysis for Dissolved Oxygen by DO Probe	EFP031
Field Operations	Field pH in Water by Electrode	EFP032
Field Operations	Field Measurement of Specific Conductance and Resistivity	EFP033

Appendix III

Analytical Capabilities

Method Capabilities By NELAC Accredited Fields of Testing

Analytes	Method Number	Program	Chemistry Field
Alkalinity	SM 2320 B	Drinking Water	Inorganic Wet Chem
Ammonia	SM 4500NH_3-H	Drinking Water	Inorganic Wet Chem
Chloride, Fluoride, Sulfate	EPA 300.0	Drinking Water	Inorganic Wet Chem
Chlorine, Total Residual	SM 4500-CL F	Drinking Water	Inorganic Wet Chem
Color, Apparent	SM 2120 B	Drinking Water	Inorganic Wet Chem
Conductivity	SM 2510 B	Drinking Water	Inorganic Wet Chem
Cyanide	EPA 335.4	Drinking Water	Inorganic Wet Chem
Foaming Agents (MBAS)	SM 5540 C	Drinking Water	Inorganic Wet Chem
Nitrate/Nitrite	EPA 353.2	Drinking Water	Inorganic Wet Chem
Nitrite	SM 4500-NO_2-B	Drinking Water	Inorganic Wet Chem
Odor	SM 2150 B	Drinking Water	Inorganic Wet Chem
Organic Carbon, Total (TOC)	SM 5310 B	Drinking Water	Inorganic Wet Chem
Orthophosphate	SM 4500 P-E	Drinking Water	Inorganic Wet Chem
Perchlorate	EPA 314.0	Drinking Water	Inorganic Wet Chem
pH, Hydrogen Ion	SM 4500H^+-B	Drinking Water	Inorganic Wet Chem
Silica – Dissolved	SM 4500 Si-D	Drinking Water	Inorganic Wet Chem
Temperature	SM 2550 B	Drinking Water	Inorganic Wet Chem
Total Dissolved Solids	SM 2540 C	Drinking Water	Inorganic Wet Chem
Total Organic Halides (TOX)	SM 5320 B	Drinking Water	Inorganic Wet Chem
Turbidity	EPA 180.1	Drinking Water	Inorganic Wet Chem
Hardness – Calcium	EPA 200.7	Drinking Water	Metals
Hardness – Calcium	SM 2340B	Drinking Water	Metals
Hardness – Total	EPA 200.7	Drinking Water	Metals
Hardness – Total	SM 2340C	Drinking Water	Metals
Mercury	EPA 245.1	Drinking Water	Metals
Metals	EPA 200.7	Drinking Water	Metals
Metals	EPA 200.8	Drinking Water	Metals
Chlorinated Herbicides	EPA 515.1	Drinking Water	Organics
DBCP, EDB & TCP	EPA 504.1	Drinking Water	Organics
Volatile Organics	EPA 524.2	Drinking Water	Organics
Total Coliform/ E. Coli	SM 9223 B	Drinking Water	Microbiology
Heterotrophic Bacteria	SM 9215 B	Drinking Water	Microbiology
Acidity as CaCO3	SM 2310 B(4A)	Wastewater	Inorganic Wet Chem
Alkalinity as CaCO3	SM 2320 B	Wastewater	Inorganic Wet Chem
Ammonia	SM20 4500 NH_3-B+G	Wastewater	Inorganic Wet Chem
Biochemical Oxygen Demand	SM 5210B	Wastewater	Inorganic Wet Chem
Bromide, Chloride, Fluoride, Sulfate	EPA 300.0	Wastewater	Inorganic Wet Chem

Method Capabilities By NELAC Accredited Fields of Testing

Analytes	Method Number	Program	Chemistry Field
Carbonaceous BOD (CBOD)	SM 5210 B	Wastewater	Inorganic Wet Chem
Chemical Oxygen Demand (COD)	SM 5220 C	Wastewater	Inorganic Wet Chem
Chloride	SM 4500 Cl-C	Wastewater	Inorganic Wet Chem
Chlorine, Total Residual	SM 4500-CLF	Wastewater	Inorganic Wet Chem
Chromium (VI)	SM 3500-Cr D	Wastewater	Inorganic Wet Chem
Chromium (VI)	EPA 218.6	Wastewater	Inorganic Wet Chem
Color, Apparent	SM 2120 B	Wastewater	Inorganic Wet Chem
Cyanide (Sample Preparation)	SM 4500 CN-C,E	Wastewater	Inorganic Wet Chem
Cyanide (Analytical Finish)	EPA 335.4	Wastewater	Inorganic Wet Chem
Cyanide Amenable to Cl2	SM 4500 CN-C,G	Wastewater	Inorganic Wet Chem
Hardness – Total as CaCO3	SM 2340 B or C	Wastewater	Inorganic Wet Chem
Kjeldahl Nitrogen – Total	EPA 351.2	Wastewater	Inorganic Wet Chem
Nitrate/Nitrite	EPA 353.2	Wastewater	Inorganic Wet Chem
Nitrite	SM 4500-NO_2-B	Wastewater	Inorganic Wet Chem
Oil & Grease - HEM-LL	EPA 1664A	Wastewater	Inorganic Wet Chem
Oil & Grease – SGT-HEM, non-polar	EPA 1664A	Wastewater	Inorganic Wet Chem
Organic Nitrogen	SM 4500 N	Wastewater	Inorganic Wet Chem
Orthophosphate	SM 4500 P-E	Wastewater	Inorganic Wet Chem
Oxygen, Dissolved	SM 4500 O-C	Wastewater	Inorganic Wet Chem
Oxygen, Dissolved	SM 4500 O-G	Wastewater	Inorganic Wet Chem
pH Hydrogen Ion	SM 4500 H^+-B	Wastewater	Inorganic Wet Chem
Phenols	EPA 420.1 + .4	Wastewater	Inorganic Wet Chem
Phosphorus (Total)	EPA 365.3	Wastewater	Inorganic Wet Chem
Residue – Filterable (TDS)	SM 2540 C	Wastewater	Inorganic Wet Chem
Residue – Nonfilterable (TSS)	SM 2540 D	Wastewater	Inorganic Wet Chem
Residue – Settlable	SM 2540 F	Wastewater	Inorganic Wet Chem
Residue – Total	SM 2540 B	Wastewater	Inorganic Wet Chem
Residue – Volatile	EPA 160.4	Wastewater	Inorganic Wet Chem
Total, fixed, and volatile solids (SQAR)	SM 2540 G-18th Ed.	Wastewater	Inorganic Wet Chem
Salinity	SM 2520 B	Wastewater	Inorganic Wet Chem
Silica – Dissolved	SM 4500 Si-D	Wastewater	Inorganic Wet Chem
Specific Conductance	SM 2510B	Wastewater	Inorganic Wet Chem
Sulfide – S	SM 4500 S, E or F	Wastewater	Inorganic Wet Chem
Sulfite - SO3	SM 4500 SO_3-B	Wastewater	Inorganic Wet Chem
Surfactants (Methylene Blue)	SM 5540 C	Wastewater	Inorganic Wet Chem
Temperature	SM 2550 B	Wastewater	Inorganic Wet Chem
Total Organic Carbon (TOC)	SM 5310 B, C or D	Wastewater	Inorganic Wet Chem
Turbidity	EPA 180.1	Wastewater	Inorganic Wet Chem
Hardness - Total as CaCO3	EPA 200.7	Wastewater	Metals
Hardness - Total as CaCO3	SM 2340C	Wastewater	Metals
Mercury	EPA 245.1	Wastewater	Metals

Method Capabilities By NELAC Accredited Fields of Testing

Analytes	Method Number	Program	Chemistry Field
Metals – ICP	EPA 200.7	Wastewater	Metals
Metals – ICP/MS	EPA 200.8	Wastewater	Metals
Acrolein & Acrylonitrile	EPA 603	Wastewater	Organics
Base/Neutrals and Acids	EPA 625	Wastewater	Organics
Organochlorine Pests & PCBs	EPA 608	Wastewater	Organics
Purgeable Aromatics	EPA 602	Wastewater	Organics
Volatile Organics	EPA 624	Wastewater	Organics
Coliform, Fecal , No./100 ml	SM 9222 D	Wastewater	Microbiology
Coliform, Total , Number/100 ml	SM 9222 B	Wastewater	Microbiology
Heterotrophic Plate Count	SM 9215B	Wastewater	Microbiology
Acid Soluble/Insoluble Sulfides	SW846 9034	Solid/Haz. Waste	Inorganic Wet Chem
Bromide, Chloride, Fluoride, Sulfate	SW846 9056	Solid/Haz. Waste	Inorganic Wet Chem
Cation – Exchange Capacity	SW846 9081	Solid/Haz. Waste	Inorganic Wet Chem
Chromium (VI) Digestion	SW846 3060A	Solid/Haz. Waste	Inorganic Wet Chem
Chromium (VI)	SW846 7196A	Solid/Haz. Waste	Inorganic Wet Chem
Chromium (VI)	SW846 7199	Solid/Haz. Waste	Inorganic Wet Chem
Corrosivity/pH, >20% H2O	SW846 9040C	Solid/Haz. Waste	Inorganic Wet Chem
Cyanide	SW846 9010B	Solid/Haz. Waste	Inorganic Wet Chem
Cyanide, Cl_2 Amenable	SW846 9010B	Solid/Haz. Waste	Inorganic Wet Chem
Cyanide	SW846 9012B	Solid/Haz. Waste	Inorganic Wet Chem
Extractable Organic Halides	SW846 9023	Solid/Haz. Waste	Inorganic Wet Chem
Free Liquid	SW846 9095	Solid/Haz. Waste	Inorganic Wet Chem
Ignitability	SW846 1010A	Solid/Haz. Waste	Inorganic Wet Chem
Oil & Grease – HEM	EPA 1664A	Solid/Haz. Waste	Inorganic Wet Chem
Oil & Grease, Sludge – HEM	SW846 9071B	Solid/Haz. Waste	Inorganic Wet Chem
pH, Hydrogen Ion	SW846 9040C	Solid/Haz. Waste	Inorganic Wet Chem
pH, Hydrogen Ion, Waste, >20% Water	SW846 9040C	Solid/Haz. Waste	Inorganic Wet Chem
pH, Soil and Waste	SW846 9045C	Solid/Haz. Waste	Inorganic Wet Chem
Phenols (Sample Preparation)	SW846 9065	Solid/Haz. Waste	Inorganic Wet Chem
Phenols (Analytical Finish)	SW846 9066	Solid/Haz. Waste	Inorganic Wet Chem
Specific Conductance	SW846 9050A	Solid/Haz. Waste	Inorganic Wet Chem
SPLP Metals/Organics	SW846 1312	Solid/Haz. Waste	Inorganic Wet Chem
TCLP Metals/Semi Volatile Organics	SW846 1311	Solid/Haz. Waste	Inorganic Wet Chem
TCLP Volatile Organics	SW846 1311	Solid/Haz. Waste	Inorganic Wet Chem
Temperature	SM18 2550 B	Solid/Haz. Waste	Inorganic Wet Chem
Total Organic Carbon (TOC)	SW846 9060 A	Solid/Haz. Waste	Inorganic Wet Chem
Total Organic Halides (TOX)	SW846 9020B	Solid/Haz. Waste	Inorganic Wet Chem
Metals – Solids	SW846 3050B	Solid/Haz. Waste	Metals Prep

Method Capabilities By NELAC Accredited Fields of Testing

Analytes	Method Number	Program	Chemistry Field
Metals, Total - Water	SW846 3010A	Solid/Haz. Waste	Metals Prep
Metals, Total – Water, Rec. + Dissolved	SW846 3005A	Solid/Haz. Waste	Metals Prep
Mercury, Liquid Waste	SW846 7470A	Solid/Haz. Waste	Metals Analysis
Mercury, Solid Waste	SW846 7471A	Solid/Haz. Waste	Metals Analysis
Metals – ICP	SW846 6010B	Solid/Haz. Waste	Metals Analysis
Metals – ICP/MS	SW846 6020	Solid/Haz. Waste	Metals Analysis
Semivolatile – Acid/Base Partition	SW846 3650B	Solid/Haz. Waste	Organics Prep
Semivolatile – Alumina Cleanup	SW846 3610B	Solid/Haz. Waste	Organics Prep
Semivolatile – Alumina Cleanup – Petro	SW846 3611B	Solid/Haz. Waste	Organics Prep
Semivolatile – Florisil Cleanup	SW846 3620B	Solid/Haz. Waste	Organics Prep
Semivolatile – Gel Permeation Cleanup	SW846 3640A	Solid/Haz. Waste	Organics Prep
Semivolatile – Silica Gel Cleanup	SW846 3630C	Solid/Haz. Waste	Organics Prep
Semivolatile – Sulfur Cleanup	SW846 3660B	Solid/Haz. Waste	Organics Prep
Semivolatile – Sulfuric Acid/MnO_2	SW846 3665A	Solid/Haz. Waste	Organics Prep
Semivolatile Prep – Pressurized Fluid	SW846 3545	Solid/Haz. Waste	Organics Prep
Semivolatile Prep – Waste Dilution	SW846 3580A	Solid/Haz. Waste	Organics Prep
Semivolatile Prep Solid - Sonication	SW846 3550B	Solid/Haz. Waste	Organics Prep
Semivolatile Prep Solids - Soxhlet	SW846 3540C	Solid/Haz. Waste	Organics Prep
Semivolatile Prep Water	SW846 3520C	Solid/Haz. Waste	Organics Prep
Semivolatile Prep Water	SW846 3510C	Solid/Haz. Waste	Organics Prep
Volatile – Headspace	SW846 3810	Solid/Haz. Waste	Organics Prep
Volatile – Purge & Trap Solids: High	SW846 5035H	Solid/Haz. Waste	Organics Prep
Volatile – Purge & Trap Solids: Low	SW846 5035L	Solid/Haz. Waste	Organics Prep
Volatile – Purge and Trap – Water	SW846 5030B	Solid/Haz. Waste	Organics Prep
Alcohols	SW846 8015B	Solid/Haz. Waste	Organics Analysis
Aromatic/Halogenated Volatile	SW846 8021B	Solid/Haz. Waste	Organics Analysis
Base/Neutrals and Acids	SW846 8270C	Solid/Haz. Waste	Organics Analysis
Chlorinated Herbicides	SW846 8151A	Solid/Haz. Waste	Organics Analysis
DBCP, EDB & TCP	SW846 8011	Solid/Haz. Waste	Organics Analysis
Diesel Range Organic	SW846 8015B	Solid/Haz. Waste	Organics Analysis
Dissolved Gas/Aqueous Media	RSK-175	Solid/Haz. Waste	Organics Analysis
Ethylene Glycol & Propylene Glycol	SW846 8260B	Solid/Haz. Waste	Organics Analysis
Gasoline Range Organic	SW846 8015B	Solid/Haz. Waste	Organics Analysis
Organochlorine Pesticides	SW846 8081A	Solid/Haz. Waste	Organics Analysis
PCBs	SW846 8082	Solid/Haz. Waste	Organics Analysis
Polynuclear Aromatic HCs	SW846 8100	Solid/Haz. Waste	Organics Analysis
Polynuclear Aromatic HCs	SW846 8310	Solid/Haz. Waste	Organics Analysis
Volatile Organics	SW846 8260B	Solid/Haz. Waste	Organics Analysis

Method Capabilities By NELAC Accredited Fields of Testing

Analytes	Method Number	Program	Chemistry Field
Volatile Organics	EPA TO – 3	Clean Air Act	Organics
Volatile Organics	EPA TO –15	Clean Air Act	Organics

Method Capabilities – Non NELAC Methods

Analytes	Method Number	Program	Chemistry Field
Phenols	EPA 420.4	Drinking Water	Inorganic
Carbon Dioxide	SM 4500CO2C/D	Wastewater	Inorganic
Iron, Ferrous	SM 3500 - FE D	Wastewater	Inorganic
Nonionic Surfactants as CTAS	SM 5540 D	Wastewater	Inorganic
Particulate Matter	EPA 160.2M	Wastewater	Inorganic
Petroleum Hydrocarbons	EPA 418.1	Wastewater	Inorganic
Phosphorus, Hydrolyzable	EPA 365.3	Wastewater	Inorganic
Redox Potential Vs H2	ASTM D1498-76	Wastewater	Inorganic
Specific Gravity	ASTM D1298-85	Wastewater	Inorganic
Tetraethyl Lead	ASTM D3341-91M	Wastewater	Inorganic
Total Organic Content	ASTM D2974-87	Wastewater	Inorganic
Unburned Combustibles	EPA 160.1/160.4	Wastewater	Inorganic
Viscosity	ASTM D445/6	Wastewater	Inorganic
Volatile Suspended Solids	EPA 160.2/160.4	Wastewater	Inorganic
Weak Acid Dissoc. CN Prep	SM 4500CN-I	Wastewater	Inorganic
Total Petroleum Hydrocarbons	NJOQA – QAM - 025	Wastewater	Organics
Ammonia	EPA 350.1M	Solid/Haz Waste	Inorganic
Ammonia	EPA 350.2M	Solid/Haz Waste	Inorganic
Base Sediment	ASTM D473-81	Solid/Haz Waste	Inorganic
Bulk Density (Dry Basis)	ASTM D2937-94M	Solid/Haz Waste	Inorganic
Chemical Oxygen Demand	HACH 8000M	Solid/Haz Waste	Inorganic
Chloride	EPA 325.3M	Solid/Haz Waste	Inorganic
Grain Size & Sieve Testing	ASTM D422-63	Solid/Haz Waste	Inorganic
Heat Content, BTU	ASTM D3286-85	Solid/Haz Waste	Inorganic
Ignitability (Flashpoint)	ASTM D93-90/SW846 Ch 7	Solid/Haz Waste	Inorganic
Moisture, Karl Fischer	ASTM D1744-92	Solid/Haz Waste	Inorganic
Neutral Leaching Procedure	ASTM D3987-85	Solid/Haz Waste	Inorganic
Nitrate/Nitrite	EPA 353.2M	Solid/Haz Waste	Inorganic
Organic Matter (Ignition Loss)	AASHTO T267-86M	Solid/Haz Waste	Inorganic
Orthophosphate	EPA 365.2M	Solid/Haz Waste	Inorganic
Percent Ash (Dry Basis)	ASTM D482-91	Solid/Haz Waste	Inorganic
Percent Solids	ASTM D4643-00	Solid/Haz Waste	Inorganic
Percent Sulfur	ASTM D129-61	Solid/Haz Waste	Inorganic
Petroleum Hydrocarbons	EPA 418.1M	Solid/Haz Waste	Inorganic
Phosphorus (Total)	EPA 365.3M	Solid/Haz Waste	Inorganic
Phosphorus, Hydrolyzable	EPA 365.3M	Solid/Haz Waste	Inorganic
Pour Point	ASTM D97-87	Solid/Haz Waste	Inorganic
Reactivity (Cyanide)	SW846 7.3.3.2	Solid/Haz. Waste	Inorganic
Reactivity (Sulfide)	SW846 7.3.4.2	Solid/Haz. Waste	Inorganic
Redox Potential Vs H2	ASTM D1498-76M	Solid/Haz Waste	Inorganic

Method Capabilities – Non NELAC Methods

Analytes	Method Number	Program	Chemistry Field
Specific Gravity of Solids	ASTM D1429-86M	Solid/Haz Waste	Inorganic
Sulfide – S	EPA 376.1 M	Solid/Haz Waste	Inorganic
Sulfite - SO_3	EPA 377.1M	Solid/Haz Waste	Inorganic
Tetraethyl Lead	ASTM D3341-91M	Solid/Haz Waste	Inorganic
Total Chlorine	ASTM D808-91	Solid/Haz Waste	Inorganic
Total Kjeldahl Nitrogen	EPA 351.2M	Solid/Haz Waste	Inorganic
Total Organic Carbon	CORP ENG 81	Solid/Haz Waste	Inorganic
Total Organic Carbon	LLOYD KAHN 1988	Solid/Haz Waste	Inorganic
Total Organic Chlorine	ASTM D808-91M	Solid/Haz Waste	Inorganic
Total Plate Count	SM 9215BM	Solid/Haz Waste	Inorganic
Total Volatile Solids	EPA 160.4M	Solid/Haz Waste	Inorganic
Water Content	ASTM D95-83	Solid/Haz Waste	Inorganic
Multiple Extractions	SW846 1320	Solid/Haz Waste	Inorganic
Combustion, Bomb Oxidation	SW846 5050	Solid/Haz Waste	Inorganic
Bomb Calorimeter	ASTM D-240	Solid/Haz Waste	Inorganic
Extractable Petroleum HCs	Massachusetts EPH	Solid/Haz Waste	Organics
Extractable Petroleum HCs	Missouri DRO	Solid/Haz Waste	Organics
Total Petroleum Hydrocarbons	NJOQA – QAM - 025	Solid/Haz Waste	Organics
Total Petroleum Hydrocarbons	FLDEP FL – PRO	Solid/Haz Waste	Organics
Total Petroleum Hydrocarbons	Connecticut ETPH	Solid/Haz Waste	Organics
Volatile Petroleum HCs	Massachusetts VPH	Solid/Haz Waste	Organics
Volatile Petroleum HCs	Missouri GRO	Solid/Haz Waste	Organics

Appendix IV

Laboratory Equipment

Equipment	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
HPLC-1	Agilent Technologies 1100Series G1321A, G1315B, G1316A, G1379A	DE33205279; DE33219455; DE33234553; JP13210348	HP Chemstation	HP Enviroquant	Semi-Volatiles Annex	2003
GC/MS-S	Hewlett-Packard 6890/5973 MSD/OI 4552/4660 ARCHON	US00024322/ US82311313	HP Chemstation	HP Enviroquant	Organics – Volatiles	2000
GC/MS-T	Hewlett-Packard 6890/5973 MSD/OI 4551A/4660 P&T	US00024323/ US82311482	HP Chemstation	HP Enviroquant	Organics – Volatiles	2000
GC/MS-F	Hewlett-Packard 6890/5973 MSD/HP 7683 AS	US00034179/ US82601551	HP Chemstation	HP Enviroquant	Organics – Semi-Volatiles	1998
GC/MS-R	Hewlett-Packard 6890/5973 MSD/HP 7683 AS	US00021820/ US81501001	HP Chemstation	HP Enviroquant	Organics – Semi-Volatiles	1998
GC/MS-B	Hewlett-Packard 5890ll+/5972 MSD/Agilent 7673	3336A61054/ 3524A03106	HP Chemstation	HP Enviroquant	Organics – Semi-Volatiles	1996
GC/MS-H	Hewlett-Packard 5890ll+/5972 MSD/HP 7673 AS	3336A58190/ 3501A02356	HP Chemstation	HP Enviroquant	Organics – Semi-Volatiles	1995
GC/MS-Q	Hewlett-Packard 5890ll/5971 MSD/Entech Air Samp 7000	3033A31092/ 3188A02934	HP Chemstation	HP Enviroquant	Air Laboratory	1993
GC/MS-L	Hewlett-Packard 5890/5970 MSD/OI 4551/4560 P&T	2921A22898/ 2623A01291	HP Chemstation	HP Enviroquant	Organics – Volatiles	1992
GC/MS-J	Hewlett-Packard 5890/5970 MSD/OI 4552/4560 P&T	2643A11557/ 2716A10379	HP Chemstation	HP Enviroquant	Organics – Volatiles	1990
GC/MS-K	Hewlett-Packard 5890ll/ 5970 MSD/OI 4551/4560 P&T	2750A116838/ 2905A11628	HP Chemstation	HP Enviroquant	Organics – Volatiles	1990

Equipment	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
GC/MS-C	Hewlett-Packard 5890/5970 MSD/HP OI 4552/4560	2623A08318/ 2807A1146	HP Chemstation	HP Enviroquant	Organics – Volatiles	1990
GC/MS-G	Hewlett-Packard 5890II/5970 MSD/OI 4552/4660	2905A11905/ 2807A11004	HP Chemstation	HP Enviroquant	Organics – Volatiles	1989
GC/MS-M	Hewlett-Packard 6890/5973 MSD/HP 7683 AS	US00021813/ US802111003	HP Chemstation	HP Enviroquant	Organics – Semi-Volatiles	1999
GC/MS-A	Hewlett-Packard 6890/5973 MSD/OI 4552/4560 ARCHON	US00033272/ US94212183	HP Chemstation	HP Enviroquant	Organics – Volatiles	2000
GC/MS-E	Hewlett-Packard 6890/5973 MSD/OI 4551/4560 P&T	US00031161/ US93112044	HP Chemstation	HP Enviroquant	Organics – Volatiles	2001
GC/MS-N	Hewlett-Packard 5890/5970 MSD/Tekmar 2000/2032 P&T	2750A17088/ 2716A10218	HP Chemstation	HP Enviroquant	Organics – Volatiles	1988
GC/MS-I	Hewlett-Packard 5890/5970 MSD/OI 4551/4560	2643A10503/ 2637A01687	HP Chemstation	HP Enviroquant	Organics – Volatiles	1986
GC/MS-D	Hewlett-Packard 6890/5973 MSD/OI 4551/4560 P&T	US00030551 / US93122843	HP Chemstation	HP Enviroquant	Organics – Volatiles	2001
GC/MS-V	Agilent Technologies 5973/6890N AS 4552/4560	US10149085/US10441917	HP Chemstation	HP Enviroquant	Organics – Volatiles	2002
GC/MS-W	Agilent Technologies 5973/6890N AS Entech 7016CA	US44621455/CN10517032	HP Chemstation	HP Enviroquant	Air Laboratory	2005
GC/MS-X	Agilent Technologies 5973/6890N AS 4552/4660	US21843889 / US10239071	HP Chemstation	HP Enviroquant	Organics – Volatiles	2002
GC/MS-Y	Agilent Technologies 5973/6890N AS 4552/4560	US10240013 / US21844012	HP Chemstation	HP Enviroquant	Organics – Volatiles	2002

Equipment	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
GC/MS-P	Agilent Technologies 5973/6890N AS 4552/4560	US10251064 / US21844596	HP Chemstation	HP Enviroquant	Organics – Semi-Volatiles	2003
GC/MS-Z	Agilent Technologies 5973/6890N AS 4552/4560	US10251028 / US21844586	HP Chemstation	HP Enviroquant	Organics – Semi-Volatiles	2003
GC/MS-U	Hewlett-Packard 6890/5973 MSD/HP 4551A/4660	US00032623/ US94212183	HP Chemstation	HP Enviroquant	Organics – Volatiles	1999
GC/MS-1A	Agilent Technologies 5973/6890N AS 4551A/4660	CN10314026/ US30945331	HP Chemstation	HP Enviroquant	Organics – Volatiles	2003
GC/MS-1B	Agilent Technologies 7890A/5975C Teledyne/Tekmar AquaTek AS	CN10845177/US83111119	HP Chemstation	HP Enviroquant	Organics – Volatiles	2008
GC/MS-2A	Agilent Technologies 5973/6890N AS Tekmar Solatek 72	CN10314028/ US30945325	HP Chemstation	HP Enviroquant	Organics – Volatiles	2003
GC/MS-3A	Agilent Technologies 5973/6890N AS 4551A/4660	CN10432042/US43146776	HP Chemstation	HP Enviroquant	Organics – Volatiles	2004
GC/MS-1C	Agilent Technologies 5973/6890N AS 4551/4560	CN10425085/ US 41746667	HP Chemstation	HP Enviroquant	Organics – Volatiles	2004
GC/MS-2D	Agilent Technologies 5973/6890N AS 4552/4560	CN10432038/ US 43146771	HP Chemstation	HP Enviroquant	Organics – Volatiles	2004
GC/MS-2W	Agilent Technologies 5973/6890N AS Entech 7016CA	CN10413022 / US40646500	HP Chemstation	HP Enviroquant	Air Laboratory	2004
GC/MS-2B	Agilent Technologies 5973/6890N AS 4551A/4660	CN10441033/ US 43146954	HP Chemstation	HP Enviroquant	Organics – Volatiles	2004
GC/MS-2C	Agilent Technologies 5973/6890N AS 4551A/4560	CN10441035/ US 43146953	HP Chemstation	HP Enviroquant	Organics – Volatiles	2004

Equipment	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
GC/MS-3B	Agilent Technologies 6890/5973/ OI 4551A/4660	US10240044/ US21844015	HP Chemstation	HP Enviroquant	Organics – Volatiles	2002
GC/MS-3C	Agilent Technologies 5973/6890N AS 45551A/4660	CN10517038/ US44621480	HP Chemstation	HP Enviroquant	Organics – Volatiles	2005
GC/MS-3D	Agilent Technologies 5975B/6890N AS 4551A/4660	CN10637120/ US62724193	HP Chemstation	HP Enviroquant	Organics – Volatiles	2006
GC/MS-2E	Agilent Technologies 5975/6890N AS 4551A/4660	CN10612046/ US60532596	HP Chemstation	HP Enviroquant	Organics – Volatiles	2006
GC/MS-3E	Agilent Technologies 5975/6890N Agilent 7683	CN10614011/ US61332852	HP Chemstation	HP Enviroquant	Organics – Semi-Volatiles	2006
GC/MS-2M	Agilent Technologies 5973/6890N AS 4552/12720	CN10612028/ US60532578	HP Chemstation	HP Enviroquant	Organics – Semi-Volatiles	2006
GC/MS-3W	Agilent Technologies 5973/6890N Entech 7016A	CN10425086/ US41746669	HP Chemstation	HP Enviroquant	Air Laboratory	2007
GC/MS-3M	Agilent Technologies 5975B/6890N	US65125107/ CN10703029	HP Chemstation	HP Enviroquant	Organics – Semi-Volatiles	2007
GC/MS-4M	Agilent Technologies 5975C/7890A Agilent 7683B	US73317574/ CN1074251	HP Chemstation	HP Enviroquant	Organics-Semi Volatiles	11/2007
GC-AB	Hewlett-Packard 5890/Dual ECD/HP 7673 AS	2413A03719	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	1990
GC –XX	Hewlett-Packard 6890/Dual ECD/HP 7683 AS	US00022968	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	1998

Equipment	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
GC-2Y2Z	Agilent Technologies 6890N & N10149	CN10407032/ CN40327643	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	2004
GC-YZ/ZZ	Hewlett-Packard 6890/PID/FID/OI HP GC System Injector	US00011065 US83806744	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	1998
GC-AA	Agilent 7890A As 7683B	CN10832133 US08232002	HP Chemstation	HP Enviroquant	Organics - Volatiles	2008
GC-LM	Hewlett-Packard 6890/PID/FID/OI 4551/4560 P&T	US00008927	HP Chemstation	HP Enviroquant	Organics - Volatiles	1998
GC-WW	Hewlett-Packard 6890/Dual ECD/HP 7673 AS	US00010037	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	1997
GC-ST	Hewlett-Packard 5890/FID/NPD/HP 7673 AS/Tek	314OA38871	HP Chemstation	HP Enviroquant	Organics - Volatiles	1996
GC- UV	Hewlett-Packard 5890/Dual FID/ OI 4551/4560	2921A23322	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	1996
GC-NP	Hewlett-Packard 5890/PID/FID/Tekmar solatek 72	3336A58858	HP Chemstation	HP Enviroquant	Organics - Volatiles	1995
GC-CD	Hewlett-Packard 5890/Dual ECD/HP 7673 AS	3336A58788	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	1995
GC-JK	Hewlett-Packard 5890/PID/Hall/4552/4560ARCHON	3336A51043	HP Chemstation	HP Enviroquant	Organics - Volatiles	1994
GC-QR	Hewlett Packard 5890/PID/FID/Entech AutoAir7000	3336A51044	HP Chemstation	HP Enviroquant	Air Laboratory	1993

Equipment	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
GC-EF	Hewlett-Packard 5890/Dual ECD/HP 7673 AS	2541A06786	HP Chemstation	HP Enviroquant	Organics - Volatiles	1992
GC-II	Hewlett-Packard 5890 Series II	3203A40375	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	1994
GC-GH	Hewlett-Packard 5890/Dual ECD/HP 7673 AS	2938A25059	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	1990
GC-2G (I)	Agilent Technologies 6890N/7683	CN10450110	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	2005
GC-3G (J)	Agilent Technologies 6890N/7683	CN10450109	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	2005
GC-SC	Hewlett-Packard 5890/ FID/OI4551/4560	2443AO3797	HP Chemstation	HP Enviroquant	Organics - Volatiles	1990
GC-QT	Agilent Technologies 6890N	US10235024	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	2002
GC-OA/OB	Agilent Technologies 6890N	US10240147	HP Chemstation	HP Enviroquant	Organics - Semi-Semi-Volatiles	2002
GC-G1/1H	Agilent Technologies 6890N/7683	US10322012/ CN3203089	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	2003
GC-3Y/3Z	Agilent Technologies 7890A/7683B Dual FID	CN10735014/ CN73345070	HP Chemstation	HP Enviroquant	Organics - Semi-Volatiles	2007

Equipment	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
GC-SR	Hewlett-Packard 5890/FID/Tekmar 7000	2612A07448	HP Chemstation	HP Enviroquant	Organics - Screening	1992
GC-SV	Hewlett-Packard 5890/FID/ OI4551/4560	LR47-359C/ N244460743	HP Chemstation	HP Enviroquant	Organics - Screening	1996
GC-SY	Hewlett-Packard 5890/FID/ OI4551A/4560	2643A10503	HP Chemstation	HP Enviroquant	Organics - Screening	1990
GPC4	Waters 717	717-000152	None	N/A	Organic Prep	1992
ASE	Dionex ASE 200	99040595	None	N/A	Organic Prep	1999
ASE	Dionex ASE 200	99040603	None	N/A	Organic Prep	1999
ASE	Dionex ASE 200	03040695	None	N/A	Organic Prep	2005
ASE	Dionex ASE 200	99030375	None	N/A	Organic Prep	1999
Sonicator	Sonics Vibracell VC 750	31800A	None	N/A	Organic Prep	2000
Sonicator	TEKMAR Sonicator	6916	None	N/A	Organic Prep	1997
ICP-MS	Thermo Elemental X series ICP-MS	X0180	Thermo PlasmaLab	Thermo PlasmaLab	Metals Laboratory	2003
ICP	TJA Enivro Trace 61E Simultaneous	10970	Thermo ICP Manager	Thermo ICP Manager	Metals Laboratory	2000
ICP	Thermo ICAP 6500 (6500)	ICP-20072001	ITEVA	ITEVA	Metals Laboratory	2007
ICP	Thermo ICP 6500 Duo	ICP-20074989	ITEVA	ITEVA	Metals Laboratory	2007

Equipment	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
Hg Analyzer	Leeman Mercury Analyzer HYDRAA	HA-3011	WIN Hg Runner	WIN Hg Runner	Wet Chem	2003
Hg Analyzer	Leeman Mercury Analyzer PS200II	Hg6037	Leeman PS #150-00052	Leeman PS #150-00052	Wet Chem	1999
Auto Anal.	Lachat Quikchem 8000	A83000-2273	OMNION FIA	OMNION FIA	Wet Chem	2004
Auto Anal.	Lachat Quikchem 8000	A83000-1402	OMNION FIA	OMNION FIA	Wet Chem	1999
TOC Anal.	Shimadzu 5000 Series A/S system	30825274	Shimadzu TOC Control	Shimadzu TOC Control	Wet Chem	2000
TOC Anal.	Shimadzu 5000 Series A/S system	35517409	Shimadzu TOC Control	Shimadzu TOC Control	Wet Chem	1998
TOC Anal	Shimadzu TOC-V CSH	H51104435198 CS	Shimadzu TOC Control	Shimadzu TOC Control	Wet Chem	2007
TOX Anal.	Mitsubishi TOX-10E	75R04185	None	N/A	Wet Chem	1996
TOX Anal	Mitsubishi TOX-100	A7M 42997	None	N/A	Wet Chem	2008
IR Spec.	Buck Scientific HC-404	687	None	N/A	Wet Chem	1997
DO Meter	YSI-50B	91L034801	None	N/A	Wet Chem	1988
DO Meter	YSI-51B	92A035818	None	N/A	Wet Chem	1998
DO Meter	YSI-55/12ft	00C0598BG	None	N/A	Wet Chem	2000
Turbidimeter	HF Scientific DRT 100B	21141	None	N/A	Wet Chem	1987
Flashpoint	Fisher Scientific Pensky-Martin	40300010	None	N/A	Wet Chem	1996
fpH Meter	Orion 250A	O18019	None	N/A	field	2007
fpH10	YSI	JC02538	None	N/A	field	2007

Equipment	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
pH Meter-4	Orion 710A General chem. (pH 4)	3978	None	N/A	Wet Chem	1996
PH Meter-11	Fisher Scientific (pH 3)	1505104	None	N/A	Wet Chem	2003
PH Meter-12	Thermo Orion 310 (pH12)	14011	None	N/A	Wet Chem	2003
pH Meter 26	Thomas Scientific TS 625	06390411	None	N/A	Wet Chem	2007
PH Meter 46	Thermo Orion 4 Star	B10299	None	N/A	Wet Chem	2008
PH Meter-47	Thermo Orion 4 Star	B04869	None	N/A	Wet Chem	2008
PH/EH Meter-22	Thermo Orion 4 Star	SN00742	None	N/A	Wet Chem	2008
PH Meter - 23	Thermo Orion Model 310	SN013786	None	N/A	Wet Chem	2008
Cond. Meter	YSI-30	J0183	None	N/A	Wet Chem	2004
Cond. Meter	Amber Science 1056	01020851056-101	None	N/A	Wet Chem	2001
Cond. Meter	Orion 145+	78035	None	N/A	Wet Chem	2004
Cond. Meter	Oakton 4003	78643	None	N/A	Wet Chem	2004
UVVIS Spec C	Spectronix 20 Gensys	3SGA122034	None	N/A	Wet Chem	2000
UVVIS Spec F	Spectronix 20 Gensys (4001/4)	356329906	None	N/A	Wet Chem	2007
UVVIS Spec G	Thermo Electron Corp Genesys 20	3SGJ238001	None	N/A	Wet Chem	2007
UVVIS Spec H	Thermo Electron Corp Genesys 20	3SGJ306016	None	N/A	Wet Chem	2007
UVVIS Spec D	Spectronix 20 Gensys (4001/4)	3SGF170020	None	N/A	Wet Chem	2007
UVVIS Spec E	Spectronix 20 Gensys (4001/4)	3SGD.352011	None	N/A	Wet Chem	2007
Calorimeter	PARR 1261EA; no software used	1499	None	N/A	Wet Chem	1996
Ion Chrom.	Dionex DX500	99040750	Dionex Peak Net Run	Dionex Peak Net Run	Wet Chem	1999
Ion Chrom.	Dionex ICS2000	02090737	Dionex Chromeleon Client	Dionex Chromeleon Client	Wet Chem	2004

Equipment	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
Ion Chrom.	Dionex ICS2000	02110028	Dionex Chromeleon Client	Dionex Chromeleon Client	Wet Chem	2004
Ion Chrom.	Dionex ICS2000	04060060	Dionex Chromeleon Client	Dionex Chromeleon Client	Wet Chem	2004
Ion Chrom.	Dionex ICS3000	06040160	Dionex Chromeleon Client	Dionex Chromeleon Client	Wet Chem	2006
Ion Chrom.	Metrohm-Peak IC	1844012003147	MagIC Net	MagIC Net	Wet Chem	2007
ASE Extract	Dionex Accelerated Solvent Extractor	99030375	None	N/A	Wet Chem	1999
Analytical Balance	Mettler AE 160 (B-5)	C11620	None	N/A	Wet Chem	1999
Analytical Balance	ACCU LA 110 (B-10)	70405919	None	N/A	Wet Chem	2001
Analytical Balance	Ohaus Adventurer (B-24)	1225032523P	None	N/A	Wet Chem	2004
Top Load Balance	Ohaus TS400D (B-3)	1330	None	N/A	Wet Chem	Prior to 2000
Top Load Balance	Ohaus Scout (B-4)	BJ046417	None	N/A	Wet Chem	2001
Top Load Balance	Ohaus E400 (B-6)	8714	None	N/A	Wet Chem	Prior to 2000
Top Load Balance	Ohaus Navigator (B-7)	1121370265	None	N/A	Wet Chem	2002
Top Load Balance	Ohaus CT200S (B-8)	17872	None	N/A	Wet Chem	2000
Top Load Balance	Ohaus TS400S (B-9)	2475	None	N/A	Wet Chem	2000

Equipment	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
Top Load Balance	Ohaus GT4100 (B-11)	3202	None	N/A	Wet Chem	Prior to 2000
Top Load Balance	Sartorious B4100 (B-13)	38080035	None	N/A	Wet Chem	Prior to 2000
Top Load Balance	Denver Inst. Co. XL500 (B-14)	B045530	None	N/A	Wet Chem	Prior to 2000
Top Load Balance	Ohaus Navigator (B-15)	121370273	None	N/A	Wet Chem	2002
Top Load Balance	Ohaus Explorer (B-16)	E1581119212171	None	N/A	Wet Chem	2001
Top Load Balance	Ohaus Navigator (B-17)	11192639994	None	N/A	Wet Chem	2001
Top Load Balance	Ohaus Navigator (B-18)	1119323138	None	N/A	Wet Chem	2001
Top Load Balance	Ohaus Scout II (B-19)	BJ514783	None	N/A	Wet Chem	2002
Top Load Balance	Ohaus Scout II (B-20)	BJ320905	None	N/A	Wet Chem	2002
Top Load Balance	Ohaus Adventurer (B-21)	E1021218270448	None	N/A	Wet Chem	2001
Top Load Balance	Accu Lab V-3mg (B-23)	9891BL374	None	N/A	Wet Chem	2004
Top Load Balance	Ohaus Scout II (B-25)	BJ514770	None	N/A	Wet Chem	2004
Top Load Balance	Ohaus Adventurer – AR3130 (B-26)	1240-P	None	N/A	Wet Chem	2004
Top Load Balance	Ohaus Adventurer AV412 (B-27)	8026251106	None	N/A	Wet Chem	2005
Top Load	Ohaus Sport (B-28)	7124230518	None	N/A	Wet Chem	2005

Equipment	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
Balance						
Top Load Balance	Ohaus Adventurer AV412 (B-29)	8026391019	None	N/A	Wet Chem	2005
Top Load Balance	Ohaus Adventurer AV412 (B-30)	8026391160	None	N/A	Wet Chem	2005
Top Load Balance	Ohaus Adventurer AV412 (B-31)	8028041080	None	N/A	Wet Chem	2007
TOP Load Balance	Sartorius TE31025 (B-32)	21950273	None	N/A	Wet Chem	2007
TOP Load Balance	Ohaus Adventure AV412 (B-33)	8028391184	None	N/A	Sample Management	2007
TOP Load Balance	Ohaus Adventure AV412 (B-34)	8028391117	None	N/A	Organic Hood	2007
TOP Load Balance	Ohaus Adventure AV212 (B-35)	8029171184	None	N/A	Extra	2008
TOP Load Balance	Ohaus Adventure AV212 (B-36)	8029131104	None	N/A	extra	2008
TOP Load Balance	Ohaus Adventure AV412 (B-37)	802916112	None	N/A	extra	2008

APPENDIX C

Site Specific Health and Safety Plan

Former Time Warner Building
511 West 21st Street
New York City, New York
(AKA 510 W. 22nd Street, New York, New York)
BCP # C231080

SITE SPECIFIC HEALTH & SAFETY PLAN

Prepared for:

510 West 22nd Street Partners, LLC

c/o Albanese Development Corp.
1050 Franklin Avenue
Garden City, NY 11530

FLS Project Number: 10173-002

Submitted to:

New York State Department of Environmental Conservation
1 Hunters Point Plaza
47-40 21st Street
Long Island City, NY 11101

May 2013

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1.0 INTRODUCTION

Fleming-Lee Shue, Inc. (FLS) prepared this Site Specific Health and Safety Plan (HASP) for use by FLS employees during remedial investigation of The Former Time Warner Building (hereafter referred to as the "Site"). The Site address is 511 West 21st Street in New York, NY (Figure 1), aka 510 West 22nd Street in New York, NY. The legal address of the Site is Block 693, Lot 23 in the borough of Manhattan. The Site encompasses an L-shaped 19,750 sf lot located on the north side of West 21st Street and the south side of West 22nd Street between 10th Avenue and 11th Avenue in Manhattan, New York. The property has frontage on the north side of West 21st Street and the south side of West 22nd Street. The surrounding properties typically consist of multiple-story residential, office, and warehouse buildings.

The subject property contains a vacant 5-story parking garage building with no basement level. The site was used for manufacturing in the 1800s. The existing building was constructed in 1918/19 as a 2-story parking garage building, then was gutted to its load bearing walls and reconstructed as a 5-story building in 1989. Time Warner occupied the building from 1991 to 2008 and used the building for vehicle parking, storage, vehicle maintenance, and offices. Time Warner vacated the building in 2008 and it has remained vacant since that time.

The client plans to redevelop the site with a 10-story office building with ground-floor retail that will utilize 25% of the existing building while demolishing the remaining 75%. The building is planned to contain one subgrade level.

2.0 PURPOSE

The purpose of the HASP is to identify the real and potential hazards associated with Site investigation and remediation and to stipulate appropriate health and safety procedures to protect site workers from injury while performing work at the site. The procedures and guidelines contained in this document are intended to minimize exposure to chemical, physical, and biological hazards that may be present at the Site, in soil, groundwater, or air, and to prevent accidents and injuries.

This HASP is based on the premise that accidents are preventable and that accident prevention is the responsibility of all individuals on the project team. Usually accidents are the result of dangerous actions, conditions, equipment, poor judgment, or carelessness. Therefore, the goal of this HASP is to prevent all accidents by developing a sense of safety, health awareness, and safe work habits in field and construction personnel, and by ensuring that the safety requirements of this HASP are fulfilled. FLS desires to instill a "Culture of Safety" while on the job.

As part of this HASP, a Qualitative Human Health Exposure Assessment will be completed in accordance with Appendix 3B of DER-10. Existing data will be reviewed in order to evaluate and document potential exposures. This will also include determining potential exposure pathways, who may be affected by the identified contaminants and the anticipated exposure, if any, for the future occupants of the property/building. Where required, data gaps from previous sampling events will be identified and addressed with additional sampling.

2.1 Background

The procedures in this document were developed in accordance with the provisions of Occupational Safety and Health Administration (OSHA) rule 29 CFR 1910.120 and FLS' experience with similar projects. All Site workers must review and comprehend this HASP before entering the Site. The Health and Safety Officer (HSO) or designee will ensure that personnel have reviewed the HASP and will provide an opportunity to ask health and safety questions during attendance at a pre-field safety meeting. Field personnel will sign the acknowledgment form (Attachment I) maintained on-Site at the field office by the HSO. The recommended health and safety guidelines in this document may be modified, if warranted, by additional information obtained prior to, or during Site remediation. The HSO will also maintain copies of pertinent health and safety records for all field personnel.

The Occupational Safety and Health Act (1970) requires:

- Employers shall furnish each employee with a place of employment free from recognized hazards that are causing or likely to cause death or serious physical harm.
- Employers must comply with occupational health and safety standards and rules, regulations and orders pursuant to the Act, that are applicable to company business and operations.
- All employees must comply with occupational health and safety standards and

regulations under the Act, which are applicable to their actions and situations.

- Employees are encouraged to contact their immediate superior for information that will help them understand their responsibilities under the Act.

3.0 SITE HISTORY

3.1 Site Background

The site was used for manufacturing in the 1800s. The existing building was constructed in 1918/19 as a 2-story parking garage building, then was gutted to its load bearing walls and reconstructed as a 5-story building in 1989. Time Warner occupied the building from 1991 to 2008 and used the building for vehicle parking, storage, vehicle maintenance, and offices. Time Warner vacated the building in 2008 and it has remained vacant since that time.

The Site is underlain by 13 to 17 feet of man-made fill. Native soils beneath the fill layer consist of organic silty clay of estuarine origin as well as sand and silt of glacial origin. The depth- to -bedrock varies from approximately 33 feet below grade at the northern end of the Site to 65 feet below grade at the southern end of the Site. Published geologic data indicates that the Site is underlain with mica schist that is known as the Manhattan Schist. The Manhattan Schist is a mass of metamorphic rock covering the deeper limestone stratum which is the firm bedrock providing the foundation for New York City's skyscrapers.

The depth- to -groundwater at the Site is approximately 6 to 7 feet below sidewalk grade. The previous investigations indicated that the local groundwater flow direction is to the southwest.

3.2 Previous Site Investigations

The following summarizes site environmental activities from 2007 through the present:

2007 AKRF Phase I Environmental Site Assessment

The following environmental concerns were identified in the Phase I Environmental Site Assessment (ESA):

- The subsurface conditions at the subject property have been affected by two petroleum releases from on-Site gasoline underground storage tanks (USTs). According to the New York State Department of Environmental Conservation (NYSDEC) SPILLS database, the leak associated with the UST was repaired and a small amount of soil was excavated. Subsequent subsurface investigations (including required offsite sampling) found benzene and methyl tert-butyl ether (MTBE) contamination in soil, and benzene, toluene, ethylbenzene and xylenes (BTEX) and MTBE contamination in groundwater, with the greatest concentrations located west of the gasoline dispensers and southwest of the former tank field. The NYSDEC project manager's remarks indicate that DEC

required the installation of permanent monitoring wells and the development of a Remedial Action Plan under a stipulation agreement. The spill remains active.

- The subsurface conditions at the subject property may have been affected by 24 petroleum releases from many different off-Site sources. Several of the off-Site releases caused regional contamination of soils and groundwater, and resulted in significant amounts of free petroleum product in monitoring wells.

- The former Consolidated Edison West 18th Street Gas Works site caused extensive contamination of soil and groundwater from manufactured gas plant wastes and petroleum. Remediation activities started in 2004. Two voluntary cleanup program sites and three Brownfields Cleanup Program (BCP) sites are located within the boundaries of the former gas works. Coal tar and BTEX contamination of both soil and groundwater have been encountered. Because of the downgradient and cross gradient location of the former gas works, it is unlikely to have affected environmental conditions on the Site.

- The Site storage areas contained two 270-gallon aboveground storage tanks that appeared to be in good condition. Small leaks and spills from auto repair activities were captured by an oil water separator beneath the floor slab in the northern section of the building. A floor drain was located in the center of the fueling area at the southwest corner of the building.

2008 LBG UST Closure/Remedial Action Report

Leggette, Brashears and Graham, Inc. (LBG), under contract with Time Warner, removed the tanks present on the Site in 2007 along with the dispensers and piping in 2007/8 including removal of contaminated soils that could be excavated without endangering the building's structural elements. The closure report describes the conditions of the tanks and piping as sound, with no soil contamination in the shallow soils that would indicate possible piping leaks that could have caused the noted groundwater contamination. Evidence of free product was noted around the foundation footings and was removed by the use of sumps to skim the product. The soils near the foundations could not be removed without endangering the building's foundations.

After the tanks and contaminated soils were removed, LBG applied a mixture of two oxidants designed to oxidize the dissolved organic material and slowly release oxygen into the groundwater to enhance bio-remediation of the gasoline constituents. Before backfilling the excavations, the end point samples were reviewed by the NYSDEC and additional excavation to the east of the gasoline tanks was performed to remove MTBE contaminated soil above clean-up objectives, two test pits were excavated to examine soil conditions near the south foundation wall and gravel was placed at the

bottom of these test pits to allow additional oxidizing chemicals to be added in the future and monitoring wells were installed at these locations.

LBG also advanced three soil borings on the Site and installed two groundwater monitoring wells to supplement the four wells previously installed on and adjacent to the Site in connection with Spill # 00-10394.

2008 AKRF Phase II ESI

AKRF conducted an investigation on July 7 and 11, 2008, which included the advancement of 10 soil borings and the collection of 18 soil and six groundwater samples for laboratory analysis. The results and conclusions were as follows:

- Elevated volatile organic compounds (VOCs) were detected in 10 of the 18 soil samples. The VOCs were present at concentrations exceeding their respective NYSDEC Technical and Administrative Guidance Memorandum No. 4046 Recommended Soil Cleanup Objectives (RSCOs). These compounds exceeding RSCOs included 1,2,4-trimethylbenzene, benzene, isopropylbenzene, methyl tert-butyl ether (MTBE, a highly water-soluble gasoline additive), n-butylbenzene and n-propylbenzene. The were detected in five soil samples, mostly at the soil-water interface. Based on the distribution and concentrations, AKRF concluded that the VOCs detected beneath the southern portion of the building appeared to be attributable to the known on-site spill of MTBE-containing gasoline. The VOCs detected in the northern portion of the site included gasoline-related compounds, but not MTBE. As noted in the Phase I ESA, historical Sanborn maps from 1951 through 1987 indicate the presence of two 1000-gallon gasoline tanks in this portion of the Site. AKRF concluded that the gasoline contamination found in this area may be the result of past releases from these tanks or associated piping, or of off-Site releases, including several closed status spills on the east-adjacent property.

- The concentrations of eight semi-volatile organic compounds (SVOCs) exceeded their RSCOs in 12 soil samples, mostly from the upper 5 feet of the soil borings. The majority of the SVOCs detected, including those that exceeded their respective RSCOs, are polycyclic aromatic hydrocarbons, which are typically detected in urban fill encountered in New York City. Therefore, it was concluded that the nature and levels of the SVOCs detected on-Site are likely attributable to the presence of urban fill beneath the Site.

- The concentrations of six metals (calcium, copper, lead, magnesium, mercury and zinc) exceeded their respective RSCOs and Eastern U.S. background levels reported in TAGM No. 4046 in six soil samples. The highest concentration of lead, 600 parts per million (ppm), was detected in sample SB-4 (3-5 feet), and the highest concentration of mercury (2.4 ppm) was identified in sample SB-5 (1-6

feet). These metals' Eastern U.S. Background Levels are 500 ppm and 0.2 ppm respectively. Based on the detected concentrations of metals, it was concluded that the exceedances may be attributable to urban fill beneath the Site, which typically contains highly variable concentrations of metals.

- VOCs were detected in the each groundwater samples at concentrations exceeding the NYSDEC Class GA Ambient Water Quality Standards (drinking water standards). The highest concentrations of VOCs were detected in samples SB-2 (GW) (25,000 parts per billion of MTBE), SB-3 (GW) (13,550 ppb of MTBE), and SB-8 (GW) (1,798 ppb of gasoline related compounds). MTBE was present below the Class GA standard in groundwater sample SB-6 (GW), and was detected at a concentration of 20 ppb, in exceedance of the Class GA standard of 10 ppb, in monitoring well Roux MW-3.

  AKRF concluded that Based on Site history, the VOC contamination in groundwater at SB-1, SB-2 and SB-3 is likely attributable to the on-Site spill of MTBE-containing gasoline. Although an active fuel oil spill was reported on the property south-adjacent to Roux MW -3, fuel oil does not contain MTBE, and the presence of this chemical in the samples indicates contamination migrating from the subject Site or the west-adjacent property, which also had an active MTBE-containing gasoline spill reported. The low levels of MTBE detected in sample SB-6 (GW) may be attributable to spills on the southern portion of the Site or the west-adjacent property. However, since MTBE was not detected in sample SB-8 (GW) or in the soil samples collected in the northern portion of the Site, the VOCs detected in this area are generally not likely to be attributable to the gasoline spill in the southern portion of the Site, and may instead be due to past to releases from the gasoline tanks formerly located in this area or from spills on the east-adjacent property.

- Bis(2-ethylhexyl)phthalate was the only SVOC detected at concentrations exceeding its Class GA standard in groundwater sample SB-3 (GW). Bis(2-ethylhexyl)phthalate, which is commonly used in plastics, was not detected in soil samples from boring SB-3 and was concluded to be a laboratory contaminant. The presence of other SVOCs, at concentrations below their respective Class GA standards was attributed to the presence of suspended soil particles in the samples, which were not filtered prior to analysis.

- Ten metals were detected at concentrations exceeding their respective Class GA standards in unfiltered groundwater samples (total metals analysis) . However, in the filtered samples (dissolved metals analysis), only iron, magnesium, manganese and sodium were detected at concentrations that exceeded their respective Class GA standards. Most metals detected in the unfiltered samples were either not detected or detected at much lower levels in the filtered samples.

The analytical results suggest that metals detected in the unfiltered samples are primarily due to suspended sediments in the groundwater samples.

- Overall, AKRF concluded that gasoline and MTBE contamination from on-Site Spill # 00-10394 remains in the southern portion of the Site, and may be migrating off-Site in groundwater. Additional petroleum contamination, either from historical on-site gasoline storage tanks or from off-Site spills, was discovered in the northern portion of the Site. The Site was underlain by urban fill, which may contain highly variable concentrations of SVOCs and metals.

Leggette Brashears & Graham Groundwater Monitoring Reports (2008-2011)

Quarterly groundwater monitoring at the Site by LBG began in March of 2008. The first sampling event of this series showed that VOCs associated with gasoline (BTEX) were present at concentrations exceeding the groundwater standards in each of the monitoring wells with MBTE having the most pervasive presence and highest concentrations.

The NYSDEC requested three additional wells be installed to the south and southwest of the gasoline tank area to further delineate the extent of groundwater contamination on and off site in 2010 based upon continued exceedance of the groundwater standards during quarterly monitoring. After installation of these additional wells, a comprehensive groundwater study was performed sampling all 9 available wells in June 2010. No gasoline constituents were detected at concentrations that exceeded their respective Part 375 restricted commercial standards in the soil samples taken as part of the installation of the three additional wells.

The groundwater analytical results from this sampling indicated VOCs present at concentrations exceeding the groundwater standards in samples from 6 of 9 monitoring wells. MTBE was the most common constituent which was detected at the highest concentrations in the groundwater samples. BTEX compounds were at the highest concentrations in the downgradient wells closest to the former tank area (MW-8 and GFMW-1) where the highest concentration of MTBE was also detected. The mean concentration of MTBE in all existing wells had trended lower over the 2 year period following the oxidant application with MTBE being reduced by 78 to 98 percent.

Quarterly groundwater monitoring continued in 2011, although the quarterly reports were not made available to FLS for review. The most recent groundwater monitoring report discussed in section 2.3.6 indicates that BTEX and MTBE concentrations increased in certain wells during 2011.

FLS Phase I Environmental Site Assessment (November 2011)

A Phase I ESA was prepared for the Site by FLS in November 2011 on behalf of 510 West 22nd Street Partners, LLC. The Phase I ESA identified the following recognized environmental conditions (RECs):

- The open spill case (Spill #00-10394) on the Site;
- The historical Sanborn Fire Insurance maps from 1921 to 1988 show 11 properties with underground gasoline tanks in the vicinity of the Site. Most of these sites have been converted to art galleries and/or office space, or redeveloped into a multi-story apartment buildings. The adjacent property to the west of the subject property at 521-529 West 21st Street is listed on the NYSDEC Spills Database as an active spill site for the release of gasoline and fuel oil to the soil and groundwater. This is considered a REC that could potentially impact the Site.

Although the prior uses of nearby sites and the active spill incident/case on the adjacent property to the west are RECs, FLS concluded that the ongoing remediation activities for the on-Site spill (Spill #00-10394) should address any contamination that may migrate beneath the subject property from off-site sources.

LBG Chemical Oxidation Injections and Recent Groundwater Monitoring (2011-2012)

In late 2011 and early 2012, due to rebounding concentrations of BTEX and MTBE in certain wells since mid-2010, LBG performed 2 rounds of chemical oxidation injections at the Site. A slurry mix of RegenOx® and Oxygen Release Compound Advanced® was injected into the saturated zone at and beneath the water table in the southern-central portion of the Site during each round. LBG's evaluation of the results from the 2nd quarter of 2012 groundwater monitoring states that the injections were successful in mobilizing residual VOCs into the dissolved phase. However, the evaluation also states that continued groundwater monitoring is necessary to ensure the effectiveness of the injections, and discusses the possibility of additional future injections and soil excavation, indicating that remediation of soil and groundwater at the Site is not yet completed.

4.0 POTENTIAL CHEMICAL AND PHYSICAL HAZARDS AND CONTROLS

This section discusses the potential chemical, physical, and biological hazards and controls associated with the investigation tasks above.

4.1 Potential Chemical Hazards/Controls

Based on data collected during previous investigations, this HASP focuses on the following chemicals of concern:

- VOCs
    - Benzene
    - Toluene
    - Ethylbenzene
    - Xylenes
    - Methyl-tert-butyl-ether
    - Methylene Chloride
    - 1,2,4-trimethylbenzene
    - P-isopropyltoluene
    - Naphthalene
    - Chloromethane

- Metals
    - Mercury
    - Lead

Attachment II lists the recognized and suspected health hazards, exposure limits, physical and chemical properties, recommended protection levels and symptoms of exposure for the chemicals known or suspected. Chemical hazards will be minimized by limiting exposure of personnel to soil and groundwater and by engineering control and personnel protective equipment (PPE).

4.2 Physical Hazards/Controls

Physical hazards potentially present at the Site include, but are not limited to, the following:

Hazard	Control
Slip, trip and fall (uneven terrain and slippery surfaces)	Avoid uneven terrain, walk slowly, wear sturdy/supportive shoes
Environmental (heat/cold) stress	A discussion of heat stress and cold stress and related illnesses and controls is provided in Attachment III.
Vehicular Traffic	Avoid working in high traffic areas. If necessary,

	use cones, reflective vests, and consider use of a flagman/additional protection.
Fire	Ensure class ABC fire extinguisher is nearby to work area when using equipment that can provide an ignition source (heavy machinery, generators, power tools)
Noise hazards	Use ear plugs and/or ear muffs during demolition and excavation activities.
Use of heavy equipment	Stay clear of heavy equipment during operation. Maintain eye contact with operator when approaching equipment.
Flying/Falling Debris	Safety glasses and hard hats will be used during all demolition and excavation activities. Be vigilant.

Anticipated Site operations do not include the need for specific operations such as lockout/tag-out, scaffolds or confined spaces; therefore these items are not addressed in this HASP. If Site activities require these operations, the HASP will be amended and properly trained, experienced and competent personnel shall be utilized.

4.3 Changing Conditions

Physical conditions change on site and it is important to recognize this situation. One type of changing condition is a growing excavation. It is important to be mindful of this condition.

Another potentially changing condition is gases and depth of excavation. As the excavation deepens below the breathing zone, it is possible for gases denser than air to accumulate. These gases must be monitored before entering the excavation of enclosure. This is especially true at the beginning of each work day after gases have had all night to accumulate.

4.4 Biological Hazards

General biological hazards present at the Site include, but not limited to, the following:

- Bites or stings from insects (particularly ticks) resulting in skin inflammation, disease, or allergic reaction
- Allergens and toxins from plants and animals, producing dermatitis, rhinitis, or asthma

5.0 HEALTH AND SAFETY PROTOCOL

5.1 Site/Work Hazard Evaluation

Upon review of contaminant levels and physical hazards, exposure routes and the nature of the remediation/excavation/construction tasks, it has been determined that Level D protection will be used during field activities with a contingency to upgrade to Level C protection if warranted. Air monitoring and action levels for the appropriate level of PPE appear in Section 8.

5.2 Project Team Organization

All personnel who participate in field activities will be required to attend a Health and Safety meeting prior to the commencement of field activities. The project team organization roles are described below.

Health and Safety Officer (HSO)

- Administers all aspects of the occupational health and safety program
- Develops programs and technical guidance to identify and remove physical, chemical, and biological hazards from facilities, operations, and sites
- Assists management and supervisors in the health and safety training of employees
- Conducts inspections to identify unhealthy or unsafe conditions or work practices. Takes immediate corrective action.
- Investigates all accidents and takes action to eliminate accident causes
- Monitors to determine the degree of hazard
- Determines the protection levels and equipment required to ensure the safety of personnel
- Evaluates on-site conditions (i.e., weather and chemical hazard information) and recommending to the project manager and/or the field coordinator, modifications to the work plan and personnel protection levels
- Monitors performance of all personnel to ensure compliance with the required safety procedures
- Ensures that all personnel have been trained in proper site-safety procedures including the use of PPE, and have read and signed the Acknowledgment Form (Attachment I)

- Conducts daily briefings as necessary
- Halts work if necessary
- Ensures strict adherence to the Site HASP
- Reviews personnel medical monitoring participation
- Records safety infractions and corrective actions in field log
- Notifies subcontractors and contractors of unsafe conditions

Project Manager

- Familiar with health and safety regulations related to area of responsibility
- Directs and coordinates health and safety activities within area of responsibility
- Ensures arrangements for prompt medical attention in case of serious injury
- Requires all employees supervised to use individual protective equipment and safety devices
- Ensures that safety equipment is available, maintained, used, and stored correctly
- Instructs and trains all persons within area of responsibility in health and safety requirements
- Conducts frequent and regular health and safety inspections of work area Directs correction of unsafe conditions
- Conducts weekly safety briefings with all supervisors and/or workers
- Requires all subcontractors and subcontractor personnel to comply with health and safety regulations

All Employees

The minimum personal qualifications for each individual participating in field activities are as follows:

- OSHA-specific medicals including, but not limited to, audiometric testing under the hearing conservation program and medical approval for the use of respirators
- Participation in the FLS Occupational Health Monitoring Program
- Successful completion of the 40-hour OSHA health and safety training for hazardous material sites (29 CFR 1910.120[e][3][i]) and valid/up-to-date 8-hour refresher training (29 CFR 1910.120[e][4])

- Additionally, it is strongly recommended that all field personnel be trained in first aid and Cardio-Pulmonary Resuscitation (CPR)
- Be familiar with and comply with proper health and safety practices
- Use the required safety devices and proper personal protective safety equipment
- Notify HSO/supervisor immediately of unsafe conditions/acts, accidents, and injuries
- No. 1 – Be alert on site and communicate unsafe conditions and safety infractions immediately!

5.3 Training

Knowledge of the safety rules supplemented by compliance, is essential to safety. New employees will be provided orientation training and will be furnished information and literature covering the company health and safety policies, rules, and procedures. This orientation training must be provided prior to the employee's visit to the Site. Employees must read the HASP and project-specific Work Plan, which contains the applicable regulations/standards for their job.

Prior to beginning work on-Site, and weekly thereafter, the HSO will lead safety-training sessions and/or "tailgate" training meetings. These meetings will be conducted to provide information and training on new equipment, new procedures, new chemicals, refresher/remedial training in specific areas, or meet annual requirements. Such training may be held in conjunction with the safety briefings/meetings addressed elsewhere in this program. If necessary, the HSO will ensure that employees are scheduled and provided specialized training as required. Examples of specified training include (but are not limited to):

- Safe handling/use of flammables, poisons, or toxics
- Confined space entry
- Respirator care/use
- Hazard communication (hazardous chemicals)
- Slip, trip and fall hazards and fall protection
- Lockout/tagout procedures
- Scaffold use, and erection/dismantling
- Blood-borne Pathogens (Non-Medical)

Specialized training will be documented in the employees' personnel records and/or in a master training record.

5.4 Contractor & Subcontractor Compliance

All contractors and subcontractors that will come in contact with contaminated soil and groundwater shall be responsible for preparing a Site-specific HASP for their work and have available a supervisor on site who understands their scope of work. The supervisor will be responsible for ensuring that their personnel comply with the HASP.

The provisions of this health and safety plan apply to contractors and subcontractors and their employees working for FLS. Failure to fulfill this requirement is a failure to meet the conditions of the contract.

5.5 Personal Hygiene

Eating, drinking and the use of tobacco products in the work area are prohibited. The use of alcohol at the work site is prohibited. Field personnel taking prescription or non-prescription medication that could impair function or cause drowsiness should alert the HSO before work begins. Beards or facial hair that could interfere with the use of a respirator (if required) are not permitted. Dermal contact with groundwater or soil should be avoided. This includes avoiding walking through puddles, pools, and mud, sitting or leaning on or against drums, equipment, or on the ground. Field personnel should wash their hands before eating, smoking, using the toilet, etc. Field personnel should wash their hands and face and shower (daily) as soon as possible after leaving the site.

5.6 Levels of Personal Protection

PPE must be worn as required for each job in all operations where there is an exposure to hazardous conditions.

5.6.1 Level D

Level D applies to work in areas where the possibility of contact with potentially contaminated media exists. The protective equipment required for Level D includes, but is not limited to, the following:

- Work clothes or coveralls (as needed)
- Safety boots, with steel toe
- Safety glasses
- Hard hat
- Reflective vest (as needed)
- Disposable nitrile gloves

- Hearing protection as needed

5.6.2 Level C

Level C is selected for working when the type of material and the concentration are known and pose a moderate level of respiratory. Level C is required when photoionization detector (PID) readings trigger respiratory action levels per Section 8. Level C protection will include, but is not limited to, the following:

- Protective clothing and other equipment required for Level D
- Full-face air purifying respirator (APR) with high efficiency /organic vapor cartridges (ultra-twin with GMCH cartridges)
- Tyvek disposable coveralls with hoods
- Boot covers

5.7 General Workplace Safety Rules

- Report unsafe conditions, accidents, injuries, or incidents to the HSO and Project Manager—immediately.
- Use eye and/or face protection where there is danger from flying objects or particles, (such as when grinding, chipping, burning and welding, etc.) or from hazardous chemical splashes.
- Dress properly. Loose clothing and jewelry shall not be worn.
- Keep all equipment in safe working condition. Never use defective tools or equipment.
- Report any defective tools or equipment to immediate supervisor.
- Properly care for and be responsible for all PPE.
- Do not leave materials in aisles, walkways, stairways, work areas, roadways, or other points of egress.
- Practice good housekeeping at all times.
- Training on equipment is required prior to unsupervised operation.
- During work, pause every few minutes and assess surrounding conditions—Be alert!
- For personal safety, be cognizant of your surroundings and ensure that equipment is properly secured.

5.8 Housekeeping

- Proper housekeeping is the foundation for a safe work environment. It definitely helps prevent accidents and fires, as well as creating a professional appearance in the work area.
- Material will be piled or stored in a stable manner so that it will not be subject to falling.
- Combustible scrap, debris, and garbage shall be removed from the work area at frequent and regular intervals.
- Stairways, walkways, exit doors, in front of electrical panels, or access to fire-fighting equipment will be kept clear of materials, supplies, trash, and debris.

5.9 Fire Prevention

- All firefighting equipment shall be conspicuously located, accessible, and inspected periodically, and maintained in operating condition. An annual service check and monthly visual inspections are required for fire extinguisher.
- All employees must know the location of fire-fighting equipment in the work area and have knowledge of its use and application.

5.10 Industrial Hygiene and Occupational Health

- Toilet facilities shall be provided as required for the number of workers.
- A first aid kit and portable eyewash station shall be kept on site.
- An adequate supply of potable water shall be provided.
- When no medical facility is reasonably accessible (time and distance) to the worksite, a person who has a valid certificate of first aid training will be available at the worksite to render first aid.
- Employees must be protected against exposure to hazardous noise levels by controlling exposure or by use of proper PPE.
- Any demolition work will be assessed for lead exposure (particularly if drywall or any painted surfaces or abrasive blasting/grinding is involved) and/or asbestos exposure.

5.11 Spill Containment Program

The cleanup of a chemical spill should only be done by knowledgeable and experienced personnel. Spill kits, consisting of absorbents and protective equipment should be available to clean up minor spills. A minor chemical spill is one that the FLS staff is capable of handling safely without the assistance of emergency personnel. All other chemical spills are considered major. For a major spill, contact the HSO.

Procedure for Responding to a Minor Chemical Spill

- Contact HSO to obtain guidance
- Alert people in immediate area of spill
- Wear PPE, minimum level D—**First assess the spill to determine whether you have sufficient protection to continue**
- Upgrade to level C to avoid breathing vapors from spill
- Confine spill to small area using absorbent, debris, soil etc.
- Absorb spill with vermiculite, dry sand, or oil-sorbent pads
- Collect residues, place in Department of Transportation (DOT)-approved containers (labeled) and dispose as chemical waste
- Clean spill area with water

6.0 INDIVIDUAL SAFETY & HEALTH PROGRAMS LISTING

OSHA standards specify various individual programs that may be applicable to work performed on construction sites. Highlights of these programs are provided below, and specific written programs or procedures may be included into this written program, attached, or developed separately.

6.1 Hazard Communication Program

If employees are exposed to or work with hazardous chemicals at the job site, this program is required. Important elements of the written program are required to include a master listing of chemicals, maintaining material safety data sheets on each chemical, and training of employees on the program, the chemicals exposed to, and material safety data sheets.

6.2 Confined Space Entry Program

If employees enter a confined space that contains or has the potential to contain a atmospheric or physical hazard, this program is required. Either the ANSI Z117.1-1989 Safety Requirements or Confined Spaces program of the OSHA General Industry Permit Require Confined Space program must be used as guidance to develop the company's program. Primary elements of the program are identification of applicable confined spaces, testing/monitoring, control or elimination of hazards, protective equipment, entry authorization, attendants, training, and rescue.

No FLS employee is authorized to enter a confined space without the specified training AND notifying the project manager or HSO.

6.3 Respiratory Protection Program

If employees are exposed to hazardous/toxic chemical, paint or other gases, vapors, fumes, dusts, or mists above the permissible exposure limit, and/or employees wear respirators, this program is required. Program elements are written program for the selection, maintenance, care, and use of respirators; fit testing, training, and employee evaluation for use.

6.4 Occupational Noise Exposure/Hearing Conservation Program

If employees are exposed to noise levels above the permissible noise exposures, protection against the effects of noise and an effective hearing conservation program are required. Such a program would include elements such as written program, noise monitoring, hearing evaluations and follow-on testing, personal protective equipment (hearing protection), and maintenance of medical records.

6.5 Lockout/Tagout Program

If employees deactivate or de-energize electrical controls, equipment, or circuits and are thus exposed to electrical energy, this program is required. Program elements include lockout when possible, tagout when lockout not possible, and the employer providing and controlling lockouts.

6.6 Assured Equipment Grounding Conductor Program

If the employer uses assured equipment grounding verses ground fault circuit interrupters to provide employee electrical grounding protection, this program is required. Program elements include the inclusion of all cord sets, receptacles and cord/plug connected equipment and tools; a written program; quarterly testing; recording of each test by logging, color coding, or other equally effective means; and designation of a competent person to run the program.

6.7 Fire Protection and Prevention

A fire protection and prevention program must be developed and followed throughout all phases of the construction and demolition work. Program elements include providing the specified firefighting equipment, periodic inspections of the same, providing fire alarm devices/system, and establishment and adherence to fire prevention practices.

6.8 Emergency Response Plan

If employees are engaged in emergency response to a hazardous substance/chemical release, an emergency response plan must be developed and implemented to handle anticipated emergencies. Program elements include a written response plan, identification and training of responding employees, medical surveillance and consultation, and post response operations.

6.9 Asbestos Control Program

If employees are exposed to asbestos fibers in the workplace, then an initial monitoring for asbestos exposure must be made. If the monitoring results are above the permissible exposure limit (PEL), this program is required. Program elements include regulated areas, exposure monitoring, medical surveillance and records maintenance, engineering controls, personal protective equipment, and training.

6.10 Lead Exposure Program

If employees are exposed to lead in the workplace, then an initial monitoring for lead exposure must be made. If the monitoring results are above the permissible exposure limit (PEL), this program is required. Program elements include regulated areas, exposure monitoring, medical surveillance and records maintenance, engineering controls, personal protective equipment, and training.

7.0 AIR MONITORING EQUIPMENT AND ACTION LEVELS

A PID will be used during all work to monitor total organic vapors. The instrument will be calibrated daily or as necessary due to field conditions and the results noted in the project field book. A background level will be established, at a minimum, on a daily basis, and recorded in the field book.

The action levels and required responses are listed in the below.

Air Monitoring, Action Levels, PPE

Instrument	Action Level	Response Action
Gas/Vapor		
PID	> 5 ppm	Temporarily halt work activities and monitor until readings decrease to below 5ppm. Level D
	>5ppm - <25ppm	Halt work activities, notify HSO; continue monitoring.
	>25ppm	Shut down work activities. Resume work when readings are less than 25 ppm.

8.0 DECONTAMINATION

8.1 Site/Work Area Organization

Site control measures shall be implemented to protect the public and FLS personnel working on-site. A typical Site work area will consist of an exclusion zone where the actual field activity will take place, a contaminant reduction zone, and a support zone located outside the contaminant reduction and exclusion zones.

Levels of personal protection in the exclusion zone will vary depending on air monitoring data, and will be specified by the Site HSO.

Fences, guardrails and access devices shall be provided and maintained by the construction contractor throughout the project activities in accordance with 29 CFR 1926. In addition, barricades, warning signs and devices, temporary lighting and other safety measures shall be provided by the construction contractor, as required, to protect site personnel.

All visitors to the Site shall report first to the Contractor field office. Visitor access shall be limited to the Support Zone and Level D operation areas only, and shall be allowed only with the prior consent of the Site Manager. No visitor shall enter a work area unescorted by a Subcontractor or Contractor representative.

8.2 Work Zones

Entry into the work zones begins once a person comes on-site. This approach reflects the dynamic nature of the operations and the need for everyone to be aware of the conditions while on-site. Using the concept of three zones for the Site, the following areas are identified:

Support Zone
This area starts at the project/property fence line and extends to the entry to where field work will be conducted. In this area all personnel shall wear Level D PPE.

Contamination Reduction Zone (CRZ)
The CRZ will be within a designated area to be determined based on where field activities will take place. Personnel shall be aware of and follow all Site control procedures with respect to entering and exiting the CRZ, to ensure that they are not exposed to contaminants and to minimize the potential for contamination of personnel and the spread of contamination outside the Exclusion Zone (EZ). These measures include having personnel follow the proper procedures for donning and doffing PPE and washing in the CRZ. The measures also address the decontamination procedures for use when moving equipment between zones. The CRZ shall consist of an area to drop off equipment, plastic bags to dispose of protective clothing, adequate soap and water for personnel and equipment decontamination and a means of capturing wash water generated during decontamination.

Exclusion Zone (EZ)

The EZ will be within a designated area to be determined based on where field activities will take place. No employee shall enter the Exclusion Zone without the required training and PPE. The employee must first exit the Exclusion Zone and follow decontamination procedures (Section 2.8.2.1) in the CRZ before engaging in any of the above actions. In the event that an employee in the EZ requires a replacement or his/her protective suit or respirator filters, the employee shall exit the EZ and utilize proper decontamination procedures in the CRZ, replace or repair the defective PPE, then re-enter the EZ.

8.3 Personnel Decontamination

Decontamination (decon) of personnel consists of physically removing soil or contaminants using the correct procedures for washing and removal of PPE. Decon will take place in the designated decontamination zone using the following steps, if applicable

- Soap and potable water wash and potable water rinse of gloves
- Tyvek removal
- Glove removal
- Field wash of hands and face

9.0 EMERGENCY AND CONTINGENCY PLAN

Emergency communications will be maintained during all on-site field activities. The emergency route to the hospital is depicted on Figure 3 and emergency contacts and their phone numbers are presented in Table 1.

A first aid kit will be available on-site at all times for any minor on-site injuries. Emergency medical assistance or ambulance can be reached by calling 911 for more severe injuries.

All OSHA recordable injuries and illnesses will be reported using OSHA Form 301 (Attachment IV).

General Emergency Response Procedures:

Any employee discovering a fire, explosion, or release of hazardous materials, which could potentially harm human health, or the environment, must immediately notify 911 to activate appropriate emergency procedures.

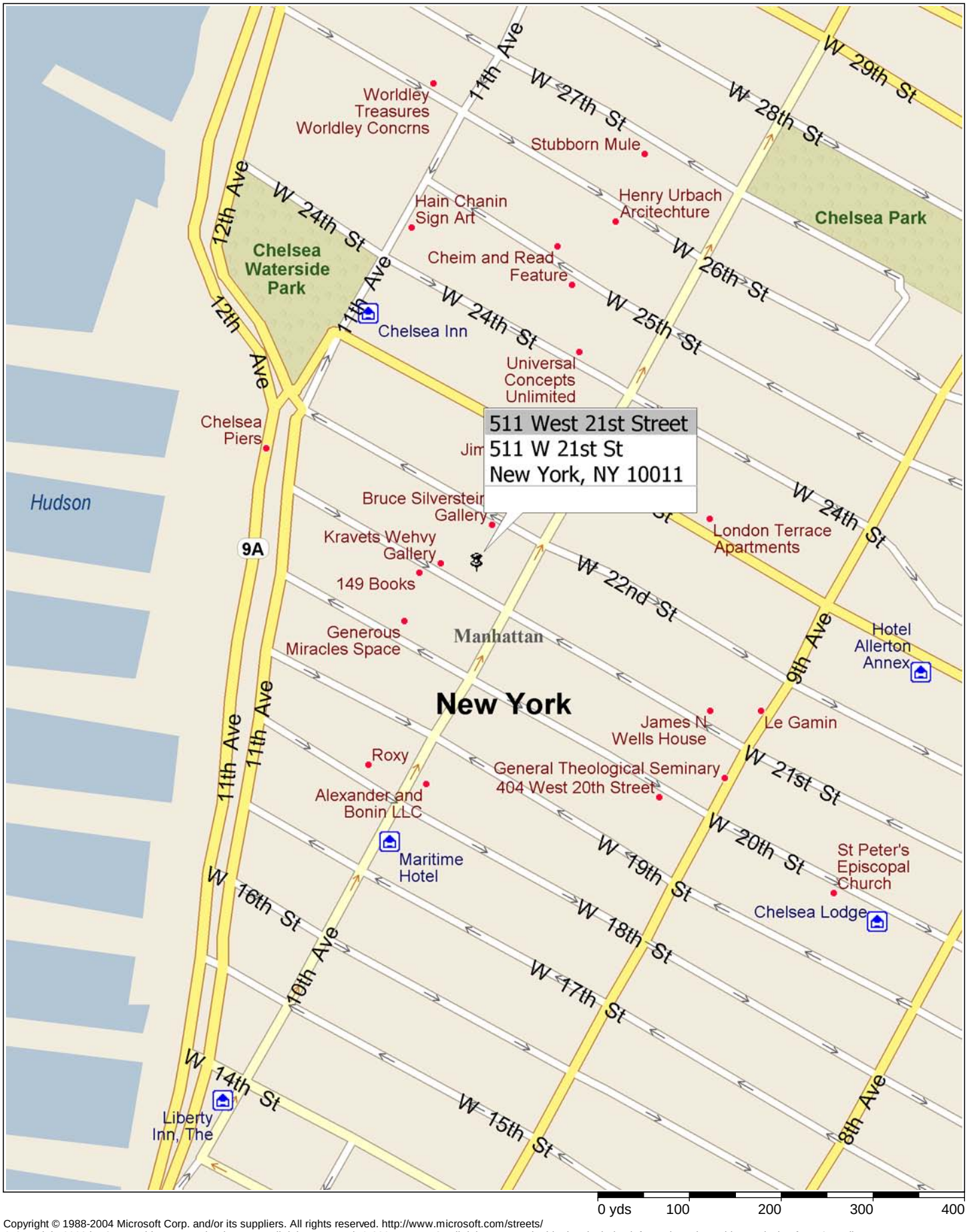
The following steps will be taken to expeditiously secure the appropriate assistance:

- Ascertain pertinent information (location, type of emergency condition, presence of possible victims which may be hurt or trapped nearby to the condition) and immediately contact and provide this information to 911 emergency personnel.
- Identify yourself and give the exact location first, then the type of emergency, and the presence of possible victims which may be hurt or trapped nearby to the condition. Then await the arrival of emergency response police officers, staying a safe distance from the emergency condition if warranted.
- Contact the FLS Technical Director and Project Manager and notify them of situation while waiting for emergency personnel.
- If possible, have a responsible person nearby to help flag down responding emergency services personnel as they respond.
- Emergency response personnel will assess the reported emergency and advise of the appropriate action to be taken, i.e., evacuate an area.

Unless specifically trained to handle an emergency of the type you may be reporting, please do not attempt to render assistance in handling the emergency unless ordered to do so by competent authority or emergency services personnel.

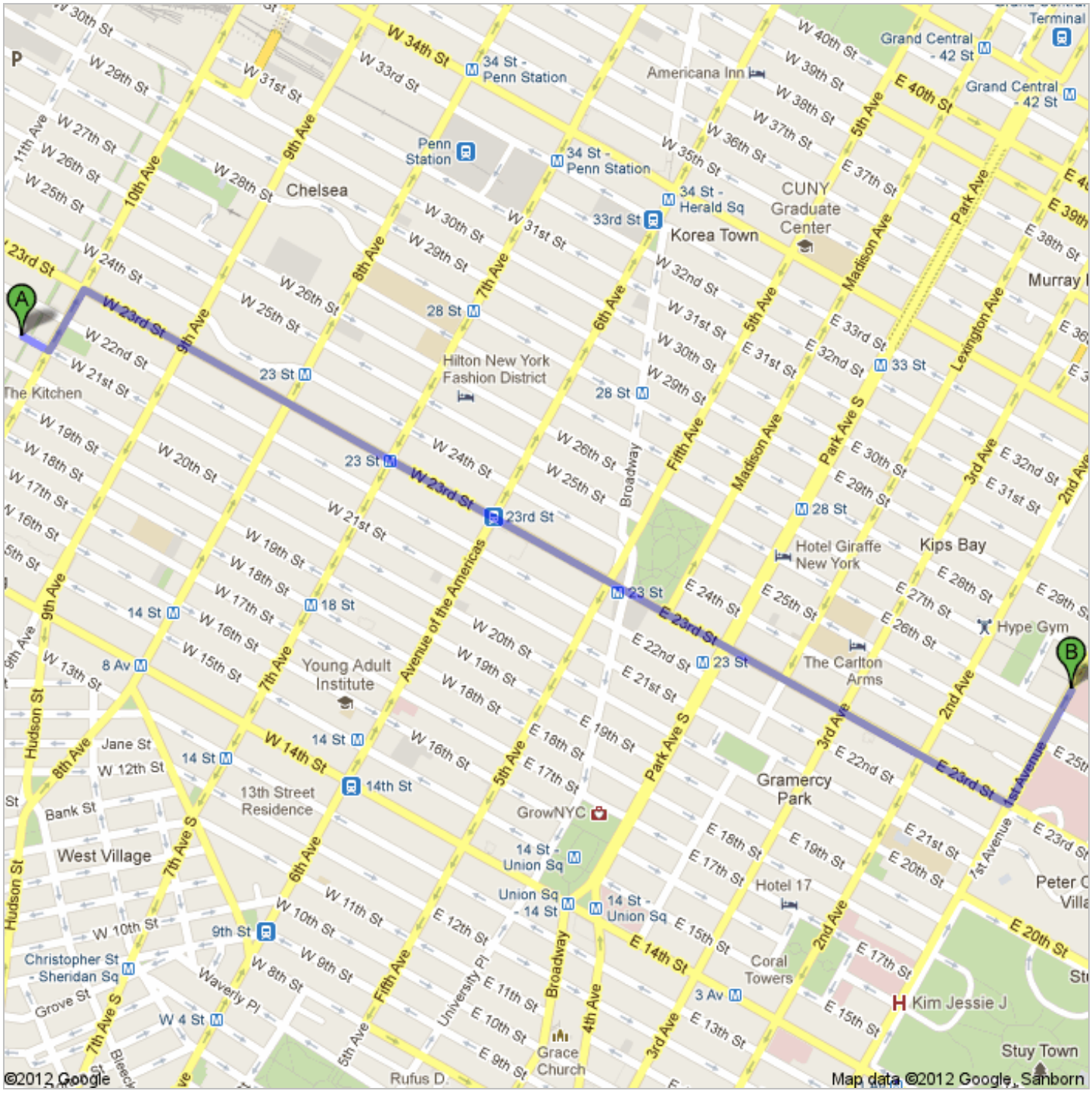
FIGURES

Site Location Map



Google

Directions to Bellevue Hospital Center
462 1st Avenue, New York, NY 10010
1.9 mi – about **9 mins**



511 W 21st St, New York, NY 10011

	1. Head **southeast** on **W 21st St** toward **10th Ave**	go 233 ft total 233 ft
	2. Take the 1st left onto **10th Ave** About 47 secs	go 0.1 mi total 0.1 mi
	3. Take the 2nd right onto **W 23rd St** About 7 mins	go 1.5 mi total 1.7 mi
	4. Turn left onto **1st Avenue** Destination will be on the right About 58 secs	go 0.2 mi total 1.9 mi

Bellevue Hospital Center
462 1st Avenue, New York, NY 10010

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

TABLES

Table 1 – Emergency Contacts

Emergency	
New York City Police Department	911
New York City Fire Department	911
Emergency Medical Service (ambulance)	911
NYSDEC Spill Hotline	(800) 457-7362
National Response Center	(800) 424-8802
Bellevue Hospital Center 462 First Avenue New York, NY 10016 212-562-1000	(212) 562-1000
FLS Project Staff	
Peter Helseth, FLS Project Manager	(212) 675-3225 ext. 308
Susan Bianchetti, Health and Safety Officer	(212) 675-3225 ext. 310
Arnold Fleming, Principal	(212) 675-3225 ext. 301
Albanese Development Corporation	
Marty Dettling, Client Representative	(516) 746-6000

ATTACHMENT I

HASP Acknowledgment Form

HASP ACKNOWLEDGMENT FORM

The following personnel have read the site-specific HASP and are familiar with its provisions.

Print Name	*Signature*	*Company*	*Function*	*Date*

ATTACHMENT II

Profiles of Chemicals of Concern/Material Safety Data Sheets

International Chemical Safety Cards

BENZENE

ICSC: 0015

Cyclohexatriene
Benzol
C_6H_6
Molecular mass: 78.1

ICSC # 0015
CAS # 71-43-2
RTECS # CY1400000
UN # 1114
EC # 601-020-00-8

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive. Risk of fire and explosion: see chemical dangers.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Dry skin (further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
•EYES		face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Sore throat. Vomiting (further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Fireproof. Separated from food and feedstuffs, oxidants and halogens.	Do not transport with food and feedstuffs. F symbol T symbol R: 45-11-48/23/24/25 S: 53-45 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0015

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1999. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

BENZENE

ICSC: 0015

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air and may travel along the ground; distant ignition possible.

CHEMICAL DANGERS:
Reacts violently with oxidants and halogens causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 10 ppm; 32 mg/m^3 (as TWA) A2 (ACGIH 1991-1992).
OSHA PEL: 1910.1028 TWA 1 ppm ST 5 ppm See Appendix F
NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm See Appendix A
NIOSH IDLH: Potential occupational carcinogen 500 ppm

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and through the skin.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C; on spraying or dispersion, however, much faster.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the skin and the respiratory tract. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure far above the occupational exposure limit may result in unconsciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the blood forming organs, liver and immune system. This substance is carcinogenic to humans.

PHYSICAL PROPERTIES	Boiling point: 80°C Melting point: 6°C Relative density (water = 1): 0.9 Solubility in water, g/100 ml at 25°C: 0.18 Vapour pressure, kPa at 20°C: 10 Relative vapour density (air = 1): 2.7	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2 Flash point: (c.c.) -11°C Auto-ignition temperature: about 500°C Explosive limits, vol% in air: 1.2-8.0 Octanol/water partition coefficient as log Pow: 2.13
ENVIRONMENTAL DATA		

N O T E S

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-7
NFPA Code: H2; F3; R0;

ADDITIONAL INFORMATION

ICSC: 0015 **BENZENE**

MSDS Number: **T3913** * * * * * *Effective Date:* ***10/05/06*** * * * * * *Supercedes:* ***08/03/04***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

TOLUENE

1. Product Identification

Synonyms: Methylbenzene; Toluol; Phenylmethane
CAS No.: 108-88-3
Molecular Weight: 92.14
Chemical Formula: C6H5-CH3
Product Codes:
J.T. Baker: 5375, 5812, 9336, 9351, 9364, 9456, 9457, 9459, 9460, 9462, 9466, 9472, 9476
Mallinckrodt: 4483, 8092, 8604, 8608, 8610, 8611, V560

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Toluene	108-88-3	100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Very high concentrations may cause unconsciousness and death.
Ingestion:
Swallowing may cause abdominal spasms and other symptoms that parallel over-exposure from inhalation. Aspiration of material into the lungs can cause chemical pneumonitis, which may be fatal.
Skin Contact:
Causes irritation. May be absorbed through skin.
Eye Contact:
Causes severe eye irritation with redness and pain.
Chronic Exposure:
Reports of chronic poisoning describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated or prolonged contact has a defatting action, causing drying, redness, dermatitis. Exposure to toluene may affect the developing fetus.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired liver or kidney function may be more susceptible to the effects of this substance. Alcoholic beverage consumption can enhance the toxic effects of this substance.

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4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.
Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.
Skin Contact:
In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Flash point: 7C (45F) CC
Autoignition temperature: 422C (792F)
Flammable limits in air % by volume:
lel: 1.1; uel: 7.1
Flammable liquid and vapor!
Dangerous fire hazard when exposed to heat or flame. Vapors can flow along surfaces to distant ignition source and flash back.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full

facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Toluene:
- OSHA Permissible Exposure Limit (PEL):
200 ppm (TWA); 300 ppm (acceptable ceiling conc.); 500 ppm (maximum conc.).
- ACGIH Threshold Limit Value (TLV):
50 ppm (TWA) skin, A4 - Not Classifiable as a Human Carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Aromatic benzene-like.
Solubility:
0.05 gm/100gm water @ 20C (68F).
Specific Gravity:
0.86 @ 20C / 4 C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
111C (232F)
Melting Point:
-95C (-139F)
Vapor Density (Air=1):
3.14
Vapor Pressure (mm Hg):
22 @ 20C (68F)
Evaporation Rate (BuAc=1):
2.24

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Heat, flame, strong oxidizers, nitric and sulfuric acids, chlorine, nitrogen tetraoxide; will attack some forms of plastics, rubber, coatings.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 636 mg/kg; skin rabbit LD50: 14100 uL/kg; inhalation rat LC50: 49 gm/m3/4H; Irritation data: skin rabbit, 500 mg, Moderate; eye rabbit, 2 mg/24H, Severe. Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Has shown some evidence of reproductive effects in laboratory animals.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Toluene (108-88-3)	No	No	3

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction

with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. This material has a log octanol-water partition coefficient of less than 3.0. Bioconcentration factor = 13.2 (eels).
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

International (Water, I.M.O.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Toluene (108-88-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Toluene (108-88-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Toluene (108-88-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Toluene (108-88-3)	1000	U220	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

WARNING:

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 3[Y]E
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:
Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Label First Aid:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head below hips to prevent aspiration into lungs. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 5.
Disclaimer:
****

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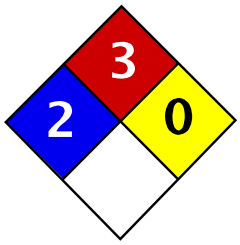
****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Ethylbenzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethylbenzene

Catalog Codes: SLE2044

CAS#: 100-41-4

RTECS: DA0700000

TSCA: TSCA 8(b) inventory: Ethylbenzene

CI#: Not available.

Synonym: Ethyl Benzene; Ethylbenzol; Phenylethane

Chemical Name: Ethylbenzene

Chemical Formula: C8H10

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ethylbenzene	100-41-4	100

Toxicological Data on Ingredients: Ethylbenzene: ORAL (LD50): Acute: 3500 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (irritant, sensitizer).
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC.
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to central nervous system (CNS).
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 432°C (809.6°F)

Flash Points:
CLOSED CUP: 15°C (59°F). (Tagliabue.) OPEN CUP: 26.667°C (80°F) (Cleveland) (CHRIS, 2001)
CLOSED CUP: 12.8 C (55 F) (Bingham et al, 2001; NIOSH, 2001)
CLOSED CUP: 21 C (70 F) (NFPA)

Flammable Limits: LOWER: 0.8% - 1.6%UPPER: 6.7% - 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
Slightly explosive in presence of heat.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Vapor may travel considerable distance to source of ignition and flash back. Vapors may form explosive mixtures with air. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Vapors may form explosive mixtures in air.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 STEL: 125 (ppm) from OSHA (PEL) [United States]
TWA: 435 STEL: 545 from OSHA (PEL) [United States]
TWA: 435 STEL: 545 (mg/m3) from NIOSH [United States]
TWA: 100 STEL: 125 (ppm) from NIOSH [United States]
TWA: 100 STEL: 125 (ppm) from ACGIH (TLV) [United States]
TWA: 100 STEL: 125 (ppm) [United Kingdom (UK)]
TWA: 100 STEL: 125 (ppm) [Belgium]
TWA: 100 STEL: 125 (ppm) [Finland]
TWA: 50 (ppm) [Norway]
Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish. Gasoline-like. Aromatic.

Taste: Not available.

Molecular Weight: 106.16 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 136°C (276.8°F)

Melting Point: -94.9 (-138.8°F)

Critical Temperature: 617.15°C (1142.9°F)

Specific Gravity: 0.867 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.66 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: 140 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Easily soluble in diethyl ether.
Very slightly soluble in cold water or practically insoluble in water.
Soluble in all proportions in Ethyl alcohol.
Soluble in Carbon tetrachloride, Benzene.
Insoluble in Ammonia.
Slightly soluble in Chloroform.
Solubility in Water: 169 mg/l @ 25 deg. C.; 0.014 g/100 ml @ 15 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ingnition sources (flames, sparks, static), incompatible materials, light

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials.
Sensitive to light.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation.

Toxicity to Animals: Acute oral toxicity (LD50): 3500 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC.
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.
May cause damage to the following organs: central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation.
Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals:
Lethal Dose/Conc 50% Kill:
LD50 [Rabbit] - Route: Skin; Dose: 17800 ul/kg
Lowest Published Lethal Dose/Conc:
LDL[Rat] - Route: Inhalation (vapor); Dose: 4000 ppm/4 H

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data.
May cause cancer based on animals data. IARC evidence for carcinogenicity in animals is sufficient. IARC evidence of carcinogenicity in humans inadequate.
May affect genetic material (mutagenic).

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Can cause mild skin irritation. It can be absorbed through intact skin.
Eyes: Contact with vapor or liquid can cause severe eye irritation depending on concentration. It may also cause conjunctivitis. At a vapor exposure level of 85 - 200 ppm , it is mildly and transiently irritating to the eyes; 1000 ppm causes further irritation and tearing; 2000 ppm results in immediate and severe irritation and tearing; 5,000 ppm is intolerable (ACGIH, 1991; Clayton and Clayton, 1994). Standard draize test for eye irritation using 500 mg resulted in severe irritation (RTECS)
Inhalation: Exposure to high concentrations can cause nasal, mucous membrane and respiratory tract irritation and can also result in chest constriction and, trouble breathing, respiratory failure, and even death. It can also affect behavior/Central Nervous System. The effective dose for CNS depression in experimental animals was 10,000 ppm (ACGIH, 1991). Symptoms of CNS depression include headache, nausea, weakness, dizziness, vertigo, irritability, fatigue, lightheadedness, sleepiness, tremor, loss of coordination, judgement and conciousness, coma, and death. It can also cause pulmonary edema. Inhalation of 85 ppm can produce fatigue, insomnia, headache, and mild irritation of the respiratory tract (Haley & Berndt, 1987).
Ingestion: Do not drink, pipet or siphon by mouth. May cause gastroinestinal/digestive tract irritation with Abdominal pain, nausea, vomiting. Ethylbenzene is a pulmonary aspiration hazard. Pulmonary aspiration of even small amounts of the liquid may cause fatal pneumonitis. It may also affect behavior/central nervous system with

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 14 mg/l 96 hours [Fish (Trout)] (static). 12.1 mg/l 96 hours [Fish (Fathead Minnow)] (flow-through)]. 150 mg/l 96 hours [Fish (Blue Gill/Sunfish)] (static). 275 mg/l 96 hours [Fish (Sheepshead Minnow)]. 42.3 mg/l 96 hours [Fish (Fathead Minnow)](soft water). 87.6mg/l 96 hours [Shrimp].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Ethylbenzene UNNA: 1175 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Ethylbenzene
Illinois toxic substances disclosure to employee act: Ethylbenzene
Illinois chemical safety act: Ethylbenzene
New York release reporting list: Ethylbenzene
Rhode Island RTK hazardous substances: Ethylbenzene
Pennsylvania RTK: Ethylbenzene
Minnesota: Ethylbenzene
Massachusetts RTK: Ethylbenzene
Massachusetts spill list: Ethylbenzene
New Jersey: Ethylbenzene
New Jersey spill list: Ethylbenzene
Louisiana spill reporting: Ethylbenzene
California Director's List of Hazardous Substances: Ethylbenzene
TSCA 8(b) inventory: Ethylbenzene
TSCA 4(a) proposed test rules: Ethylbenzene
TSCA 8(d) H and S data reporting: Ethylbenzene: Effective Date: 6/19/87; Sunset Date: 6/19/97
SARA 313 toxic chemical notification and release reporting: Ethylbenzene

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
CLASSE D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable.
R20- Harmful by inhalation.
S16- Keep away from sources of ignition - No smoking.
S24/25- Avoid contact with skin and eyes.
S29- Do not empty into drains.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References:
-Manufacturer's Material Safety Data Sheet.
-Fire Protection Guide to Hazardous Materials, 13th ed., National Fire Protection Association (NFPA)
-Registry of Toxic Effects of Chemical Substances (RTECS)
-Chemical Hazard Response Information System (CHRIS)
-Hazardous Substance Data Bank (HSDB)
-New Jersey Hazardous Substance Fact Sheet
-Ariel Global View
-Reprotext System

Other Special Considerations: Not available.

Created: 10/09/2005 05:28 PM

Last Updated: 10/09/2005 05:28 PM

MSDS Number: **X2000** * * * * * *Effective Date:* ***02/16/06*** * * * * * *Supercedes:* ***04/01/03***

MSDS Material Safety Data Sheet

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

XYLENES

1. Product Identification

Synonyms: Dimethyl benzene, xylol, methyltoluene
CAS No.: 1330-20-7
Molecular Weight: 106.17
Chemical Formula: C6H4(CH3)2
Product Codes:
J.T. Baker: 5377, 5813, 9483, 9489, 9490, 9493, 9494, 9499, 9516, X516
Mallinckrodt: 8664, 8668, 8671, 8672, 8802, V052

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
m-Xylene	108-38-3	40 - 65%	Yes
o-Xylene	95-47-6	15 - 20%	Yes
p-Xylene	106-42-3	< 20%	Yes
Ethyl Benzene	100-41-4	15 - 25%	Yes

3. Hazards Identification

Emergency Overview

DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)

Flammability Rating: 2 - Moderate
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors may be irritating to the nose and throat. Inhalation of high concentrations may result in nausea, vomiting, headache, ringing in the ears, and severe breathing difficulties which may be delayed in onset. Substernal pain, cough, and hoarseness are also reported. High vapor concentrations are anesthetic and central nervous system depressants.
Ingestion:
Ingestion causes burning sensation in mouth and stomach, nausea, vomiting and salivation. Minute amounts aspirated into the lungs can produce a severe hemorrhagic pneumonitis with severe pulmonary injury or death.
Skin Contact:
Skin contact results in loss of natural oils and often results in a characteristic dermatitis. May be absorbed through the skin.
Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.
Chronic Exposure:
Chronic inhalation can cause headache, loss of appetite, nervousness and pale skin. Repeated or prolonged skin contact may cause a skin rash. Repeated exposure of the eyes to high concentrations of vapor may cause reversible eye damage. Repeated exposure can damage bone marrow, causing low blood cell count. May damage the liver and kidneys.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, blood, or respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Flash point: 29C (84F) CC
Autoignition temperature: 464C (867F)
Flammable limits in air % by volume:

lel: 1.0; uel: 7.0
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

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7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
100 ppm (TWA) xylene
100 ppm (TWA) ethylbenzene
-ACGIH Threshold Limit Value (TLV):
xylene: 100 ppm (TWA) 150 ppm (STEL), A4 - Not classifiable as a human carcinogen.
ethyl benzene: 100 ppm (TWA) 125 ppm (STEL), A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

The following physical data is for xylene.
Appearance:
Clear, colorless liquid.
Odor:
Characteristic odor.
Solubility:
Insoluble in water.
Specific Gravity:
0.86 @ 20C/4C
pH:
Not applicable.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
137 - 140C (279 - 284F)
Melting Point:
-25C (-13F)
Vapor Density (Air=1):
3.7
Vapor Pressure (mm Hg):
8 @ 20C (68F)
Evaporation Rate (BuAc=1):
0.7

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Involvement in a fire causes formation of carbon monoxide and unidentified organic components.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents and strong acids.
Conditions to Avoid:

Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Toxicological Data:
Xylene: oral rat LD50: 4300 mg/kg; inhalation rat LC50: 5000 ppm/4H; skin rabbit LD50: > 1700 mg/kg; Irritation eye rabbit: 87 mg mild (Std. Draize); irritation skin rabbit 500 mg/24 moderate (Std. Draize); investigated as a tumorigen, mutagen, reproductive effector.
Ethyl benzene: oral rat LD50: 3500 mg/kg; skin rabbit LD50: 17800 uL/kg; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
m-Xylene (108-38-3)	No	No	3
o-Xylene (95-47-6)	No	No	3
p-Xylene (106-42-3)	No	No	3
Ethyl Benzene (100-41-4)	No	No	2B

12. Ecological Information

Environmental Fate:
Following data for xylene: When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. (mixed xylenes: octanol / water partition coefficient 3.1 - 3.2; bioconcentration factor = 1.3, eels)
Environmental Toxicity:
For xylene: This material is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
m-Xylene (108-38-3)	Yes	Yes	Yes	Yes
o-Xylene (95-47-6)	Yes	Yes	Yes	Yes
p-Xylene (106-42-3)	Yes	Yes	Yes	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
m-Xylene (108-38-3)	Yes	Yes	No	Yes
o-Xylene (95-47-6)	Yes	Yes	No	Yes
p-Xylene (106-42-3)	Yes	Yes	No	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
m-Xylene (108-38-3)	No	No	Yes	No
o-Xylene (95-47-6)	No	No	Yes	No
p-Xylene (106-42-3)	No	No	Yes	No
Ethyl Benzene (100-41-4)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
m-Xylene (108-38-3)	1000	No	No
o-Xylene (95-47-6)	1000	No	No
p-Xylene (106-42-3)	100	No	Yes
Ethyl Benzene (100-41-4)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): Yes CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 3[Y]
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**

Label Hazard Warning:
DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.
Label Precautions:
Keep away from heat, sparks and flame.
Avoid contact with eyes, skin and clothing.
Keep container closed.
Use only with adequate ventilation.
Avoid breathing vapor.
Wash thoroughly after handling.
Label First Aid:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
****

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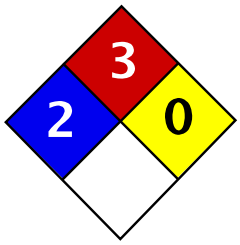
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Methyl tert-butyl ether MSDS

Section 1: Chemical Product and Company Identification

Product Name: Methyl tert-butyl ether

Catalog Codes: SLM2152

CAS#: 1634-04-4

RTECS: KN5250000

TSCA: TSCA 8(b) inventory: Methyl tert-butyl ether

CI#: Not available.

Synonym:

Chemical Name: Methyl tert-Butyl Ether

Chemical Formula: C5-H12-O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Methyl {tert-}butyl ether	1634-04-4	100

Toxicological Data on Ingredients: Methyl tert-butyl ether: ORAL (LD50): Acute: 4000 mg/kg [Rat]. 5960 mg/kg [Mouse]. VAPOR (LC50): Acute: 23576 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Extremely hazardous in case of eye contact (irritant), of ingestion. Very hazardous in case of skin contact (irritant), of inhalation. Hazardous in case of skin contact (permeator). Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Extremely hazardous in case of eye contact (irritant), of ingestion.
Very hazardous in case of skin contact (irritant), of inhalation.
Hazardous in case of skin contact (permeator).
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.

The substance is toxic to lungs, the nervous system, mucous membranes.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 224°C (435.2°F)

Flash Points: CLOSED CUP: -28°C (-18.4°F).

Flammable Limits: LOWER: 2.5% UPPER: 15.1%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid.
Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Characteristic. (Strong.)

Taste: Not available.

Molecular Weight: 88.15 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 55.2°C (131.4°F)

Melting Point: -109°C (-164.2°F)

Critical Temperature: Not available.

Specific Gravity: 0.7405 (Water = 1)

Vapor Pressure: 245 mm of Hg (@ 20°C)

Vapor Density: 3.1 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:
Soluble in methanol, diethyl ether.
Partially soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.
Acute oral toxicity (LD50): 4000 mg/kg [Rat].
Acute toxicity of the vapor (LC50): 23576 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:
Extremely hazardous in case of ingestion.
Very hazardous in case of skin contact (irritant), of inhalation.
Hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Methyl tert-butyl ether : UN2398 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Methyl tert-butyl ether
Massachusetts RTK: Methyl tert-butyl ether
TSCA 8(b) inventory: Methyl tert-butyl ether
SARA 313 toxic chemical notification and release reporting: Methyl tert-butyl ether
CERCLA: Hazardous substances.: Methyl tert-butyl ether

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 10/10/2005 08:23 PM

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Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	CLASS B-4: Flammable solid. Class D-2B: Material causing other toxic effects (TOXIC).	

Section 1. Product and Company Identification

Product Name / Trade name	Naphthalene	Associated Product's Item Code	NAPHTHALENE
Synonym	Refined naphthalene	CAS #	91-20-3
Chemical Family	Aromatic hydrocarbon.	DSL	CEPA DSL: Naphthalene
Chemical Formula	$C_{10}H_8$	Validation Date	5/18/2001.
Manufacturer	Recochem Inc. 850-Montee de Liesse Montreal, Quebec 514-341-3550	Print Date	5/18/2001.
Material Uses	Consumer products: Moth preventative.	In Case of Emergency	Recochem Inc. Communications and Regulatory Affairs Department (905) 791-1788

Section 2. Hazardous Ingredients

Name	CAS #	% by Weight	Exposure Limits	
			Canadian Values (ACGIH)	U.S. Values (OSHA)
1) Naphthalene	91-20-3	100	TWA: 10 ppm from ACGIH (Canada, 1999). Period: 8 hour(s). TWA: 52 mg/m³ from ACGIH (Canada, 1999). Period: 8 hour(s). STEL: 15 ppm from ACGIH (Canada, 1999). Period: 15 minute(s). STEL: 79 mg/m³ from ACGIH (Canada, 1999). Period: 15 minute(s).	1) Naphthale TWA: 10 ppm from OSHA (United States, 1999). Period: 8 hour(s). TWA: 50 mg/m³ from OSHA (United States, 1999). Period: 8 hour(s).

Section 3. Emergency Overview

Hazard Overview	WARNING! FLAMMABLE SOLID, skin sensitizer. Harmful if swallowed. Keep out of reach of children. Keep in a cool, well-ventilated place. Avoid contact with eyes, skin and clothing. DO NOT ingest. Avoid breathing dust. Wash thoroughly after handling.
Potential Acute Health Effects	Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. May cause skin sensitization.
Note to Physician	Not available.

Section 4. First Aid Measures

Eye Contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. If irritation persists, seek medical attention.
Skin Contact	After contact with skin, wash immediately with plenty of water. If irritation persists, seek medical attention.
Inhalation	Allow the victim to rest in a well ventilated area. Seek medical attention.
Ingestion	DO NOT induce vomiting. Have conscious person drink several glasses of water or milk. SEEK IMMEDIATE MEDICAL ATTENTION.

Section 5. Fire Fighting Measures

Products of Combustion	These products are carbon oxides (CO, CO_2).
Fire Fighting Media and Instructions	Flammable solid. SMALL FIRE: Use DRY chemicals, CO_2, water spray or foam. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.
Fire Hazards	Yields flammable vapors on heating above melting point.
Explosion Hazards	Vapour forms explosive mixture with air. Material in powder form, capable of creating a dust explosion.

Continued on Next Page

Section 6. Accidental Release Measures

Small Spill and Leak	Use appropriate tools to put the spilled material in a convenient waste disposal container.
Large Spill and Leak	Flammable product. Use water spray curtain to divert vapor drift. Eliminate all sources of ignition. Use appropriate equipment to put the spilled material in a waste disposal. Dispose of in accordance with regional regulations.

Section 7. Handling and Storage

Handling	Keep away from heat, sparks and flame. To avoid fire, minimize ignition sources. DO NOT ingest. Avoid breathing dust. After handling, always wash hands thoroughly with soap and water.
Storage	Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Do not store above 38°C (100.4°F).

Section 8. Exposure Controls, Personal Protection

Engineering Controls	Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.
Personal Protection	
Eyes	Safety glasses.
Body	No special protective clothing is required.
Respiratory	Wear appropriate respirator when ventilation is inadequate.
Hands	Gloves (impervious).

Section 9. Physical and Chemical Properties

Physical State and Appearance	Crystalline solid. (Flakes, chips and balls.)	**Odor**	Characteristic.
Molecular Weight	128.19 g/mole	**Taste**	Not available.
pH (1% Soln/Water)	Not applicable.	**Color**	White.
Boiling/Condensation Point	218°C (424.4°F)	**Volatility**	Not available.
Melting/Freezing Point	80.2°C (176.4°F)	**Evaporation Rate**	<1 compared to Butyl acetate.
Specific Gravity	1.162 (Water = 1)	**Odor Threshold**	>0.3 ppm
Vapor Pressure	Not applicable.	**Viscosity**	Not available.
Vapor Density	4.42 (Air = 1)	**Solubility**	Insoluble in water.
VOC Content	Not available.	**Other Properties**	Not available.
The Product is:	Combustible.		
Autoignition Temperature	526°C (978.8°F)		
Flash Points	CLOSED CUP: 79°C (174.2°F).		
Flammable Limits	LOWER: 0.9% UPPER: 5.9%		
Fire Hazards in Presence of Various Substances	Combustible in presence of open flames and sparks. Material in powder form, capable of creating a dust explosion.		

Section 10. Stability and Reactivity

Stability	The product is stable.
Conditions of Instability	No additional remark.
Incompatibility with Various Substances	Reactive with oxidizing agents, acids.

Continued on Next Page

Section 11. Toxicological Information

Routes of Entry	Inhalation. Ingestion.
Toxicity to Animals	Acute oral toxicity (LD50): >633 mg/kg [Mouse].
Acute Effects on Humans	
Eyes	Contact may cause eye irritation.
Skin	Prolonged contact can cause skin irritation.
Inhalation	Inhalation is minimal since vapours are unlikely due to physical properties. Practically non-toxic by inhalation. Inhalation may cause irritation to nose and throat.
Ingestion	Hazardous in case of ingestion.
Chronic Effects on Humans	Slightly hazardous in case of skin contact (irritant), of eye contact (irritant). CARCINOGENIC EFFECTS: Classified None by NIOSH. A4 (Not classifiable for human or animal.) by ACGIH. NTP has classified Naphthalene as a carcinogen to rats. MUTAGENIC EFFECTS: Non-mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, eyes, hemolytic anemia, skin irritation. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 12. Ecological Information

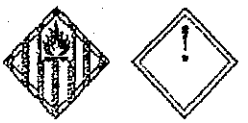
Ecotoxicity	Not available.

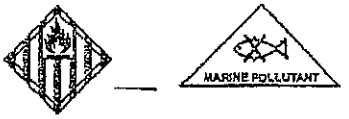
Section 13. Disposal Considerations

Waste Information	Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14. Transport Information

TDG Classification (Canada)	CLASS 4.1: Flammable solid. Class 9.2: Environmentally hazardous material.
PIN (Canada)	Shipping name: Naphthalene, crude or Naphthalene, refined UNNA: UN 1334 PG: III
Special Provisions for Transport (Canada)	In inner packages of 500 g capacity or less this product is classified as a "Consumer Commodity" under TDG regulations.
IMDG Classification	4.1
PIN	Shipping name: Naphthalene, refined UNNA: UN 1334 PG: III
Marine Pollutant	IMDG Class: Marine Pollutant. (Pollutant.)
DOT Classification (U.S.A)	CLASS 4.1: Flammable solid.
PIN	Naphthalene, crude or Naphthalene, refined, 4.1, UN 1334, III, Pollutant., RQ (Naphthalene)
Special Provisions for Transport (U.S.)	In inner containers of 100 lbs (45.36 kg) capacity or less this product is exempt from DOT regulations (non regulated).





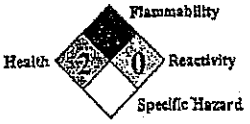
Section 15. Other Regulatory Information and Pictograms

WHMIS Classification (Canada)	CLASS B-4: Flammable solid. Class D-2B: Material causing other toxic effects (TOXIC).
HCS Classification (U.S.A.)	CLASS: Flammable solid. Class: Target organ effects.
USA Regulatory Lists	TSCA Inventory: Naphthalene

Continued on Next Page

Hazardous Material Information System (U.S.A.)		
	Health	2
	Flammability	2
	Reactivity	0
	Personal Protection	E

National Fire Protection Association (U.S.A.)



Section 16. Other Information

Validated and verified by Product Development and Technical Coordinator on 5/18/2001.	Printed 5/18/2001.

MSDS Number: **M4420** * * * * * *Effective Date:* ***10/06/05*** * * * * * *Supercedes:* ***05/14/03***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300
National Response in Canada
CANUTEC: 613-996-6666
Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

METHYLENE CHLORIDE

1. Product Identification

Synonyms: MC; Dichloromethane (DCM); Methylene dichloride; Methylene bichloride; Methane dichloride
CAS No.: 75-09-2
Molecular Weight: 84.93
Chemical Formula: CH2Cl2
Product Codes: 9235, 9264, 9266, 9295, 9315, 9324, 9329, 9330, 9348, 9350, 9965, Q480

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Methylene Chloride	75-09-2	> 99%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, CARDIOVASCULAR SYSTEM, AND BLOOD. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 1 - Slight
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes formation of carbon monoxide in blood which affects cardiovascular system and central nervous system. Continued exposure may cause increased light-headedness, staggering, unconsciousness, and even death. Exposure may make the symptoms of angina (chest pains) worse.
Ingestion:
May cause irritation of the gastrointestinal tract with vomiting. If vomiting results in aspiration, chemical pneumonia could follow. Absorption through gastrointestinal tract may produce symptoms of central nervous system depression ranging from light headedness to unconsciousness.
Skin Contact:
Causes irritation, redness and pain. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
Eye Contact:
Vapors can cause eye irritation. Contact can produce pain, inflammation and temporal eye damage.
Chronic Exposure:
Can cause headache, mental confusion, depression, liver effects, kidney effects, bronchitis, loss of appetite, nausea, lack of balance, and visual disturbances. Can cause dermatitis upon prolonged skin contact. Methylene chloride may cause cancer in humans.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye problems, impaired liver, kidney, respiratory or cardiovascular function may be more susceptible to the effects of this substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Autoignition temperature: 556C (1033F)
Flammable limits in air % by volume:
lel: 12; uel: 23
Forms flammable vapor-air mixtures above 100C (212F).
Explosion:
Concentrated can be ignited by a high intensity ignition source. Vapor may form flammable mixture in atmosphere that contains a high percentage of oxygen. Sealed containers may rupture when heated.
Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Combustion by-products include phosgene and hydrogen chloride gases. Structural firefighters' clothing provides only limited protection to the combustion products of this material.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Outside or detached storage is recommended. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. To minimize decomposition, all storage containers should be galvanized or lined with a phenolic coating. This material may corrode plastic and rubber. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Odor Threshold: 205 - 307 ppm. The odor threshold only serves as a warning of exposure; not smelling it does not mean you are not being exposed.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Methylene Chloride (Dichloromethane):
- OSHA Permissible Exposure Limit (PEL) -
25 ppm (TWA), 125 ppm (STEL), 12.5 ppm (8-hour TWA - Action Level)
- ACGIH Threshold Limit Value (TLV) -
50 ppm (TWA), A3 - suspected human carcinogen.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. The cartridges recommended for this material have a predicted service of less than 30 minutes at concentrations of ten times (10x) the exposure limits. Actual service life will vary considerbly, depending on concentration levels, temperature, humidity, and work rate. This substance has poor warning properties.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene is a recommended material for personal protective equipment. Natural rubber

and polyvinyl chloride ARE NOT recommended materials for personal protective equipment.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.
Other Control Measures:
Do not use closed circuit rebreathing system employing soda lime or other carbon dioxide absorber because of formation of toxic compounds capable of producing cranial nerve paralysis. See OSHA Standard for medical surveillance, record keeping, and reporting requirements for methylene chloride (29 CFR 1910.1052).

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Chloroform-like odor.
Solubility:
1.32 gm/100 gm water @ 20C.
Specific Gravity:
1.318 @ 25C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
39.8C (104F)
Melting Point:
-97C (-143F)
Vapor Density (Air=1):
2.9
Vapor Pressure (mm Hg):
350 @ 20C (68F)
Evaporation Rate (BuAc=1):
27.5

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Emits highly toxic fumes of phosgene when heated to decomposition. Decomposes in a flame or hot surface to form toxic gas phosgene and corrosive mists of hydrochloric acid. Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizers, strong caustics, plastics, rubber, nitric acid, water + heat, and chemically active metals, such as aluminum and magnesium powder, sodium, potassium, and lithium. Avoid contact with open flames and electrical arcs. Liquid methylene chloride will attack some forms of plastics, rubber, and coatings.
Conditions to Avoid:
Moisture, heat, flames, ignition sources and incompatibles.

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11. Toxicological Information

Toxicological Data:
Dichloromethane: Oral rat LD50: 1600 mg/kg; inhalation rat LC50: 52 gm/m3; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Dichloromethane has been linked to spontaneous abortions in humans.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Methylene Chloride (75-09-2)	No	Yes	2B

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of greater than 30 days. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.
Environmental Toxicity:
The LC50/96-hour values for fish are over 100 mg/l. This material is not expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: DICHLOROMETHANE
Hazard Class: 6.1
UN/NA: UN1593
Packing Group: III
Information reported for product/size: 52L

International (Water, I.M.O.)

Proper Shipping Name: DICHLOROMETHANE
Hazard Class: 6.1
UN/NA: UN1593
Packing Group: III
Information reported for product/size: 52L

International (Air, I.C.A.O.)

Proper Shipping Name: DICHLOROMETHANE
Hazard Class: 6.1

UN/NA: UN1593
Packing Group: III
Information reported for product/size: 52L

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15. Regulatory Information

```
--------\Chemical Inventory Status - Part 1\---------------------------------
Ingredient                                  TSCA  EC   Japan  Australia
--------------------------------------------  ----  ---  -----  ---------
Methylene Chloride (75-09-2)                 Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
                                                      --Canada--
Ingredient                                  Korea  DSL   NDSL  Phil.
--------------------------------------------  -----  ---   ----  -----
Methylene Chloride (75-09-2)                 Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                        -SARA 302-    ------SARA 313------
Ingredient                              RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Methylene Chloride (75-09-2)            No    No      Yes        No

--------\Federal, State & International Regulations - Part 2\----------------
                                                    -RCRA-    -TSCA-
Ingredient                              CERCLA      261.33     8(d)
----------------------------------------  ------      ------    ------
Methylene Chloride (75-09-2)            1000        U080       No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: No          (Pure / Liquid)
```

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: 2Z
Poison Schedule: S5
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, CARDIOVASCULAR SYSTEM, AND BLOOD. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.
Label Precautions:
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat and flame.
Do not get in eyes, on skin, or on clothing.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is

difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:
Laboratory Reagent.

Revision Information:
MSDS Section(s) changed since last revision of document include: 14.

Disclaimer:
****

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****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

METAL

MATERIAL SAFETY DATA SHEET

ALDON CORPORATION
221 Rochester Street
Avon, New York 14414-9409
(585) 226-6177

MSDS No.: LL0070 LL0079 LL0080 LL0081 LL0082 LL0085 LL0086
Effective Date: March 29, 2005

SECTION I NAME

Product	Lead Metal
Chemical Synonyms	N/A
Formula	Pb
Unit Size	up to 2.5 Kg.
C.A.S. No.	7439-92-1

24 HOUR EMERGENCY ASSISTANCE

CHEMTREC 800-424-9300
Day 585-226-6177

NFPA

Health	3
Fire	0
Reactivity	0

HMIS *

HAZARD RATING
MINIMAL 0 SLIGHT 1 MODERATE 2 SERIOUS 3 SEVERE 4

SECTION II INGREDIENTS OF MIXTURES

Principal Component(s)	%	TLV Units
Lead metal, shot, granular, sheet, foil	99+%	See Section V.
CAUTION! MAY BE HARMFUL OR FATAL IF SWALLOWED		
OR INHALED AS FUMES OR DUST.		

SECTION III PHYSICAL DATA

Melting Point (°F)	Approx. 327.4°C (621°F)	Specific Gravity (H_2O = 1)	11.34 (20/4°C)
Boiling Point (°F)	1753°C (3187°F)	Percent Volatile by Volume (%)	0% at ambient temp.
Vapor Pressure (mm Hg)	N/A	Evaporation Rate (=1)	Non-volatile (N/A).
Vapor Density (Air=1)	N/A		
Solubility in Water	Insoluble.		
Appearance & Odor	Bluish, silvery, gray soft metal, granular, shot, sheet, foil; no odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	Non-flammable (N/A).	Flammable Limits in Air % by Volume	Lower --------	Upper --------
Extinguisher Media	Dry chemical or carbon dioxide should be used on surrounding fire. Do not use water on fires where molten metal is present.	N/A		

SPECIAL FIREFIGHTING PROCEDURES

In fire conditions, wear a NIOSH/MSHA-approved self-contained breathing apparatus and full protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS

When heated emits toxic fumes of lead which can react vigorously with oxidizing materials.

D.O.T. Non Regulated.

Approved by U.S. Department of Labor "essentially similar" to form OSHA-20

SECTION V HEALTH HAZARD DATA LL0070

Threshold Limited Value
Lead as inorganic compounds, as Pb: TWA 0.05 mg/m^3 (ACGIH 2001).

Effects of Overexposure
SKIN: Not absorbed through skin. EYES: No specific hazard known. Contact may cause transient irritation. INGESTION: May produce anorexia, vomiting, malaise, convulsions due to increased intracranial pressure. INHALATION: Of dust or fumes can cause lead poisoning. Target organs: Lungs, kidneys.

Emergency and First Aid Procedures
INGESTION: Call physician or Poison Control Center immediately. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person. EYES: Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention. SKIN: Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention. INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

SECTION VI REACTIVITY DATA

Stability			Conditions to Avoid
	Unstable		High temperatures to produce fumes.
	Stable	X	

Incompatibility (Materials to Avoid) Strong oxidizing materials.

Hazardous Decomposition Products When heated, emits toxic fumes of lead.

Hazardous Polymerization		Conditions to Avoid
May Occur	Will Not Occur	Not applicable.
	X	

SECTION VII SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled
Carefully sweep up without producing dust and recycle for use or place in a suitable container for disposal.

Waste Disposal Method
Discharge, treatment, or disposal may be subject to Federal, State or Local laws. These disposal guidelines are intended for the disposal of catalog-size quantities only.
Dispose of in an approved chemical landfill or contract with a licensed waste disposal service.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiration Protection (Specify Type) None should be needed in normal laboratory use at room temperature. If dusty conditions prevail, work in ventilation hood or wear a NIOSH/MSHA-approved dust mask or respirator.

Ventilation				
	Local Exhaust	None needed.	Special	No.
	Mechanical (General)	None needed.	Other	No.

Protective Gloves	Recommended - leather.	Eye Protection	Chemical safety glasses.

Other Protective Equipment Smock, apron, eye wash station, lab coat, ventilation hood.

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling & Storing
Keep container tightly closed when not in use.
Store in a cool, dry place away from fire hazards. Wash thoroughly after handling. Remove and wash contaminated clothing.

Other Precautions Read label on container before using. Do not wear contact lenses when working with chemicals. For laboratory use only. Not for drug, food or household use. Keep out of reach of children.

Lead can react violently with oxidizing materials. Water may become trapped within surface cracks which may cause an explosion when the metal is molten.

Revision No. 9	Date 03/29/05	Approved Michael Raszeja	Chemical Safety Coordinator MR

METAL

10 M

Material Safety Data Sheet
Mercury

ACC# 14020

Section 1 - Chemical Product and Company Identification

MSDS Name: Mercury
Catalog Numbers: S40672B, S41542, S41599, S41599B, S41599E, S41599G, S41599J, S41599K, S41599M, S41600P, S41600S, S41600W, S41630A, S41630B, S41630C, S41631, S41631A, S41631B, S41631C, S41645, S45245, S46981, S50443, S71966, S71967, S71968, S78777, 13501, M139-1LB, M139-5LB, M140-14LB, M140-1LB, M140-5LB, M141-1LB, M141-6LB, NC9534278
Synonyms: Colloidal mercury; Hydrargyrum; Metallic mercury; Quick silver; Liquid silver.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7439-97-6	Mercury	100	231-106-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: silver liquid.
Danger! Corrosive. Harmful if inhaled. May be absorbed through intact skin. Causes eye and skin irritation and possible burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. May cause central nervous system effects. Inhalation of fumes may cause metal-fume fever. May cause liver and kidney damage. Possible sensitizer. This substance has caused adverse reproductive and fetal effects in animals.
Target Organs: Blood, kidneys, central nervous system, liver, brain.

Potential Health Effects
Eye: Exposure to mercury or mercury compounds can cause discoloration on the front surface of the lens, which does not interfere with vision. Causes eye irritation and possible burns. Contact with mercury or mercury compounds can cause ulceration of the conjunctiva and cornea.
Skin: May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Causes skin irritation and possible burns. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis or pale color.
Ingestion: May cause severe and permanent damage to the digestive tract. May cause perforation

of the digestive tract. May cause effects similar to those for inhalation exposure. May cause systemic effects.
Inhalation: Causes chemical burns to the respiratory tract. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. Aspiration may lead to pulmonary edema. May cause systemic effects. May cause respiratory sensitization.
Chronic: May cause liver and kidney damage. May cause reproductive and fetal effects. Effects may be delayed. Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, personality changes. Chronic ingestion may cause accumulation of mercury in body tissues. Prolonged or repeated exposure may cause inflammation of the mouth and gums, excessive salivation, and loosening of the teeth.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Wash mouth out with water.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: The concentration of mercury in whole blood is a reasonable measure of the body-burden of mercury and thus is used for monitoring purposes. Treat symptomatically and supportively. Persons with kidney disease, chronic respiratory disease, liver disease, or skin disease may be at increased risk from exposure to this substance.
Antidote: The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Keep container tightly closed. Do not get on skin or in eyes. Do not ingest or inhale. Use only in a chemical fume hood. Discard contaminated shoes. Do not breathe vapor.
Storage: Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Store protected from azides.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Mercury	0.025 mg/m3 TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	0.05 mg/m3 TWA (vapor) 10 mg/m3 IDLH	0.1 mg/m3 Ceiling (vapor)

OSHA Vacated PELs: Mercury: 0.05 mg/m3 TWA (vapor)
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: silver
Odor: odorless
pH: Not available.

Vapor Pressure: 0.002 mm Hg @ 25C
Vapor Density: 7.0
Evaporation Rate: Not available.
Viscosity: 15.5 mP @ 25 deg C
Boiling Point: 356.72 deg C
Freezing/Melting Point:-38.87 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:13.59 (water=1)
Molecular Formula: Hg
Molecular Weight:200.59

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, incompatible materials.
Incompatibilities with Other Materials: Oxygen, sulfur, acetylene, ammonia, chlorine dioxide, azides, chlorates, nitrates, sulfuric acid, halogens, rubidium, calcium, 3-bromopropyne, ethylene oxide, lithium, methylsilane + oxygen, peroxyformic acid, tetracarbonylnickel + oxygen, copper, copper alloys, boron diiodophosphide, metals, nitromethane, sodium carbide, aluminum, lead, iron, metal oxides.
Hazardous Decomposition Products: Mercury/mercury oxides.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7439-97-6: OV4550000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 7439-97-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Intraperitoneal, rat: TDLo = 400 mg/kg/14D-I (Tumorigenic - equivocal tumorigenic agent by RTECS criteria - tumors at site of application).
Teratogenicity: Inhalation, rat: TCLo = 1 mg/m3/24H (female 1-20 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).
Reproductive Effects: Inhalation, rat: TCLo = 890 ng/m3/24H (male 16 week(s) pre-mating) Paternal Effects - spermatogenesis (incl. genetic material, sperm morphology, motility, and count).; Inhalation, rat: TCLo = 7440 ng/m3/24H (male 16 week(s) pre-mating) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).
Mutagenicity: Cytogenetic Analysis: Unreported, man = 150 ug/m3.
Neurotoxicity: The brain is the critical organ in humans for chronic vapor exposure; in severe cases, spontaneous degeneration of the brain cortex can occur as a late sequela to past exposure.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Bluegill/Sunfish: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Channel catfish: LC50 = 0.35 mg/L; 96 Hr; UnspecifiedWater flea Daphnia: EC50 = 0.01 mg/L; 48 Hr; Unspecified In aquatic systems, mercury appears to bind to dissolved matter or fine particulates, while the transport of mercury bound to dust particles in the atmosphere or bed sediment particles in rivers and lakes is generally less substantial. The conversion, in aquatic environments, of inorganic mercury cmpd to methyl mercury implies that recycling of mercury from sediment to water to air and back could be a rapid process.
Environmental: Mercury bioaccumulates and concentrates in food chain (concentration may be as much as 10,000 times that of water). Bioconcentration factors of 63,000 for freshwater fish and 10,000 for salt water fish have been found. Much of the mercury deposited on land, appears to revaporize within a day or two, at least in areas substantially heated by sunlight.
Physical: All forms of mercury (Hg) (metal, vapor, inorganic, or organic) are converted to methyl mercury. Inorganic forms are converted by microbial action in the atmosphere to methyl mercury.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 7439-97-6: waste number U151.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	MERCURY	MERCURY
Hazard Class:	8	8
UN Number:	UN2809	UN2809
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7439-97-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs

CAS# 7439-97-6: 1 lb final RQ; 0.454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 7439-97-6: acute, chronic.

Section 313

This material contains Mercury (CAS# 7439-97-6, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7439-97-6 (listed as Mercury compounds) is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

CAS# 7439-97-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7439-97-6 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7439-97-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

WARNING: This product contains Mercury, a chemical known to the state of California to cause developmental reproductive toxicity.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T N

Risk Phrases:

R 23 Toxic by inhalation.

R 33 Danger of cumulative effects.

R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 1/2 Keep locked up and out of reach of children.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 7 Keep container tightly closed.

S 60 This material and its container must be disposed of as hazardous waste.

S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 7439-97-6: 3

Canada - DSL/NDSL

CAS# 7439-97-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A, E.

Canadian Ingredient Disclosure List

CAS# 7439-97-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/15/1999
Revision #7 Date: 1/20/2005

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

ATTACHMENT III

Heat Stress/Cold Stress and Related Illnesses

Attachment III – Heat Stress / Cold Stress

1.0 HEAT STRESS

Excessive exposure to a hot environment can bring about a variety of heat-induced disorders. The four main types of heat stress related illnesses: heat rash, heat cramps, heat exhaustion, and heat stroke, are discussed below.

1.1 Heat Rash

Heat rash also know as prickly heat, is likely to occur in hot, humid environments where sweat is not readily removed from the surface of the skin by evaporation and the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears. When the rash is extensive or when it is complicated by an infection, prickly heat can be very uncomfortable and may reduce a worker's performance. The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin.

1.2 Heat Cramps

Heat cramps are painful spasms of the muscles that occur among those who sweat profusely in heat, drink large quantities of water, but do not adequately replace the body's salt loss. Drinking large quantities of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly thereafter, the low salt level in the muscles causes painful cramps. The affected muscles may be part of the arms, legs or abdomen, but tired muscles (those used to perform the work) are usually the ones most susceptible to cramps. Cramps may occur during or after work hours and may be relieved by taking salted liquids by mouth, such as the variety of sports drinks on the market.

Caution Should Be Exercised By People With Heart Problems Or Those On Low Sodium Diets Who Work In Hot Environments. These People Should Consult A Physician About What To Do Under These Conditions.

1.3 Heat Exhaustion

Heat exhaustion includes several clinical disorders having symptoms that may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from this condition still sweats but experiences extreme weakness or fatigue, giddiness, nausea, or headache. In more serious cases, the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

A summary of the key symptoms of heat exhaustion is as follows:

- Clammy skin
- Confusion
- Dizziness
- Fainting
- Fatigue
- Heat Rash
- Light-headedness
- Nausea
- Profuse sweating
- Slurred Speech
- Weak Pulse

In most cases, treatment involves having the victim rest in a cool place and drink plenty of fluids. Victims with mild cases of heat exhaustion usually recover spontaneously with this treatment. Those with severe cases may require extended care for several days. There are no known permanent effects.

As With Heat Cramps, Certain Persons Should Consult With Their Physician About What To Do Under These Conditions.

1.4 Heat Stroke

This is the most serious of health problems associated with working in hot environments. It occurs when the body's temperature regulatory system fails and sweating becomes inadequate.

The body's only effective means of removing excess heat is compromised with little warning to the victim that a crisis stage has been reached.

A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105^{o}F or higher, and the victim is mentally confused, delirious, perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur.

A summary of the key symptoms of heatstroke is as follows:

- Confusion
- Convulsions
- Incoherent Speech
- Staggering Gait
- Unconsciousness
- Sweating stops
- Hot skin, high temperature (yet extremities may feel chilled)

Any person with signs or symptoms of heat stroke requires immediate hospitalization. However, first aid should be immediately administered. This includes moving the victim to a cool area, thoroughly soaking the clothing with water, and vigorously fanning the body to increase cooling. Further treatment at a medical facility should include continuation of the cooling process and the monitoring of complications that often accompany the heat stroke. Early recognition and treatment of heat stroke are the only means of preventing permanent brain damage or death.

1.5 Preparing for the Heat

Humans, to a large extent, are capable of adjusting to heat. This acclimation to heat, under normal circumstances, usually takes about 5 to 7 days, during which time the body will undergo a series of changes that will make continued exposure to heat more tolerable.

On the first day of exposure, body temperature, pulse rate, and general discomfort will be higher. With each succeeding day of exposure, all of these responses will gradually decrease, while the sweat rate will increase. When the body does become acclimated to the heat, the worker will find it possible to perform work with less strain and distress.

A gradual exposure to heat gives the body time to become accustomed to higher temperatures, such as those encountered in chemical protective clothing.

1.6 Protecting Against Heat Stress

There are several methods that can be used to reduce heat stress:

- Limit duration of work periods
- Use protective clothing with cooling devices
- Enforce the use of the "Buddy System"
- Consume electrolyte solutions prior to suiting up
- Monitor workers for pulse recovery rates, body fluid loss, body weight loss, and excess fatigue
- Screen for heat stress susceptible candidates in your medical surveillance program
- Have all personnel know the signs and symptoms of heat stress

2.0 COLD STRESS

Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling, causing death. Areas of the body that have high surface-area-to-volume ratio such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold injury, ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10 degrees Fahrenheit with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at minus 18 degrees Fahrenheit.

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

2.1 Frostbite

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

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

2.2 Hypothermia

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

- Shivering
- Apathy, listlessness, sleepiness, and (sometimes rapid cooling of the body to less than 95°F)
- Unconsciousness, glassy stage, slow pulse, and slow respiratory rate
- Freezing of the extremities
- Death

Thermal socks, long cotton or thermal underwear, hard hat liners and other cold weather gear can aid in the prevention of hypothermia. Blankets and warm drinks (other than caffeinated coffee) are also recommended.

Measures shall be taken to keep workers from getting wet, such as issuance of rain gear.
Workers whose cloths become wet shall be given the opportunity to dry off and change clothes.

ATTACHMENT IV

OSHA Illness and Incident Report Form

OSHA's Form 301
Injury and Illness Incident Report

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related Injuries and Illnesses* and the accompanying *Summary,* these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains.

If you need additional copies of this form, you may photocopy and use as many as you need.

Completed by _____

Title _____

Phone (_____)_____--_____ **Date** ____/ ____/ ____

Information about the employee

1) **Full name** _____

2) **Street** _____

City _____ **State** _____ **ZIP** _____

3) **Date of birth** _____ / _____ / _____

4) **Date hired** _____ / _____ / _____

5) ❒ **Male**
❒ **Female**

Information about the physician or other health care professional

6) **Name of physician or other health care professional** _____

_____

7) **If treatment was given away from the worksite, where was it given?**

Facility _____

Street _____

City _____ **State** _____ **ZIP** _____

8) **Was employee treated in an emergency room?**
❒ **Yes**
❒ **No**

9) **Was employee hospitalized overnight as an in-patient?**
❒ **Yes**
❒ **No**

Information about the case

10) **Case number from the *Log*** _____ *(Transfer the case number from the Log after you record the case.)*

11) **Date of injury or illness** _____ / _____ / _____

12) **Time employee began work** _____ **AM / PM**

13) **Time of event** _____ **AM / PM** ☐ **Check if time cannot be determined**

14) ***What was the employee doing just before the incident occurred?*** **Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific.** ***Examples:*** **"climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."**

15) ***What happened?*** **Tell us how the injury occurred.** ***Examples:*** **"When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."**

16) ***What was the injury or illness?*** **Tell us the part of the body that was affected and how it was affected; be more specific than "hurt," "pain," or sore."** ***Examples:*** **"strained back"; "chemical burn, hand"; "carpal tunnel syndrome."**

17) ***What object or substance directly harmed the employee?*** ***Examples:*** **"concrete floor"; "chlorine"; "radial arm saw."** ***If this question does not apply to the incident, leave it blank.***

18) ***If the employee died, when did death occur?*** **Date of death** _____ / _____ / _____

APPENDIX D

Community Air Monitoring Plan

Community Air Monitoring Plan

511 W. 21st St, NY, NY

As required by the NYS Department of Health (DOH) real-time air monitoring for volatile organic compounds (VOCs) and particulate levels will be implemented at the Site during intrusive activities, such as advancement of soil borings and installation of groundwater monitoring wells, and non-intrusive activities, such as the collection of soil and groundwater samples, that could result in exposure to the public. As currently proposed, the investigation will be conducted within the confines of the building and therefore there are no routes of exposure to the surrounding properties. Accordingly, a photo-ionization detector (PID) will be used to provide continuous indoor air monitoring for VOCs during the duration of the interior field work. This will include additional periodic monitoring during sample collection, which will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap, monitoring during well bailing/purging, and prior to leaving a sample location. Dust levels will be visually monitored and if visible dust is noted the appropriate dust suppression measures will be implemented.

If investigatory and/or remedial tasks are conducted outside of the building, real-time air monitoring for VOCs and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during exterior non-intrusive activities, such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Any observed detections exceeding action levels during performance of the CAMP will be recorded and available to NYS Department of Environmental Conservation (NYSDEC) and NYSDOH personnel for review. This data will also be included in the Monthly Report.

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will 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 ppm above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will 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 will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will 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 will be shutdown.

All 15-minute readings will be recorded and be available for NYSDEC and NYSDOH personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring and Actions

During exterior activities, particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring

stations. The particulate monitoring will 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 will 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 will be employed. Work will 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 will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

All readings will be recorded and available for NYSDEC and NYSDOH personnel to review. If airborne dust is observed leaving the work area, then dust suppression measures, such as wetting the material with water, will be employed. Work will continue with dust suppression techniques provided that no visible dust is migrating from the work area. If, after implementation of dust suppression techniques, visible dust is still migrating from the work area, work will be stopped and re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in preventing visible dust migration.

APPENDIX E

Community Health and Safety Plan

Community Health and Safety Plan

511 W. 21st St, NY, NY

This Community Health and Safety Plan (HASP) has been developed to outline measures that will be implemented to protect the general public during remedial investigation activities at the Site.

Site Access and Site Security

Site access will be controlled through locked doorways and other access points. During the remedial investigation, all personnel will be required to sign in/out when entering or leaving the building. Provisions will be made for the care and maintenance of public thoroughfares. Sidewalks will be kept clean and free of ice, snow and debris. If equipment is temporarily staged on the sidewalk or street prior to mobilization into the building an operator will be present at all times and traffic cones or caution tape will be placed around the equipment. There will be no staging of drums or soils on the sidewalks. During removal of drums and soils the area will be cordoned off until all items are securely on the truck for off-site transportation.

Air Monitoring

If investigatory and/or remedial tasks are conducted outside of the building, real-time air monitoring for VOCs and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during exterior non-intrusive activities, such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities.

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate.

Particulate Monitoring and Actions

During exterior activities, particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will 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 will 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 airborne dust is observed leaving the work area, then dust suppression measures, such as wetting the material with water, will be employed. Work will continue with dust suppression techniques provided that no visible dust is migrating from the work area. If, after implementation of dust suppression techniques, visible dust is still migrating from the work area, work will be stopped and re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in preventing visible dust migration.