REMEDIAL WORK PLAN

BROWNFIELD CLEANUP PROGRAM
185 MOUNT HOPE AVENUE
ROCHESTER, NEW YORK
(TOWER PROPERTY)
NYSDEC SITE ID C828124

Prepared For: Conifer Hamilton, LLC
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TABLE OF CONTENTS

FIGURES

APPENDICES

EXECUTIVE SUMMARY

Day Environmental, Inc. (DAY) prepared this Remedial Work Plan (RWP) for an approximate 1.106-acre property addressed as 185 Mt. Hope Avenue, Rochester, New York (Site). This RWP summarizes the environmental conditions that exist at the Site, and the technical and administrative corrective actions that will be taken to address the environmental conditions.

The Site is improved with an apartment building with an associated paved parking lot. Prior to the residential development in 1975, past uses of the Site included commercial and warehouse uses. Portions of a feeder canal and rail yards, and possibly a gasoline station, were also once located on the Site. The Site is located in a mixed-use urban area. The Site is bounded to the north by open parkland, to the east by Mt. Hope Avenue with commercial and residential properties beyond, to the south by residential properties, and to the west by the Genesee Gateway Park with the Genesee River beyond.

Various environmental studies have been completed at the Site between 2000 and 2007. A summary of environmental conditions at the Site is provided below.

- <u>Surface Soil:</u> Constituent concentrations detected in surface soil samples do not warrant further action.

- <u>Subsurface Soil and Groundwater:</u> Petroleum contamination was encountered in soil on the northeastern portion of the Site. Soil and groundwater on this portion of the Site contains petroleum-related constituents at concentrations that exceed applicable regulatory criteria. The results of a vapor intrusion evaluation and soil vapor evaluation suggest volatile organic compounds (VOCs) in subsurface soil and groundwater do not appear to be impacting indoor air inside the existing high-rise apartment on the Site. Buried utilities that were monitored do not appear to be acting as preferential migration pathways of VOCs at concentrations that would result in an adverse exposure to receptors. However, further actions appear warranted to address the northeast portion of the Site and the associated plume that is predominantly impacted with petroleum-related constituents.

  In November 2007, groundwater samples were collected from two new wells that were installed to further assess the extent of petroleum contamination. Well MWDAY-03 was installed at a downgradient position in the right-of-way of Mt. Hope Avenue opposite the Site. Well MWDAY-04 was installed at an upgradient position north of the apartment building. Petroleum contamination was not detected in groundwater samples from these two wells.

- <u>Fill Material:</u> Fill material present at the Site may be contributing to a random distribution of detected constituents in subsurface soil and groundwater at the Site. Track 2 soil cleanup objectives (SCOs) for Restricted Residential Use were exceeded for some polyaromatic hydrocarbon (PAH) semi-volatile organic compounds (SVOCs) and the metal mercury at one subsurface soil sample location. Also, groundwater samples collected from some well locations contained antimony, barium, cyanide and gamma-chlordane at concentrations that exceeded groundwater standards or guidance values. Further actions (i.e., a Site Management Plan) appear warranted to address these detected constituents on the Site.

Remedial Alternatives Analysis

A Remedial Investigation/Remedial Alternatives Analysis (RI/RAA) report dated May 2007 identified remedial action objectives (RAOs), contaminants of interest, remediation criteria, and general response actions. In regard to these criteria, four remedial alternatives were developed and evaluated. These alternatives are summarized below:

Alternative #1	No Action
Alternative #2	Monitored Natural Attenuation and Institutional Controls
Alternative #3	Limited In-Situ Remediation, Institutional Controls, and Groundwater Monitoring
Alternative #4	Full Excavation, In-Situ Remediation, and Groundwater Monitoring

A detailed evaluation of the four remedial alternatives was performed, and implementation of Alternative #3 (Limited In-Situ Remediation, Institutional Controls, and Groundwater Monitoring) was recommended in the May 2007 RI/RAA report. However, subsequent to the date of the RI/RAA report, a fifth remedial alternative summarized below was developed (Alternative #5) as a result of discussions with the New York State Department of Environmental Conservation (NYSDEC) and Conifer Hamilton, LLC.

Alternative #5	Source-Area Soil Removal and Off-Site Disposal, Regenesis' ORC-Advanced® Placed in Excavation, Institutional Controls, and Groundwater Monitoring.

As part of Alternative #5, a source area soil removal and off-site disposal would be performed to address soil and groundwater contamination. Post-excavation soil samples would be analyzed and a final engineering report would be prepared. Institutional controls (ICs) would be implemented to protect against exposure to residual Site contamination in soil, fill material and groundwater. The institutional controls would include a site management plan (SMP), an environmental easement, and periodic certifications. If warranted, the SMP would include limited in-situ remediation outside the footprint of the excavation with subsequent performance monitoring as a contingency. Alternative #5 also includes groundwater monitoring to ensure that the remedy is effective. This alternative is considered a Track 4 cleanup for Restricted Residential Use.

The estimated present worth cost to implement the remedy (Alternative #5) is $332,567.70. The cost to construct the remedy is estimated to be $278,646.85, and the estimated average annual costs for five years is $10,784.17. The Alternative #5 costs are further detailed in Appendix F.

Further details regarding the elements of the proposed remedy (Alternative #5) are as follows:

1. Source Area Soil Removal and Off-site Disposal: This is a conventional remedial method where contaminated soil in the source area will be excavated and disposed off-site in a permitted solid waste landfill or hazardous waste landfill based on the contamination levels and the results of toxicity characteristic leaching procedure (TCLP) tests. It is currently anticipated that the contaminated soil will be accepted by a disposal facility as a non-hazardous waste.

2. Post-Excavation Soil Sampling and Analysis: Post-excavation soil samples will be collected from the sidewalls and bottom of the excavation. An analytical laboratory will analyze the samples, and the analytical results will be compared to appropriate regulatory criteria.

3. Regenesis’ ORC-Advanced® Placed in Excavation: ORC-Advanced® will be placed in the bottom of the excavation to assist in long-term biodegradation of residual petroleum contamination in saturated soil and groundwater.

4. Environmental Easement: Imposition of an institutional control in the form of an environmental easement that will require: (a) limiting the use and development of the property to restricted residential use, which would also permit commercial or industrial uses; (b) compliance with the approved site management plan; (c) restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by New York State Department of Health (NYSDOH); and (d) the property owner to complete and submit to the NYSDEC a periodic certification of institutional controls.

5. Site Management Plan: Development of a SMP, which will include the following institutional controls: (a) management to restrict excavation below existing surface soil, pavement, or buildings. Excavated soil or fill material would be tested, properly handled to protect the health and safety of workers and the nearby community, and would be properly managed in a manner acceptable to the NYSDEC; (b) continued evaluation of the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (c) monitoring of groundwater; (d) identification of any use restrictions on the site; (e) if warranted, completion of in-situ remediation beyond the source area excavation footprint (i.e., as a contingency); and, (f) provisions for the continued proper operation and maintenance of the components of the remedy.

6. Groundwater Monitoring: It is currently anticipated that groundwater monitoring would be performed for up to five years to monitor the effectiveness of the remedy. Groundwater monitoring would be conducted on a bi-annual basis for the first two years, and on an annual basis thereafter. During each monitoring event, groundwater samples would be collected from up to seven wells, and the samples would be analyzed for VOCs and SVOCs.

Conifer Hamilton, LLC is proposing Alternative #5 (source-area soil removal and off-site disposal, Regenesis’ ORC-Advanced® placed in excavation, institutional controls, and groundwater monitoring) as the remedy for this site. This proposed remedy is based on the results of the May 2007 RI/RAA report. Alternative #5 (source-area soil removal and off-site disposal, Regenesis’ ORC-Advanced® placed in excavation, institutional controls, and groundwater monitoring) is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the primary balancing criteria described in Section 8.0 of the May 2007 RI/RAA report. Alternatives #4 and #5 would achieve the remediation goals for the site by removing the soils that create the most significant threat to public health and the environment, greatly reducing the source of contamination to groundwater, and creating the conditions needed to restore groundwater quality to the extent practicable; however, Alternative #4 costs would be excessive in relation to the benefits gained. Alternatives #2 and #3 would also comply with the threshold selection criteria, but to a lesser degree or with lower certainty than Alternative #5.

The level of risk associated with short-term impacts is lowest for Alternatives #1 and #2, minimal for Alternative #3, moderate for Alternative #5, and highest for Alternative #4; however. Excavation of contaminated material is the factor that increases the risks associated with short-term impacts for Alternatives #4 and #5; however, short-term impacts for each of these two alternatives can be controlled (e.g., by implementing a Health and Safety Plan). The time needed to achieve the remediation goals would be longest for Alternative 2 and similar for Alternatives 3, 4, and 5.

Achieving long-term effectiveness is best accomplished by excavation and removal of the contaminated overburden soils. Alternative #4 and #5 contain excavation and removal components. Alternatives #1, #2, and #3 do not contain excavation and removal components. Although Alternative #5 will result in the excavation of a portion of the soil on-site, this alternative will require institutional controls (e.g., environmental easement, site management plan, etc.) and long-term monitoring. Alternatives #2 and #3 would also require institutional controls and long-term monitoring. Alternative #4 would not require long-term monitoring. Alternative #5 will likely result in the constituents of concern remaining on-site for less time than Alternatives #2 and #3, but more time than Alternative #4. Alternatives #3, #4 and #5 will reduce long-term risk associated with the contamination though aggressive remediation and institutional controls. Alternative #1 would not reduce risk, and Alternative #2 would reduce long-term risk primarily through the use of institutional controls.

Alternative 5 is favorable in that it is readily implementable in relation to the anticipated continued future use of the Site as a high-rise apartment complex and associated paved parking lot. Alternatives 1, 2, and 3 are also implementable. Alternative 4 is not readily implementable in relation to the anticipated continued future use of the Site as a high-rise apartment complex and associated paved parking lot. Spatial requirements for Alternative #5 would not impede completion of this alternative. The spatial requirements for Alternative #5 are less than the spatial requirements for Alternative #4, but greater than the spatial requirements for Alternatives #1, #2 and #3.

Physical remediation components of Alternatives #3, #4 and #5 would results in much larger reductions of contaminant toxicity, mobility or volume than Alternatives #1 and #2, which would rely solely on natural attenuation and other factors such as advection, dispersion, sorption, diffusion, etc.

The cost of the alternatives varies significantly. There is no cost associated with Alternative #1; however, this alternative is not a permanent remedy. Alternative #2 cost less than Alternatives #3, #4 and #5. Alternative #4 costs are substantially high in comparison to the costs of the other alternatives, and are considered excessive in relation to the benefits gained. Alternatives #3 and #5 are comparable in cost and are considered reasonable in terms of the benefits gained.

Alternative #1 is not protective of human health or the environment and does not address RAOs for this Site. Alternatives #2, #3, #4 and #5 are protective of human health and the environment, and risks associated with potential human health exposure pathways would be eliminated or adequately controlled. Remedial action objectives are generally addressed by Alternatives #2, #3, #4 and #5 in relation to protection of public health and the environment.

Alternative #1 provides no compliance with standards, criteria and guidance (SCGs). Alternatives #2, #3 and #5 provide varying levels of compliance with SCGs. Alternative #4 provides complete compliance with SCGs and remediates the Site to pre-release conditions, but at an exorbitant cost in relation to the benefits gained. Alternatives #2, #3, #4 and #5 provide adequate groundwater monitoring to evaluate compliance trends in relation to chemical-specific SCGs.

Alternatives #1, #2, #3, and #5 would be acceptable in relation to the continued future use of the Site as a high-rise residential apartment complex with a paved parking lot. Alternative #4 would not be acceptable in relation to the continued future use of the Site as a high-rise residential apartment complex with a paved parking lot.

1.0 INTRODUCTION

DAY prepared this RWP for an approximate 1.106-acre property addressed as 185 Mt. Hope Avenue, Rochester, New York (Site). This RWP was developed in accordance with the requirements of Brownfield Site Cleanup Agreement Index #B8-0673-04-08N between the NYSDEC and Conifer Hamilton, LLC. and from guidance provided in Section 4.0 of the NYSDEC document titled “Draft Brownfield Cleanup Program Guide” dated May 2004. The RWP summarizes the environmental conditions that exist at the Site, and the technical and administrative corrective actions that will be taken to address the environmental conditions.

1.1 Background

The Site is improved with an apartment building with an associated paved parking lot. Copies of a project locus map (Figure 1) and a site plan with select test locations (Figure 2) are provided at the end of the text of this report. The apartment building totals approximately 143,000 square feet and consists of a multi-level eight to twelve-story brick and concrete-block, slab-on-grade building constructed in 1975. The apartment building houses 202 residential units. The units primarily are one bedroom and studio apartments. Prior to the residential development in 1975, past uses of the Site included commercial and warehouse uses. Portions of a feeder canal and rail yards, and possibly a gasoline station, were also once located on the Site.

The Site is located in a mixed-use urban area. The Site is bounded to the north by open parkland, to the east by Mt. Hope Avenue with commercial and residential properties beyond, to the south by residential properties, and to the west by the Genesee Gateway Park with the Genesee River beyond.

The Site is located in an urban area that is serviced by the public water system. The Monroe County Department of Public Health (MCDPH) has no records of public or private drinking water wells or process water wells within a 0.25-mile radius of the Site. A review of a document titled “Ground Water Resources of Monroe County” (1935) revealed no groundwater supply wells on, or in the immediate area of, the Site.

The Site and surrounding area are generally level. The Genesee River is located approximately 130 feet west of the site. Surface water appears to flow off the Site toward Mount Hope Avenue to the east, and into the City of Rochester sewer system. Groundwater flows toward the southeast away from the Genesee River. This flow direction may be modified locally due to buried utilities, seasonal conditions, or other factors.

1.2 Previous Environmental Studies

An October 24, 2000 Phase I Environmental Site Assessment (Phase I ESA) report prepared by DAY identified the following recognized environmental conditions (RECs) at the Site:

a. **Historic Use of the Site:** Former uses at the Site include: rail yards, former Erie Canal feeder, and possibly a portion of a gasoline station.

b. **Historic Use of Adjoining Properties:** Historic uses of adjoining properties include: gasoline stations to the north and possibly east of the Site (i.e., east of Mt. Hope Avenue); former railroad infrastructure to the west of the Site; and a former Erie Canal feeder, a rail yard, a tannery, iron cutting, and auto repair to the south of the Site.

Subsequent intrusive environmental studies conducted between 2000 and 2003 identified petroleum contamination in soil and groundwater on the northeastern portion of the Site. In August 2004, the NYSDEC assigned Spill File # 0470234 due to the petroleum contamination that is present on the Site (i.e., 185 Mt. Hope Avenue).

A RI/RAA Report dated May 2007 was prepared by DAY. The primary objective of the remedial investigation was to perform environmental work at the Site in accordance with the requirements of the Brownfield Cleanup Program (BCP) to evaluate the nature and extent of contamination at the Site. Other objectives included: performing an exposure assessment; confirming and/or further delineating contamination in areas identified as RECs during previous studies; evaluating fate and transport of contaminants; identifying remedial alternatives; performing a detailed analysis of selected remedial alternatives; and selecting a remedial alternative.

Tasks performed as part of the remedial investigation to evaluate or address the RECs identified above included:

- Conducting an EM-61 geophysical survey and subsequent test pit study to assist in evaluating the locations of suspect underground storage tanks (USTs);
- Evaluating surface soil conditions;
- Evaluating subsurface soil conditions;
- Evaluating groundwater quality conditions and groundwater movement characteristics;
- Conducting a vapor intrusion study to evaluate whether VOCs in soil or groundwater were volatilizing and impacting indoor air inside the apartment building on the Site; and
- Conducting a soil vapor study to evaluate whether VOCs were preferentially migrating along select buried utilities.

Figure 2 includes the locations of test borings, groundwater monitoring wells and a test pit that were completed as part of the above studies.

Physical Characteristics of Site

Based on the findings of the remedial investigation, heterogeneous fill material generally consisting of reworked soil (e.g., silt, sand, gravel, and clay) with lesser amounts of brick, cinders, roots, wood, ash, and concrete is present over most of the Site from the ground surface to depths ranging between approximately 2.0 feet and 12.0 feet. At most test locations, the uppermost layer of indigenous soil predominantly consists of varying grades of sands, some silts, and lesser amounts of gravel and clay. As measured during the RI, groundwater generally flows toward the southeast.

Nature and Extent of Contamination

The nature and extent of contamination are summarized below:

- Constituents were not detected in surface soil samples at concentrations above NYSDEC Track 2 SCOs for Restricted Residential Use.
- Concentrations of petroleum-related VOCs and SVOCs in subsurface soil and groundwater were generally highest on the northeastern portion of the Site in proximity to the portion of the adjoining property to the north that was formerly improved with gasoline/service stations. A plume associated with this area of petroleum contamination appears to extend southward across the Site. Total VOCs in soil samples and September 8, 2005 groundwater samples are shown on

Figure 3 and Figure 4, respectively. Based on this Remedial Investigation, the soil contamination starts between 7.0 feet and 10 feet below the ground surface and generally extends to depths between 14 feet and 18 feet below the ground surface. The groundwater on this portion of the Site has been measured at depths ranging between approximately 14 and 17 feet below the ground surface. As such, some of the soil contamination is located in the vadose zone (i.e., above the groundwater table) on at least a seasonal basis.

- Track 2 SCOs for restricted residential use for this area of petroleum contamination were only exceeded at one test location (i.e., test boring SBDAY-09). In addition, test boring SBDAY-08 located within this area of petroleum contamination contained a concentration of manganese [i.e., 4,060 parts per million (ppm)] that exceeded its Track 2 SCO of 2,000 ppm for Restricted Residential Use.
- A sample of fill material at test location SBDAY-02 contained some PAH SVOCs and the metal mercury at concentrations that exceeded Track 2 SCOs for Restricted Residential Use. This test boring was advanced within the footprint of the former feeder canal.
- Groundwater samples from wells MWDAY-01 and MW-3 contained concentrations of VOCs and/or SVOCs that exceeded NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 groundwater standards or guidance values. Well MW-3 is located on the northeastern portion of the Site, and well MWDAY-01 is located along the southern property boundary near the apparent edge of the petroleum plume. Concentrations of VOCs in groundwater tend to decrease as the distance away from the northeast portion of the Site is increased. Based on field findings and analytical laboratory testing of soil and groundwater samples, the length of the petroleum plume located south of the northeastern portion of the Site is estimated to be at least 140 feet long.
- The results of photoionization detector (PID) screening of unsaturated soil samples collected from test boring and test pit locations indicate that petroleum vapors are present in unsaturated soils on some portions of the Site. However, the results of the vapor intrusion evaluation indicate indoor air quality inside the on-site high-rise apartment building has not been impacted as a result of VOC vapors present in subsurface soil and groundwater beneath and in proximity to this building.
- VOCs associated with the on-site petroleum plume were detected in groundwater from well MWDAY-01 and soil vapor point SV-3 that are located nearby, or in proximity, to an abandoned 54-inch diameter sewer line that extends from the Site to beneath the northern residential apartment building on the adjoining property located south of the Site. The concentrations of detected VOCs on this southern portion of the Site are lower than the concentration of VOCs detected in soil and groundwater on the northeast portion of the Site. [Note: Information obtained to date from a remedial investigation being conducted at the adjoining 225-405 Mt. Hope Avenue property to the south indicates that these lower concentrations of VOCs detected on the southern portion of the Site have not adversely impacted indoor air quality of the low-rise apartment/townhouse buildings on the adjoining property].
- Evidence of light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) was not detected at test boring, test pit or monitoring well locations.
- Evidence of USTs was not encountered on the Site.
- Apparent sources of petroleum identified during the remedial investigation include former gasoline/service station use on the northeast portion of the Site (i.e., gasoline tanks associated with a former gasoline station that may have been present at the site) and at locations on adjoining/nearby property(s) north of the Site.
- Apparent sources of other types of constituents (e.g., some PAH SVOCs, metals, cyanide, etc.) may be attributable to surficial fill materials that were documented at the Site.

Contaminant Fate and Transport

Potential routes of migration identified for this Site include:

- VOCs, SVOCs and metals in soil leaching and impacting groundwater through precipitation or contact with groundwater;
- VOCs, SVOCs and metals migrating in a dissolved groundwater plume;
- VOCs migrating as a vapor in the unsaturated zone;
- VOC volatilization from groundwater or soil to indoor air inside future buildings [Note: the vapor intrusion evaluation does not suggest this is occurring at the current residential apartment building that is located on the Site]; and
- Indirect migration pathways such as volatilization to air, transportation on construction equipment/workers, windborne processes, etc., if the impacted media (e.g., soil, groundwater) were to be disturbed in the future.

The contamination at the Site is identified as generally consisting of organic constituents (VOCs and SVOCs), and also various metals. The persistence of these constituents is further discussed below.

Organic Constituents

The VOCs and SVOCs detected at the Site are generally associated with weathered petroleum products. Much of the non-target VOCs and SVOCs detected in soil and groundwater samples may reflect biodegradation products of the petroleum contamination or other non-target compounds typically associated with petroleum products. Petroleum-type VOCs detected in soil and groundwater may be attributable to products such as gasoline. The majority of SVOCs detected in the soil and groundwater are considered PAHs. The VOCs and SVOCs encountered at the Site biodegrade aerobically and anaerobically. These VOCs and SVOCs in an aqueous setting will biodegrade faster under aerobic conditions when compared to biodegradation rates under anaerobic conditions. Most of the SVOCs detected at the Site would generally be anticipated to persist longer than the VOCs that were detected at the Site.

In addition to biodegradation, VOC and SVOC concentrations in the groundwater would presumably decrease as the distance from the suspected source area is increased due to processes such as advection, dispersion, sorption, diffusion, etc. The analytical laboratory test results for groundwater samples collected as part of this study confirm that contamination concentrations decrease as the distance from the suspected source area is increased.

Inorganics

Various metals were detected in samples of surface soil, subsurface soil, and groundwater. Some of the metals detected may be associated with contamination from past uses of the Site, and other metals may be associated with naturally occurring concentrations of metals in soil or groundwater for the area of the Site. Metals can change form (e.g., Fe^{+2} to Fe^{+3}), but are persistent in the environment and do not degrade. Some of the metals detected at the Site can bioaccumulate.

Only the metals mercury and manganese were detected in soil at concentrations exceeding Track 2 SCOs for Restricted Residential Use. The metals iron, magnesium, manganese and sodium were detected more often in groundwater at concentrations exceeding TOGS 1.1.1 groundwater standards or guidance values than other detected metals.

Processes such as advection, dispersion, sorption, diffusion, etc. can result in decreases in metals concentrations dissolved in groundwater as the distance away from their source is increased.

The petroleum contamination within the soil and groundwater at the Site is detected at highest concentrations in proximity to the northeast portion of the Site.

Given the fact that petroleum contamination is present in test boring/monitoring well locations along the northern property boundary, it appears possible that historic petroleum releases from former gasoline/service station uses at the Site and/or on adjoining/nearby property(s) north of the Site could have impacted the Site.

The findings of this project indicate petroleum-related impacts present on the northeastern portion of the Site appear to have migrated laterally in a southward direction. Based on field findings and analytical laboratory testing of soil and groundwater samples, the length of the petroleum plume located south of the northeastern portion of the Site is estimated to be at least 140 feet long.

Petroleum contamination also appears to have migrated vertically downward resulting in a zone of impacted soil that is 7 feet or more thick on the northeastern portion of the Site.

Factors affecting contaminant migration include: groundwater flow; advection; mechanical dispersion; molecular diffusion; partitioning between air, soil and groundwater; and adsorption of constituents onto soil particles or particles suspended in groundwater.

The type of contamination present at the Site generally consists of petroleum-related VOCs, SVOCs, and selected metals. In general, the VOCs tend to be more mobile in the environment than SVOCs and metals. The estimated groundwater flow velocity for the site may range between 0.004 ft/day and 0.85 ft/day (i.e., 1.46 ft/year to 310.25 ft/year). The factors described above impact the contaminant flow rates, and the physical properties of the contaminants can impact migration rates.

Exposure Assessment

Under current site conditions, no complete human health exposure pathway has been identified, and it was determined that a Fish and Wildlife Resources Impact Analysis was not needed. However, the following potential future activities have been identified as potential human health exposure pathways:

- Future site workers and occupants of future buildings that are constructed over areas of soil and groundwater containing VOCs could be exposed to VOCs, SVOCs and metals that are present in subsurface soil or groundwater at concentrations exceeding SCG values. Examples of exposure include: during disturbance of contaminated material, potential volatilization of VOCs into future site structures, etc. Routes of exposure to future Site workers could include inhalation, ingestion, dermal contact, eye contact, and puncture/injection.
- Future potential use of groundwater at the Site could pose a potential exposure pathway to VOCs, SVOCs and metals that are present in groundwater at concentrations exceeding SCGs. The primary potential route of exposure would be ingestion. However, other potential routes of exposure include inhalation, dermal contact, eye contact, and puncture/injection.

Conclusions

Surface Soil

Constituent concentrations detected in surface soil samples that were collected as part of the remedial investigation did not exceed Track 2 SCOs for Restricted Residential Use. Further actions do not appear warranted in relation to surface soil at the Site.

Subsurface Soil and Groundwater

Petroleum contamination was encountered in soil on the northeastern portion of the Site. Petroleum-contaminated soils were encountered in the saturated and unsaturated zones over an approximate 14,500 square foot (0.33-acre) area. An apparent plume extends southward across the Site from this area. The concentration of the VOCs ethylbenzene and xylene detected in one subsurface soil sample, and the concentration of the metal manganese detected in a different subsurface soil sample, that were collected on the northeastern portion of the Site exceeded Track 2 SCOs for Restricted Residential Use. Within this area, contaminated soil exceeding Track 2 SCOs for Restricted Residential Use for petroleum contamination is estimated to be present over an approximate 800 square foot (0.03-acre) area in proximity to test boring SBDAY-09. The volume of subsurface soil that is estimated to exceed NYSDEC Track 2 SCOs for Restricted Residential Use is estimated to be 210 cubic yards (i.e., 345 tons), and the contaminated soil exceeding NYSDEC Track 2 SCOs for Restricted Residential Use appears to be at least seven feet below the ground surface.

Groundwater samples collected from a monitoring well on the northeastern portion of this area, and from a monitoring well near the foot of the plume located southward from this area, contained petroleum-related constituents. Petroleum-contaminated groundwater is estimated to be present over an approximate 0.35-acre area of the Site. Within this area, contaminated groundwater exceeding TOGS 1.1.1 groundwater standards or guidance values is estimated to be present over an approximate 0.25-acre area of the Site. The top of the groundwater table on the northeast portion of the Site (i.e., area with highest concentrations of petroleum constituents) was measured to range between approximately 14.5 feet and 16.9 feet below the ground surface (i.e., at well MW-3). Also, groundwater samples from these two monitoring wells contained some metals and cyanide at concentrations exceeding groundwater standards or guidance values. VOCs in subsurface soil and groundwater do not appear to be impacting indoor air inside the existing high-rise apartment on the Site.

Buried utilities that were monitored do not appear to be acting as preferential migration pathways of VOCs at concentrations that would result in an adverse exposure. Further actions appear warranted to address the northeast portion of the Site and the associated plume that is predominantly impacted with petroleum-related constituents.

Fill Material

Fill material present at the Site may be contributing to a random distribution of detected constituents in subsurface soil and groundwater at the Site. Track 2 SCOs for Restricted Residential Use were exceeded for some PAH SVOCs and the metal mercury at one subsurface soil sample location. Also, groundwater samples collected from some well locations contained antimony, barium, cyanide and gamma-chlordane at concentrations that exceeded groundwater standards or guidance values. Further actions (i.e., SMP) appear warranted to address these detected constituents on the Site.

Remedial Alternatives Analysis

The RI/RAA report identified RAOs, contaminants of interest, remediation criteria, and general response actions. In regard to these criteria, four remedial alternatives were developed and evaluated. These alternatives are summarized below:

Alternative #1	No Action
Alternative #2	Monitored Natural Attenuation and Institutional Controls
Alternative #3	Limited In-Situ Remediation, Institutional Controls, and Groundwater Monitoring
Alternative #4	Full Excavation, In-Situ Remediation, and Groundwater Monitoring

A detailed evaluation of the four remedial alternatives was performed, and implementation of Alternative #3 (Limited In-Situ Remediation, Institutional Controls, and Groundwater Monitoring) was recommended in the RI/RAA report for the Site. However, a new remedial alternative (Alternative #5) has been evaluated since the date of the RI/RAA report, and Alternative #5 is now being recommended for the Site. Alternative #5 is summarized in the Executive Summary, and further details are provided in subsequent sections of this Remedial Work Plan.

Recent Additional Studies

In October 2007, two additional test borings were advanced and converted into groundwater monitoring wells (designated as MWDAY-03 and MWDAY-04) in relation to this BCP project. These wells were installed as requested by the NYSDEC in a letter dated September 24, 2007. Well MWDAY-03 is located in the right-of-way of Mt. Hope Avenue on the opposite side of the street from the Site. This location is at an inferred downgradient position from the northeast portion of the Site where the highest concentrations of petroleum contamination in soil and groundwater have been detected. Well MWDAY-04 is located north of the building on the Site at an inferred upgradient position from the northeast portion of the Site.

During advancement of the test borings for these new wells, soil samples were collected and observed for evidence of petroleum contamination (e.g., odors, staining, free product, etc.). The air space above portions of the soil samples was also screened for total VOC vapors using a RAE Systems MiniRAE 2000 PID equipped with a 10.6 eV lamp. Evidence of petroleum contamination was not observed on the soil samples, and only PID readings of 0.0 ppm were measured on air above soil samples. Groundwater samples were collected from monitoring wells MWDAY-03 and MWDAY-04 on November 1, 2007. Petroleum-related target compound list (TCL) VOCs and TCL SVOCs were not detected in these groundwater samples at concentrations above reported analytical laboratory detection limits.

1.3 Proposed Future Use of Site

The Site will continue to be used as a high-rise apartment complex with associated paved parking lot. Renovations to the existing building are planned.

1.4 Objectives

The objectives of this remediation project are to implement a remedial alternative that is protective of human health and the environment, addresses current environmental conditions to the satisfaction of the NYSDEC and the general public, and allows for continued use of the Site as a residential apartment complex with associated parking lot.

1.5 Applicable Project SCGs

Applicable SCGs that may be used for this project are outlined below:

- Guidelines referenced in the NYSDEC document titled “Draft Brownfield Cleanup Program Guide”, May 2004.
- Guidelines referenced in the NYSDEC document titled “Draft DER-10 Technical Guidance for Site Investigation and Remediation”, December 2002.
- Appropriate SCOs as set forth in the NYSDEC document titled “6 NYCRR Part 375 Environmental Remediation Programs” dated December 14, 2006.
- Groundwater standards and guidance values as referenced in the NYSDEC Division of Water Technical and Operational Guidance Series 1.1.1 document titled "*Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations*" (TOGS 1.1.1), June 1998 (as amended by an April 2000 addendum).

1.6 Citizen Participation

In accordance with NYSDEC BCP requirements, a Citizen Participation Plan (CPP) dated December 8, 2004 was developed for this project. This CPP is available for review at the document repositories (i.e., NYSDEC Region 8 offices located at 6274 East Avon-Lima Road, Avon, New York 14414; and the Central Library of Rochester and Monroe County located at 115 South Avenue, Rochester, New York 14604). As part of the CPP, Fact Sheets are provided to entities on the CPP mailing list to keep the public informed of project activities and documents that are available for review and/or comment. The CPP allows the general public and other interested parties to provide comments on plans for the Site, including this remedial work plan.

2.0 REMEDIAL ACTIONS

The remedial alternative selected for the Site consists of various technical and administrative actions that are intended to perform remediation of the highest concentrations of contamination at the Site (referred to as the "source area"), reduce exposure to Site contaminants, and provide monitoring of groundwater to ensure that the contamination is not migrating. This remedial alternative is considered a Track 4 cleanup for Restricted Residential Use. This section of the RWP provides details on the components of actions that will be conducted as part of this remedial alternative. In general, the remedial actions will include:

- Source area soil removal/off-site disposal and Regenesis' ORC-Advanced® placed in excavation to reduce contaminant concentrations in soil and groundwater on the northeast portion of the Site;
- Post-excavation soil sampling/analysis from the bottom and sidewalls of the excavation;
- Development of a SMP to address the residual contamination and any use restrictions. If deemed warranted, the SMP will also include a contingency to perform limited in-situ remediation of soils and groundwater to reduce contaminant concentrations beyond the limits of the source area soil removal excavation on the northeast portion of the Site, and subsequent performance monitoring;
- Development and recording of an environmental easement;
- Implementation of groundwater monitoring for up to five years to monitor the effectiveness of the remedy; and
- Periodic certification of the institutional controls (ICs).

A site-specific health and safety plan (HASP) for this project is included in Appendix A. This HASP outlines the policies and procedures necessary to protect workers and the public from potential environmental hazards posed during project activities.

The technical and administrative actions associated with the selected remedy are further presented in this RWP. It is currently planned that Mitkem Laboratories, a Division of Spectrum Analytical, Inc. (Mitkem), which is a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory (NYSDOH ELAP ID #11522), will analyze samples of soil and groundwater that are generated as part of this project. A quality assurance project plan (QAPP) for this project is included as Appendix B.

2.1 Site Preparation and Signage

Site preparation and signage tasks will be completed prior to performing the limited in-situ remediation.

- A utility stakeout will be completed and field checked prior to marking out the source area soil removal excavation described in Section 2.2 and also the contingency in-situ remediation injection points described in Section 2.4.1.1, if deemed warranted. With concurrence from the NYSDEC site representative, and to the extent deemed warranted, adjustments may be made in the field concerning the limits of excavation and locations of contingency in-situ injection points to account for the location of buried utilities on the northeast portion of the Site, as well as other factors.

- Four-foot high temporary construction fencing will be placed around the portion of the Site required for the source area soil removal. The anticipated location of this fencing is shown on Figure 5. This fencing may be adjusted as needed during the remediation work, and will be used as a site control measure to inhibit access to the work area, including during nights and/or weekends. Fencing will be placed across the vehicle ingress/egress point when remediation activities are not being performed (i.e., nightly, over weekends, holidays). Subsequent to completion of intrusive remedial field activities, the temporary construction fencing will be removed.

- A sign will be conspicuously posted at the Site prior to the start of remedial work. An example of the proposed signage and associated NYSDEC instructions are included in Appendix C. The sign will reflect the actual holders of the positions indicated on the sign at the time the sign is installed.

2.2 Source Area Soil Removal and Off-Site Disposal

DAY and its subcontractors will remove “source area” petroleum-impacted soil at the Site, subsequently transport and dispose of the petroleum-impacted soil at an approved off-site landfill facility, and document the work completed. Site preparation and layout components (e.g., fencing, equipment and material staging area, decontamination and loading areas, truck/vehicle access and traffic flow, limits of “source area” removal, etc.) are shown on Figure 5. Tape measurements and existing Site features will be used to layout these components. It is anticipated that heavy equipment to be used at the Site may include trucks, excavators, a bulldozer, a loader, and a tamper. A DAY representative will be on-site full-time to document and monitor this work. The DAY representative will also conduct health and safety air monitoring for VOCs and particulates during the removal work in accordance with provisions of the HASP and Community Air Monitoring Plan (CAMP) (refer to Appendix A). The contractor will either utilize this HASP or the components of its own HASP (accepted by regulatory agencies) for the protection of its on-site workers.

Figure 6 shows the approximate limits of the “source area” removal (i.e., an approximate 1,441 square-foot area). The petroleum-contaminated soil will be transported off-site by NYSDEC Part 364 permitted trucks for disposal at a NYSDEC-approved landfill facility. Currently, it is anticipated that the petroleum-contaminated soil will be used as cover at the landfill facility. If warranted in order to obtain disposal approvals, samples of soil to be disposed at the landfill will be collected and analyzed at a NYSDOH ELAP-certified analytical laboratory for parameters requested by the disposal facility.

As shown on Figure 6, the proximity of the high rise building and associated buried utilities represent restricting factors concerning the extent of the excavation. However, to guide the vertical extent of soil requiring removal, it is a goal that soil containing visual and olfactory observations of petroleum-contamination (e.g., staining, odors, etc.) and PID readings greater than 100 ppm will be removed to the extent practicable. To supplement remediation of residual contamination, a bioremediation application at the bottom of the excavation is planned (refer to Section 2.2.3). It is currently anticipated that contaminated soils will be removed to depths of 19 feet or less.

Based on previous studies, it is estimated that a layer of soil/fill not containing petroleum contamination with an average thickness of 9.1 feet overlies the petroleum-contaminated soil in the source area excavation. Based on the lateral limits of the excavation being 1,441 square feet, and the average thickness of 9.1 feet, it is estimated that approximately 13,113 cubic feet (i.e., approximately 485 cubic yards) of clean soil will be removed and staged on-site, which equates to approximately 880 tons when using a conversion factor of 1.65 tons/cubic yard.

It is anticipated that an average thickness of ten feet of petroleum-contaminated soil will be removed from the 1,441 square foot lateral limits of the excavation. As such, it is estimated that approximately 14,410 cubic feet (i.e., approximately 534 cubic yards) of contaminated soil will be removed, which equates to approximately 970 tons when using a conversion factor of 1.65 tons/cubic yard.

It is anticipated that the source area soil removal will be conducted as follows:

- Mark out limits of excavation using tape measurements from control points or existing Site features.
- Strip topsoil and stage on Site away from excavation for later re-use during site restoration
- Start removing clean and contaminated soil in sections or cells using the sequence (i.e., 1, 2, 3….) as shown on Figure 6. Post-excavation sampling and backfilling of the cells will subsequently be completed as described below before starting removal of soil from the next numbered set of cells. Polyethylene plastic sheeting will be used to temporarily line excavation walls prior to daily backfilling when additional soil removal is required in a specific direction. Although not anticipated, if buried utilities are identified within the planned source removal area, the Client and the NYSDEC will be consulted in order to achieve an acceptable approach that satisfies the goals and objectives of the project.
- This cell progression technique will likely incur some mixing of clean soil/backfill with contaminated soil that ends up being disposed off-site. However, the technique reduces the potential for undermining the soil located beneath the footprint of the high-rise building and minimizes open excavations on the Site overnight, during weekends, etc.
- As a result of the excavation work, existing monitoring well MW-3 will be decommissioned (i.e., removed) during the soil removal work.
- If deemed necessary based on olfactory observations or CAMP results, BioSolve®, foam, or other material will be used during the excavation process to suppress petroleum odors and vapors during excavation activities involving petroleum-contamination.
- Tape measurements from existing site structures will be used to record the actual extent of the soil removal excavation limits for transfer to a geographic information system (GIS) or computer-aided design (CAD).

2.2.1 Contingency for Dewatering of Excavation

Based on observations made during the City of Rochester's soil removal work on adjoining/nearby parcels to the north, it is unlikely that the excavation will require dewatering during removal work. However, if dewatering appears necessary, a 21,000-gallon bi-level steel aboveground holding tank will be mobilized to the Site to collect groundwater from the excavation as deemed necessary during the source removal. If the water volume approaches the capacity of the frac tank, then the excavation work will be halted to assess options with input from the NYSDEC site representative. If dewatering is conducted, a sample of the staged water will be collected by DAY and subsequently tested by a NYSDOH ELAP-certified analytical laboratory for purgeable aromatics using Method 602 or equivalent in order to characterize the staged water to evaluate necessary pre-treatment and/or disposal options.

2.2.2 Post-Excavation Soil Sampling and Analysis

Post-excavation soil samples will be collected from the excavation walls and floor when removal work in a particular direction is complete. The post-excavation sampling will be completed in general accordance with provisions set forth in Section 5.4(a) (Remedial Action Performance Compliance) of the NYSDEC document titled "Draft DER-10 Technical Guidance for Site Investigation and Remediation" dated December 2002. As such, it is currently anticipated that the post-excavation samples will be collected near the invert of the excavation walls; however, actual locations will be selected based upon field screening in order to obtain samples exhibiting the greatest evidence of contamination in accordance with DER-10. Based on the size of the excavation, and since the removal is being excavated using a cell that will be backfilled on a regular basis before excavating new cells, post-excavation samples will be collected at approximate 20-foot intervals along the outer sidewalls of the excavation. [Note: It is currently anticipated that the excavation will abut the shared property line to the north, which is the extent to where the City of Rochester recently removed petroleum-contaminated soil as part of its remediation of the adjoining/nearby parcels north of the Site. If only clean soil backfill (based on field observations and PID readings) is encountered, then post-excavation soil samples will not be analyzed from the north sidewall of the excavation.]

It is currently anticipated that up to eight discrete post-excavation soil samples will be collected from sidewalls, and that three discrete post-excavation soil samples will be collected from the bottom of the excavation. Tape measurements from control points or existing site structures will be used to record the locations of post-excavation soil samples for transfer to a GIS or CAD.

The post-excavation soil samples will be submitted for analysis under chain-of-custody control to Mitkem. Based on previous analytical laboratory test results for soil and groundwater samples collected from the area of the source removal, the post-excavation samples will be tested by Mitkem for TCL VOCs, including tentatively identified compounds (TICs), and TCL SVOCs and TICs, using NYSDEC analytical services protocol (ASP) Method OLM04.3 as shown on Table 1 included in the QAPP included as Appendix B. The analytical laboratory test results for the post-excavation soil samples will be compared to appropriate Part 375 SCOs. The test results will in part be used to determine if additional remediation beyond the footprint of the excavation is required (refer to Section 2.4.1.1).

2.2.3 Regenesis' ORC-Advanced® Placed in Excavation

Subsequent to collecting any post-excavation soil samples from excavation cells, Regenesis' Oxygen Release Compound (ORC)-Advanced® will be placed in the bottom of each excavation cell to assist in long-term biodegradation of residual petroleum contamination in saturated soil and groundwater. Based on recommendations from Regenesis, a total of 300 pounds of ORC-Advanced® will be placed in the source area soil removal excavation. The material will be placed dry onto the bottom of the excavation cells at elevations that are likely within the groundwater table on at least a seasonal basis. ORC-Advanced® is a proprietary formulation of calcium oxy-hydroxide that produces a controlled release of oxygen for a period of up to 12 months. After being hydrated and subsequently injected into the subsurface, the patented Controlled Release Technology (CRT™) associated with ORC-Advanced® delivers oxygen consistently over an extended period of time, which is used to accelerate the rate of naturally occurring aerobic contaminant biodegradation in groundwater and saturated soils. A copy of the material safety data sheet (MSDS) for ORC-Advanced® is included as part of the HASP in Appendix A.

2.2.4 Backfilling the Source Area Excavation

A select geotechnical fill material will be used as backfill to replace the petroleum-contaminated soil that is removed. It is anticipated that bank run replacement fill sourced from a New York State Department of Transportation (NYSDOT)-approved or NYSDEC-approved location, and the previously removed clean soil/fill, will be placed into the excavation in one-foot lifts and compacted to the extent practicable.

2.3 Install New Monitoring Well

Since well MW-3 will be decommissioned during the source area soil removal work, one new groundwater monitoring well (to be designated as well MWDAY-05) will be installed in the general location shown on Figure 6. A Geoprobe Systems 6000-series drill-rig will be used to install this well. Continuous direct-push macro-core soil samples will be collected ahead of 4.25-inch hollow stem augers. A DAY representative will visually observe, screen, and document soil samples in accordance with the provisions included in the QAPP as Appendix B. It is anticipated that the boring will be advanced to equipment refusal, which is estimated to be between 20 feet and 25 feet below the ground surface. A two-inch inner diameter PVC well will then be constructed inside the boring. The well will consist of a ten-foot long 10-slot PVC screen threaded to solid PVC riser that extends to the ground surface and is equipped with a cop or J-plug. A sand pack will be placed in the borehole annulus up to one foot below the bottom of the PVC screen and at least one foot above the top of the PVC screen. A minimum two-foot thick bentonite seal (i.e., hydrated bentonite pellets or chips) will be placed in the annulus above the sand pack. A Portland cement bentonite grout will be used to fill the annulus above the bentonite seal to about one foot below the ground surface. A flush-mount curb bow will then be cemented in-place with concrete.

2.4 Institutional Controls

ICs will be used to address residual contamination that may remain in soil, fill or groundwater subsequent to the limited in-situ remediation, including protecting against exposure to this residual contamination. Development of ICs will start once the RWP is approved by the NYSDEC. The ICs are provided in the subsections that follow.

2.4.1 Site Management Plan

Subsequent to completing remediation activities, a SMP will be developed and implemented to address the characterization, handling, and disposal/re-use of residual contaminated media (e.g., soil, fill, groundwater) that is disturbed during any future site activities. The SMP will also require evaluation of the potential for vapor intrusion into any future buildings to be constructed on the Site, including requirements to mitigate such potential vapor intrusions through use of environmental engineering controls (e.g., sub-slab depressurization system, etc.) or other means. In addition, the SMP will identify use restrictions for the Site (e.g., property development and groundwater use restrictions, etc.). The SMP will also include a generic HASP for the Site, and require that this HASP (or a project-specific HASP) be implemented when known or suspected impacted media at the Site have the potential to be disturbed.

2.4.1.1 Limited In-Situ Remediation (Contingency)

If warranted to treat contaminated soil or groundwater outside the footprint of the source area soil removal excavation, the SMP will include a contingency for completing limited in-situ remediation of soil and groundwater contamination on this portion of the Site. Anticipated components of the limited in-situ remediation are provided below, and these components and associated scope are subject to change depending upon the post-excavation soil sample test results outlined in Section 2.2.2.

<u>In-Situ Injection</u>

In-situ chemical oxidation and aerobic bioremediation would be performed to remediate contamination in subsurface soil and groundwater at injection points outside the footprint of the source area removal excavation on the northeast portion of the Site where petroleum constituent concentrations are determined to require treatment based on the results of post-excavation soil samples. Regenesis' RegenOx^{TM} and Regenesis' ORC-Advanced® will be used to treat the contamination. The primary goals of the in-situ remediation would be: 1) rapidly reduce the mass of contaminants in the subsurface with use of RegenOx^{TM}; and 2) provide long-term treatment of residual contaminants with ORC-Advanced®.

- RegenOx^{TM} is a solid alkaline oxidant that uses a sodium percarbonate complex with a multi-part catalytic formula. The product consists of an oxidizer and activator that are mixed with water, and combined and injected into the subsurface using common drilling or direct-push equipment. The product consists of an oxidizer complex ("Part A") and an activator complex ("Part B") that are mixed with water, combined aboveground, and then injected into the subsurface using common drilling or direct-push equipment or mixed with impacted media that are then placed back in the excavation. Once in the subsurface, the product produces an effective surface-mediated oxidation reaction comparable to that of Fenton's Reagent, without a violent exothermic reaction. RegenOx^{TM} destroys a wide range of contaminants (including petroleum constituents) in both soil and groundwater. A copy of the MSDS for RegenOx^{TM} is included as part of the HASP in Appendix A.

- Further description of the ORC-Advanced® is provided in Section 2.2.3.

Using existing data from the RI/RAA report and also the post-excavation soil sample results referenced in Section 2.2.2, Regenesis will be consulted regarding the amounts of RegenOx^{TM} and ORC-Advanced® and number of injection points that should be used for the in-situ application. The RegenOx^{TM} and ORC-Advanced® would be injected using the direct-push injection method in general accordance with Regenesis' RegenOx^{TM} In-Situ Chemical Oxidation Application Instructions included in Appendix D. Treatment of contamination above and below the water table will be considered when identifying injection point spacing, amount of water, etc. to be used. As a modification per Regenesis' technical personnel, the ORC-Advanced® would be mixed aboveground with RegenOx^{TM} Part A before being combined aboveground with RegenOx^{TM} Part B, and the resulting mixture consisting of these three components would then be injected into the subsurface. Injection pump selection and pump cleaning are also discussed in Regenesis' instructions included in Appendix D.

Figure 6 shows 40 potential injection points that may be considered if limited in-situ remediation outside the source area soil removal excavation is warranted. The actual number and location of injection points, and quantities of RegenOx^{TM} and ORC-Advanced®, would be identified in the SMP. Currently, to the extent possible, it is anticipated that between 140 and 175 pounds of RegenOx^{TM} and between 25 and 30 pounds ORC-Advanced® would be injected at each injection point that is installed.

Approximately one month after completing the in-situ remediation application, soil monitoring would be completed to assist in evaluating the effectiveness of the in-situ remedial treatment. The results of the performance monitoring would be used to document the environmental conditions in the area(s) that was treated with the in-situ remediation.

Up to six test borings would be advanced within the in-situ treatment area at locations that will be selected with input from the NYSDEC site representative. Based on the results of the previous remedial investigation, it is anticipated that the test borings would be advanced to depths of approximately 20 feet below the ground surface. However, these depths could be modified based on observations made during advancement of the borings and with concurrence from the NYSDEC site representative. Soil samples would be collected throughout the entire depth of each test boring.

The recovered soil samples would be collected, observed, monitored, and documented in accordance with the protocols outlined in Section 3.0 of the QAPP included as Appendix B, which includes recording pertinent information on test boring logs. Each test boring would be backfilled with grout upon completion, and soil cuttings would be placed in NYSDOT-approved drums that would be characterized and disposed off-site in accordance with applicable regulations.

One soil sample from each test boring with the greatest field evidence of petroleum impact (i.e., elevated PID readings, staining, odors, etc.) would be selected and submitted to Mitkem under chain-of-custody control. The NYSDEC Site representative would provide input on the actual samples submitted for testing. The analytical laboratory testing program for these samples is identified on Table 1 in the QAPP included as Appendix B. As shown, Mitkem would analyze up to six soil samples for TCL VOCs including TICs, and TCL SVOCs including TICs, using NYSDEC ASP Method OLM04.3.

The test results would be summarized on data tables that also include a comparison to appropriate Part 375 SCOs.

2.4.2 Periodic Certification

Periodic certification by the property owner will be prepared by a professional engineer or environmental professional that is acceptable to the NYSDEC. Periodic certification will be provided every three years. The certification is intended to validate that the ICs (and also engineering controls if required in the future) that are implemented for the Site are unchanged from the previous certification and that no circumstances have occurred that impair the ability of the controls to protect public health and the environment, or constitute a violation or failure to comply with the SMP for the Site.

2.4.3 Environmental Easement

An environmental easement will be developed for the Site. The environmental easement will: limit use of the Site to restricted residential, commercial and industrial applications; require compliance with the SMP; restrict use of groundwater as a source of potable water or process water without necessary water quality treatment as determined by the NYSDOH; and, require the property owner to complete and submit to the NYSDEC the periodic certification that is intended to validate that the ICs implemented for the Site are unchanged.

2.4.4 City Code Restricting Groundwater Use

Chapter 59 (Health and Sanitation), Article III (Nuisances and Sanitation) § 59-27 (Water Supply) of the current Charter and Code of the City of Rochester, New York states:

A. No person shall use for drinking purposes, or in the preparation of food intended for human consumption, any water except the potable water supply authorized for public use by the City of Rochester; and

B. Other water supplies, wells or springs used for cooling and washing purposes only, where food is prepared or sold for human consumption, shall be tested and approved by the Monroe County Health Director. All auxiliary water supplies used for commercial or industrial use shall have all hydrants and faucets conspicuously posted indicating that such water is not for drinking use, and such water supplies shall not be cross-connected or interconnected with the public water supply."

This City Code has been interpreted to represent an IC that prohibits groundwater within the city limits to be used as a source of potable water.

2.5 Groundwater Monitoring

A groundwater monitoring program will be implemented to track remedial progress and confirm its effectiveness. The groundwater monitoring program will be implemented using six existing groundwater monitoring wells (designated as MWDAY-01 through MWDAY-04, MW-URS3, and MW-URS4) and one new well (to be designated as MWDAY-05) to ensure that the remedy was effective. The locations of these wells are shown on Figure 7. This well field provides an upgradient to downgradient transect of monitoring points across the plume. Monitoring from the wells may also assist in evaluating whether the contamination is solely attributable to an off-site source(s) to the north, or is possibly a co-mingled plume attributable to an on-site source and an off-site source(s) to the north.

It is anticipated that the groundwater monitoring will be conducted for a period of up to five years. It is anticipated that the seven wells will be sampled on a bi-annual basis during the 1st and 2nd years, and on an annual basis for the 3rd through 5th years (i.e., total of 7 sampling events). As part of this monitoring program, groundwater will be tested for parameters that evaluate the presence and concentration of Site contaminants, and to determine the extent and potential movement of the contamination plume.

It is anticipated that each groundwater monitoring event will include collecting groundwater samples from the seven groundwater monitoring wells for water quality measurements and analytical laboratory testing using the low-flow purge and sample protocol outlined in Section 3.0 of the QAPP included as Appendix B. This includes creating Monitoring Well Sampling Logs that document the procedures and equipment used during the purging and groundwater sampling, and the field measurement data that is obtained.

As shown on Table 1 in the QAPP included as Appendix B, each round of performance monitoring groundwater samples from the seven wells will be tested by Mitkem for:

- TCL VOCs including TICs using NYSDEC ASP Method OLM04.3; and
- TCL SVOCs including TICs using NYSDEC ASP Method OLM04.3.

Using static water level measurements from the seven wells, and the surveyed well elevations, DAY will calculate groundwater elevations for each groundwater monitoring event. With assistance of the Surfer 8 software program, the well locations and corresponding groundwater elevations will be used to develop a groundwater potentiometric map for each groundwater monitoring event.

The detected concentrations of VOCs and SVOCs for each groundwater monitoring event will be compared on a summary table to TOGS 1.1.1 groundwater standards and guidance values. The test results will also be evaluated on a cumulative basis.

With approval from regulatory agencies and after adequate monitoring data are available for evaluation, the duration and frequency of subsequent groundwater monitoring events, the number of wells sampled during subsequent monitoring events, and the test parameters for samples collected during subsequent monitoring events, may be modified based on the test results of samples from previous monitoring events.

2.6 Remediation-Derived Wastes

It is anticipated that soil cuttings, well development water, well sampling water, decontamination water, and solid waste will be generated during various stages of this project. These wastes will be handled, characterized, and disposed off-site in accordance with applicable regulations. It is currently anticipated that soil will be transported and disposed off-site at a NYSDEC-approved regulated landfill facility, and that containerized well development water, well purge water, and decontamination water will be transported and disposed off-site at a publicly owned treatment works (POTW) or other NYSDEC-approved disposal facility.

3.0 FINAL ENGINEERING REPORT

A final engineering report (FER) will be developed for this project. This FER will include: a summary of the work completed; field documentation; scaled figures depicting the limits of the source area soil removal excavation, post-excavation soil sample locations, and groundwater monitoring well locations; a groundwater potentiometric map; analytical laboratory sampling documentation and test results; data tables; and documentation concerning the transport and disposal of contaminated soil and remediation-derived wastes.

Information and data for the first round of groundwater monitoring results will be included in the FER. Information and data for subsequent rounds of groundwater monitoring results will be provided to Conifer-Hamilton, LLC and regulatory agencies in annual groundwater monitoring reports.

3.1 Certificate of Completion

It is anticipated that the NYSDEC would issue a Certificate of Completion once the FER and SMP are completed and accepted by regulatory agencies, and the environmental easement is executed and recorded.

4.0 PROJECT SCHEDULE

A project schedule for the first year of this project is included in Appendix E. Not shown on this schedule are the following components:

- Groundwater monitoring and associated annual groundwater monitoring reports for years two through five.

- Periodic certification of ICs that will be developed and provided every three years subsequent to receipt of the certificate of completion for the project.

5.0 REFERENCES

Previous Reports

Phase I Environmental Site Assessment, 151 to 435 Mount Hope Avenue and 562 Ford Street, Rochester, New York; October 24, 2000; Day Environmental, Inc.

Phase II Environmental Study Data Package, 151 to 435 Mount Hope Avenue and 562 Ford Street, Rochester, New York; October 2000; Day Environmental, Inc.

Phase II Environmental Study Data Evaluation Report, 151, 171, 173, 175, 177, 191, 425, and 435 Mount Hope Avenue and 562 Ford Street, Rochester, New York; February 2002; Day Environmental, Inc.

Phase II Report; Environmental Site Assessment of River Park Commons Apartment Complex, Rochester, New York; June 2003; URS Corporation.

Remedial Investigation/Remedial Alternatives Analysis Report; Brownfield Cleanup Program; 185 Mount Hope Avenue, Rochester, New York (Tower Property); NYSDEC Site ID C828124; May 2007; Day Environmental, Inc.

Regulatory Documents

NYSDEC Division of Water Technical and Operational Guidance Series 1.1.1 document titled "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" (TOGS 1.1.1) dated June 1998, including April 2000 Addendum Table 1.

NYSDEC DER Draft Brownfield Cleanup Program Guide; May 2004.

NYSDEC 6 NYCRR Part 375 Environmental Remediation Programs; effective December 14, 2006.

City of Rochester, New York Charter and Code; Chapter 59 (Health and Sanitation), Article III (Nuisances and Sanitation) § 59-27 (Water Supply).

NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation, December 2002.

Reference Materials

Ground Water Resources of Monroe County; 1935; R.M. Leggette, L.O. Gould and B.H. Dollen.

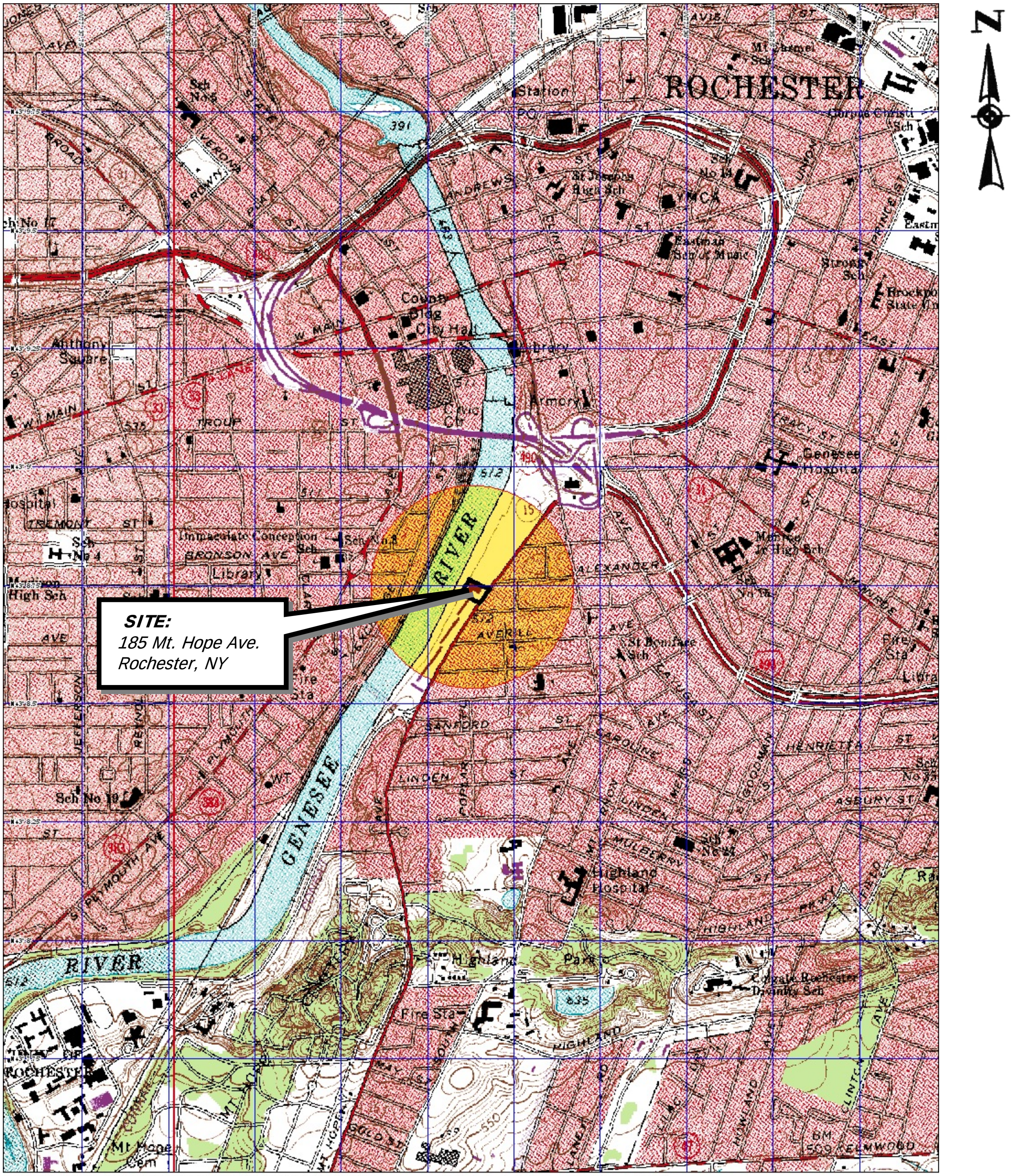
USGS topographic map for the Rochester East, New York quadrangle, 1995.

USGS topographic map for the Rochester West, New York quadrangle, 1995.

6.0 ACRONYMS

ASP	Analytical Services Protocol
BCP	Brownfield Cleanup Program
CAD	Computer-Aided Design
CAMP	Community Air Monitoring Plan
CPP	Citizen Participation Plan
CRT	Controlled Release Technology
DAY	Day Environmental, Inc.
DNAPL	Dense Non-Aqueous Phase Liquid
ELAP	Environmental Laboratory Approval Program
FER	Final Engineering Report
GIS	Geographic Information System
HASP	Health And Safety Plan
IC	Institutional Control
LNAPL	Light Non-Aqueous Phase Liquid
MCDPH	Monroe County Department of Public Health
Mitkem	Mitkem Laboratories a Division of Spectrum Analytical, Inc.
MSDS	Material Safety Data Sheet
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
ORC	Oxygen Release Compound
PAH	Polyaromatic Hydrocarbon
Phase I ESA	Phase I Environmental Site Assessment
PID	Photoionization Detector
POTW	Publicly Owned Treatment Works
PPM	Parts Per Million
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
REC	Recognized Environmental Condition
RI/RAA	Remedial Investigation/Remedial Alternatives Analysis
RWP	Remedial Work Plan
SCG	Standard, Criteria and Guidance
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SVOC	Semi-Volatile Organic Compound
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TIC	Tentatively Identified Compound
TOGS	Technical and Operational Guidance Series
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

FIGURES



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

550 ft Scale: 1 : 19,200 Detail: 14-0 Datum: WGS84

Drawing Produced From: 3-D TopoQuads, DeLorme Map Co., referencing USGS quad maps Rochester East (NY) 1995 and Rochester West (NY) 1995. Site Lat/Long: N43d-8.75' – W77d-36.62'

DATE
11-05-2007

DRAWN BY
RJM

SCALE
1" = 2000'

day

DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14623-2700

PROJECT TITLE
185 MT. HOPE AVENUE
ROCHESTER, NEW YORK

BROWNFIELD CLEANUP PROGRAM

DRAWING TITLE
PROJECT LOCUS MAP

PROJECT NO.
4003R-07

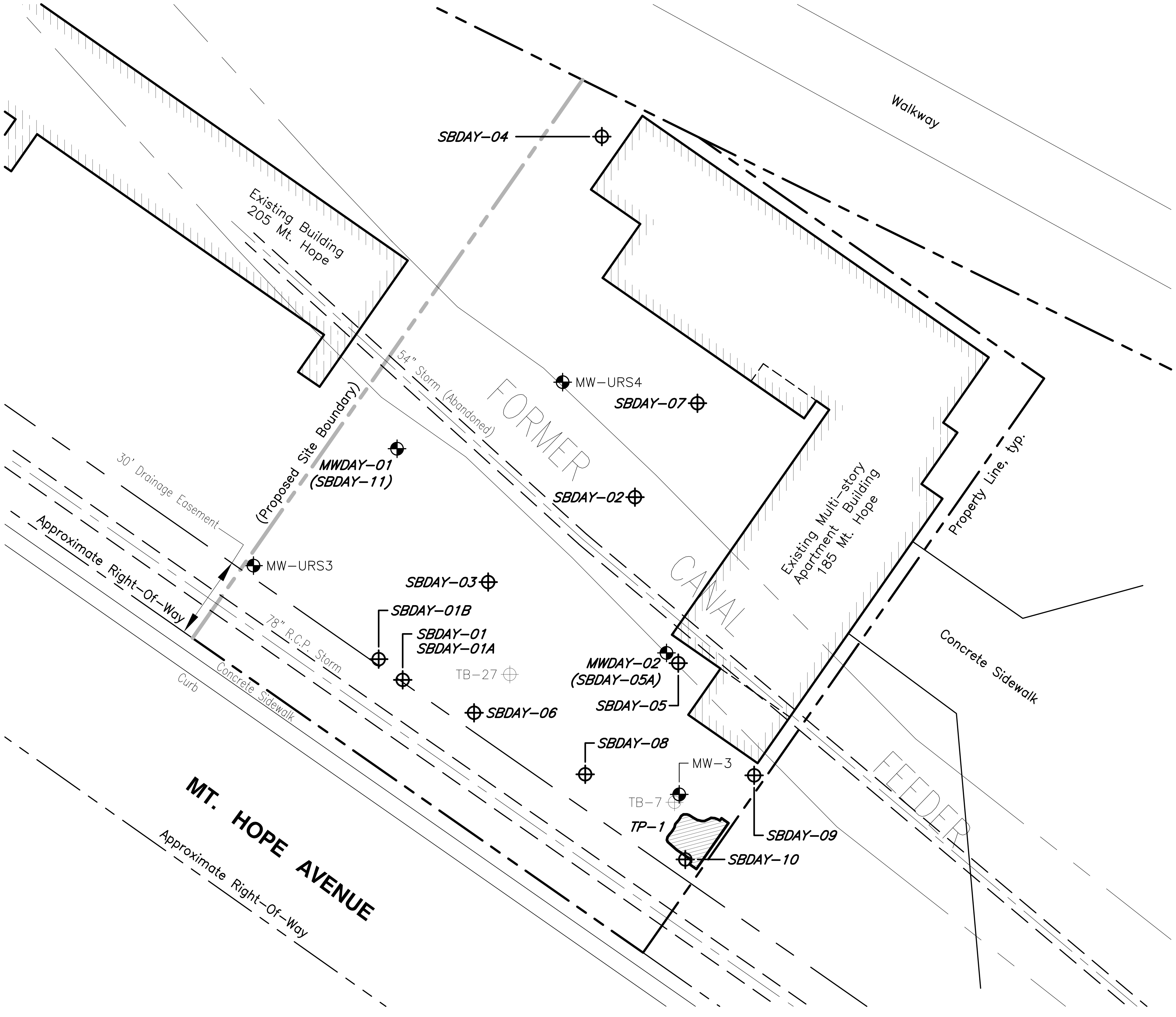
FIGURE 1

Ref4:
Ref5:
Ref6:

Ref1:
Ref2:
Ref3:

Xerox432AnsiB-2; 11 x 17
Layout Name: Layout 1

Time Plotted: Wed Dec 5 16:35 2007
File Name: Brownfield\4003R-07\4003R-4.dwg



N

Site Plan
1"= 40'

LEGEND:

⊕ *MWDAY-01*	Monitoring Well Location Installed February 2005
⊕ MW-URS3	Monitoring Well Location Installed Prior To February 2005
⊕ *SBDAY-08*	Test Boring Location Installed February 2005
⊕ TB-7	Test Boring Location Installed Prior To February 2005
TP-1 ▨	Test Pit Location Installed August 2005

NOTES:

1. This drawing was adapted from a drawing by the City of Rochester, DCD-Housing & Project Development, titled "River Park Commons" dated August 28, 2000, untitled partial utitility plan from Conifer Reality and from an instrument survey performed by James M. Parker, Land Surveyor, on September 13, 2000. No boundary survey was performed.
2. Former Canal Feeder located using select Sanborn Maps provided by Environmental Risk Information & Imaging Services. Location should be considered approximate.
3. Location of 54" abandoned storm sewer from an as-built drawing by Teetor-Dobbins P.C., titled "Relocation Of Storm Drain Plan & Profile Sheet 2 of 3", drawing No. 2, dated June 1973. Accuracy of location should be to the degree implied by the method used.

DATE	11-2007
FIELD VERIFIED BY	JAD
DATE DRAWN	11-6-2007
DRAWN BY	RJM
DATE ISSUED	11-6-2007
SCALE	1" = 40'

day
DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14614-1008
NEW YORK, NEW YORK 10165-1617

PROJECT TITLE
185 MT. HOPE AVENUE
ROCHESTER, NEW YORK

BROWNFIELD CLEANUP PROGRAM

DRAWING TITLE
Site Plan with Select Test Locations

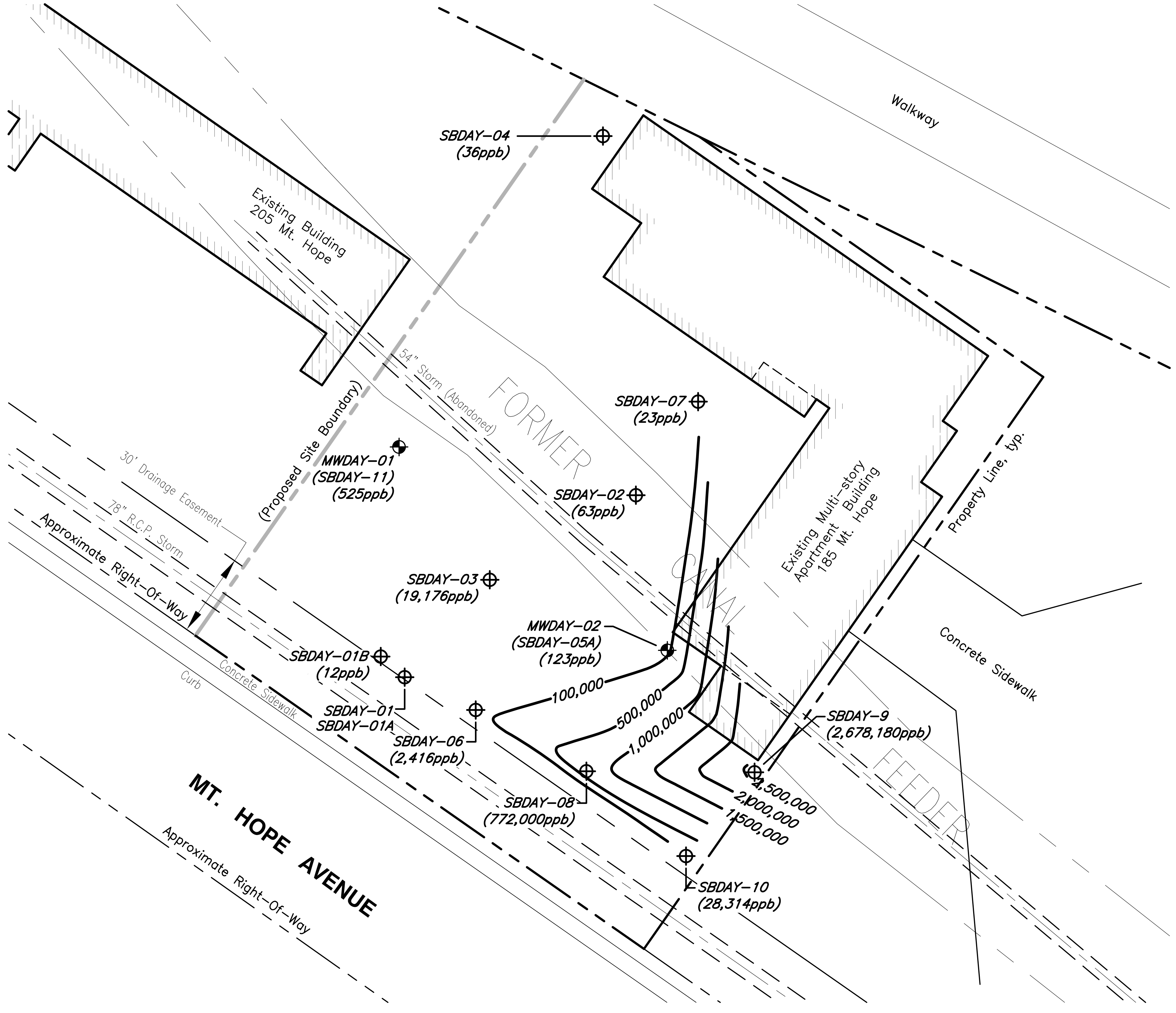
PROJECT NO.
4003R-07

FIGURE 2

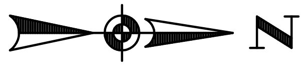
Ref1: PEAK VOC IN SOIL Contours.dwg
Ref2:
Ref3:
Ref4:
Ref5:
Ref6:

Xerox432AnsiB-2; 11 x 17
Layout Name: VOC in Soil

Time Plotted: Wed Dec 5 16:35 2007
File Name: Brownfield\4003R-07\4003R-2.dwg



Site Plan
1"= 40'



LEGEND:

⊕	***MWDAY-01*** *(525ppb)*	Monitoring Well Location Installed February 2005 With Total VOCs Detected In Soil Samples In Parentheses
⊕	***SBDAY-08*** *(772,000ppb)*	Test Boring Location Installed February 2005 With Total VOCs Detected In Soil Sample In Parentheses
—	*100,000*	Total VOCs Contour Line (ppb), Created by Golden Software, Inc. Surfer8 Program

NOTES:

1. This drawing was adapted from a drawing by the City of Rochester, DCD–Housing & Project Development, titled "River Park Commons" dated August 28, 2000, untitled partial utitility plan from Conifer Reality and from an instrument survey performed by James M. Parker, Land Surveyor, on September 13, 2000. No boundary survey was performed.
2. Former Canal Feeder located using Sanborn Maps provided by Environmental Risk Information & Imaging Services. Location should be considered approximate.
3. Location of 54" abandoned storm sewer from an as-built drawing by Teetor–Dobbins P.C., titled "Relocation Of Storm Drain Plan & Profile Sheet 2 of 3", drawing No. 2, dated June 1973. Location should be considered accurate to the degree implied by the method used.

DATE	11-2007
FIELD VERIFIED BY	JAD
DATE DRAWN	11-6-2007
DRAWN BY	RJM
DATE ISSUED	11-6-2007
SCALE	1" = 40'

DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14614-1008
NEW YORK, NEW YORK 10165-1617

PROJECT TITLE
185 MT. HOPE AVENUE
ROCHESTER, NEW YORK

BROWNFIELD CLEANUP PROGRAM

DRAWING TITLE
Total VOCs In Subsurface Soil Samples

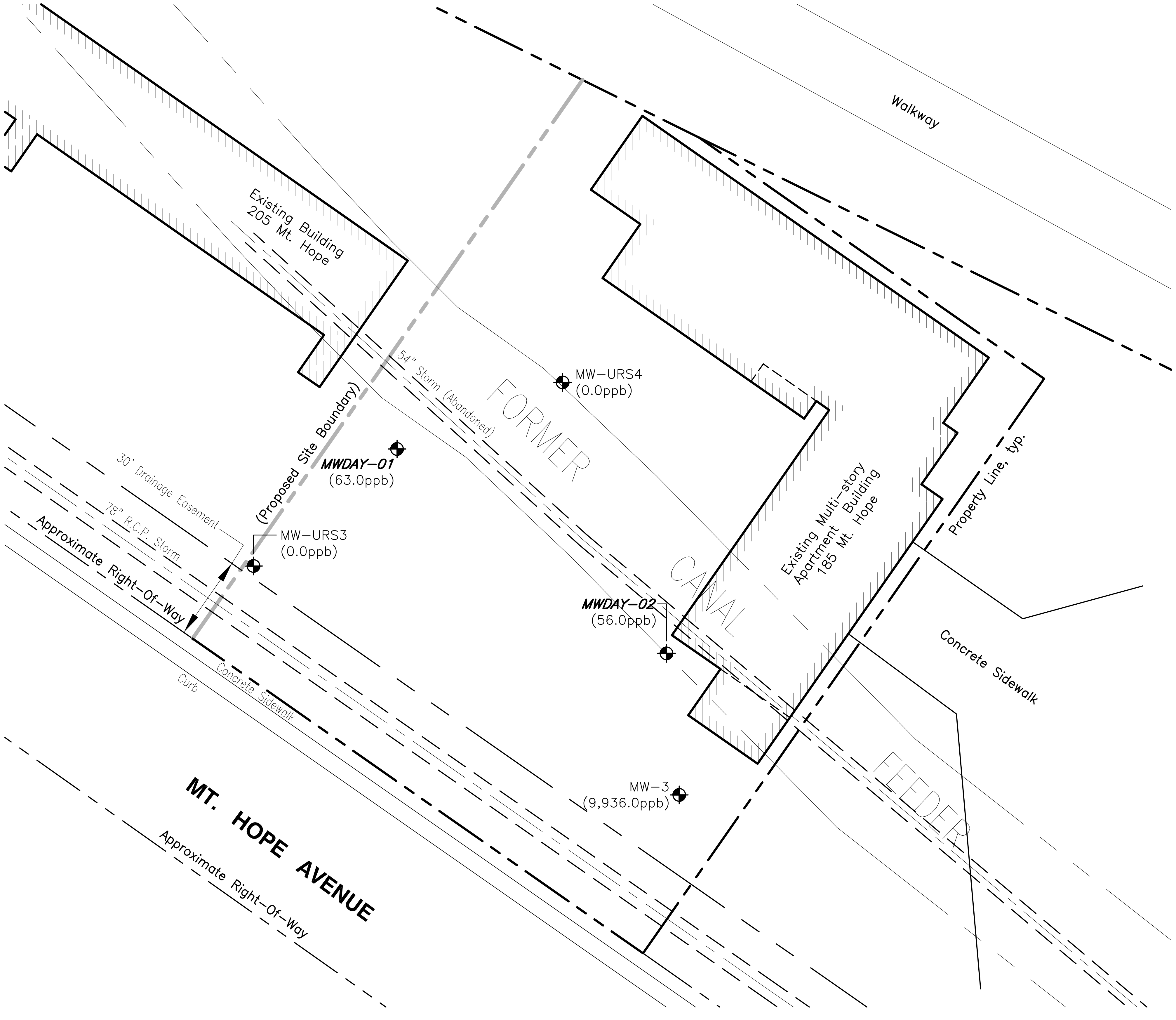
PROJECT NO.
4003R-07

FIGURE 3

Ref1: VOC GW-Contours.dwg
Ref2:
Ref3:
Ref4:
Ref5:
Ref6:

Xerox432AnsiB-2; 11 x 17
Layout Name: VOC in Groundwater

Time Plotted: Wed Dec 5 16:38 2007
File Name: Brownfield\4003R\4003R-3.dwg



Site Plan
1"= 40'

N

LEGEND:

⊕ ***MWDAY-01*** (63.0ppb)	Monitoring Well Location Installed February 2005 With Total VOCs Detected In 09/08/05 Groundwater Sample In Parentheses
⊕ MW-URS3 (0.0ppb)	Monitoring Well Location Installed Prior To February 2005 With Total VOCs Detected In 09/08/08 Groundwater Sample In Parentheses

NOTES:

1. This drawing was adapted from a drawing by the City of Rochester, DCD-Housing & Project Development, titled "River Park Commons" dated August 28, 2000, untitled partial utitility plan from Conifer Reality and from an instrument survey performed by James M. Parker, Land Surveyor, on September 13, 2000. No boundary survey was performed.
2. Former Canal Feeder located using Sanborn Maps provided by Environmental Risk Information & Imaging Services. Location should be considered approximate.
3. Location of 54" abandoned storm sewer from an as-built drawing by Teetor-Dobbins P.C., titled "Relocation Of Storm Drain Plan & Profile Sheet 2 of 3", drawing No. 2, dated June 1973. Location should be considered accurate to the degree implied by the method used.

FIELD VERIFIED BY **JAD**	DATE **11-2007**
DRAWN BY **RJM**	DATE DRAWN **11-6-2007**
SCALE **1" = 40'**	DATE ISSUED **11-6-2007**

day
DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14614-1008
NEW YORK, NEW YORK 10165-1617

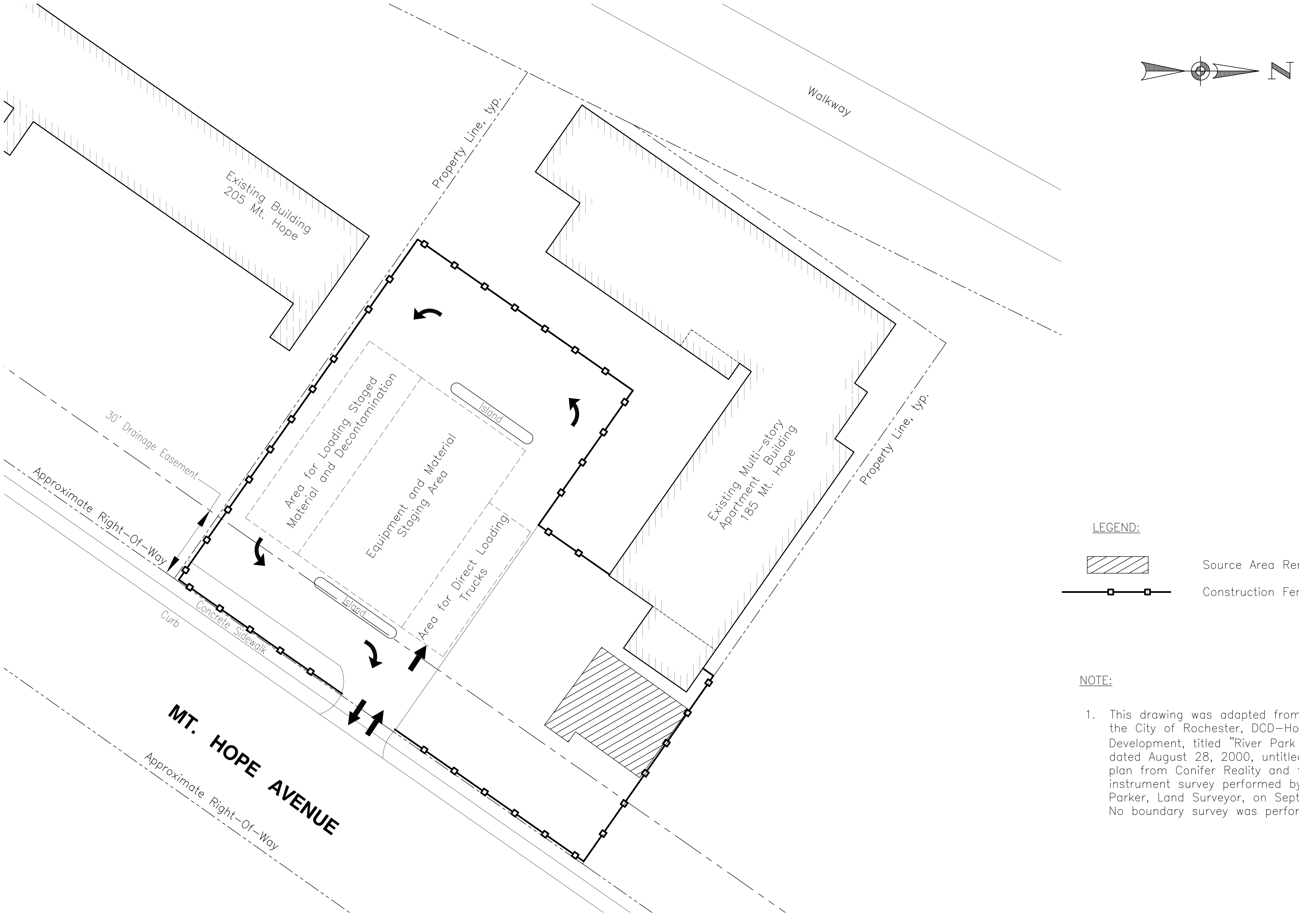
PROJECT TITLE
185 MT. HOPE AVENUE
ROCHESTER, NEW YORK

BROWNFIELD CLEANUP PROGRAM

DRAWING TITLE
Total VOCs In Groundwater Samples Collected 09-08-2005

PROJECT NO.
4003R-07

FIGURE 4



Site Plan
1"= 40'

LEGEND:

▨ Source Area Removal Excavation

—□—□— Construction Fencing

NOTE:

1. This drawing was adapted from a drawing by the City of Rochester, DCD–Housing & Project Development, titled "River Park Commons" dated August 28, 2000, untitled partial utitility plan from Conifer Realty and from an instrument survey performed by James M. Parker, Land Surveyor, on September 13, 2000. No boundary survey was performed.

FIELD VERIFIED BY	DATE
JAD	11-2007
DRAWN BY	DATE DRAWN
RJM/CPS	11-2007
SCALE	DATE ISSUED
1" = 40'	12-04-2007

day
DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14614-1008
NEW YORK, NEW YORK 10165-1617

PROJECT TITLE
185 MT. HOPE AVENUE
ROCHESTER, NEW YORK

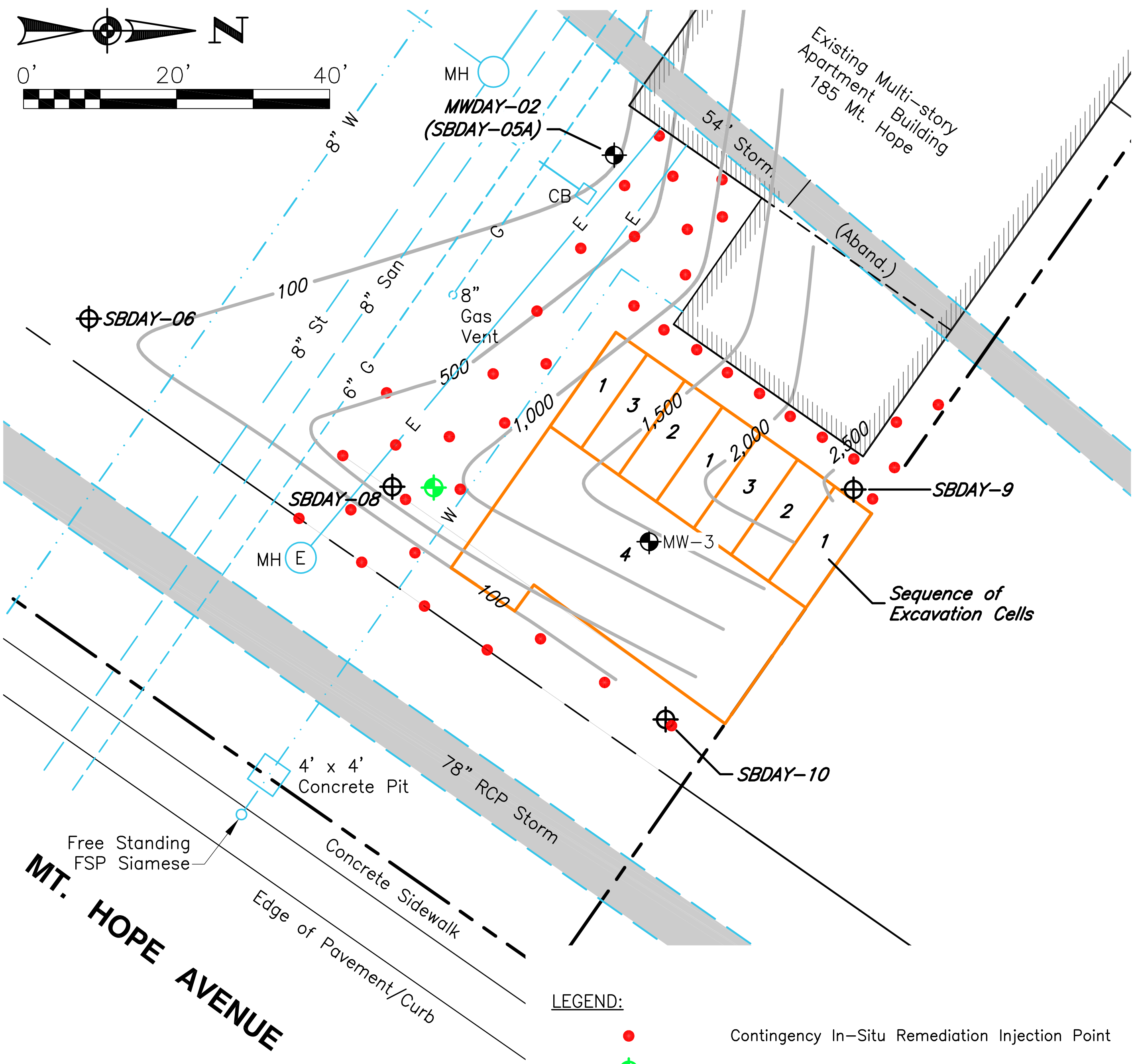
BROWNFIELD CLEANUP PROGRAM

DRAWING TITLE
Remedial Site Control Plan

PROJECT NO.
4003R-07

FIGURE 5

Ref4:
Ref5:
Ref6:
Ref1:
Ref2:
Ref3:
Xerox432AnsiB–2; 11 x 17
Layout Name: Layout 1
Time Plotted: Tues Dec 04 10:00 2007
File Name: Brownfield\4003R–07\4003R–6.dwg



LEGEND:

●	Contingency In–Situ Remediation Injection Point
⊕	Proposed New Well
⊕ MWDAY–02	Monitoring Well Location Installed February 2005
⊕ SBDAY–08	Test Boring Location
—100—	Total TCL and TIC VOCs in Soil Contour Line (ppm), Created by Golden Software, Inc. Surfer8 Program
—	Buried Utility
▭	Removal Area

NOTES:

1. This drawing was adapted from a drawing by the City of Rochester, DCD–Housing & Project Development, titled "River Park Commons" dated August 28, 2000, untitled partial utitility plan from Conifer Reality and from an instrument survey performed by James M. Parker, Land Surveyor, on September 13, 2000. No boundary survey was performed.

2. Location of 54" abandoned storm sewer from an as–built drawing by Teetor–Dobbins P.C., titled "Relocation Of Storm Drain Plan & Profile Sheet 2 of 3", drawing No. 2, dated June 1973. Location should be considered accurate to the degree implied by the method used.

DATE
12-03-2007

DRAWN BY
RJM/CPS

SCALE
1" = 20'

day

DAY ENVIRONMENTAL, INC.
ENVIRONMENTAL CONSULTANTS
ROCHESTER, NEW YORK 14614-1008
NEW YORK, NEW YORK 10165-1617

PROJECT TITLE
185 MT. HOPE AVENUE
ROCHESTER, NEW YORK

BROWNFIELD CLEANUP PROGRAM

DRAWING TITLE
Source Area Soil Removal and Contingency
In-Situ Remediation Injection Points

PROJECT NO.
4003R-07

FIGURE 6

S:\GIS Mapping\ErieHa3801S-06\Conham3618S-05 FEET.mxd

DATE
12-03-2007

DRAWN BY
CPS

SCALE
AS NOTED

DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14614-1008
New York, New York 10165-1617

PROJECT TITLE
185 MT. HOPE AVENUE
ROCHESTER, NEW YORK

BROWNFIELD CLEANUP PROGRAM

DRAWING TITLE
WELL LOCATION PLAN

PROJECT NO.
4003R-07

Figure 7

APPENDIX A

Health and Safety Plan

HEALTH AND SAFETY PLAN

BROWNFIELD CLEANUP PROGRAM
185 MOUNT HOPE AVENUE
ROCHESTER, NEW YORK
NYSDEC SITE ID C828124

Prepared for:	Conifer Hamilton, LLC. 183 East Main Street, 6th Floor Rochester, New York 14604
Prepared by:	Day Environmental, Inc. 40 Commercial Street Rochester, New York 14614
Project No.:	4003R-07
Date:	December 2007

TABLE OF CONTENTS

ATTACHMENTS

Attachment 1	Material Safety Data Sheets for Regenesis' ORC-Advanced® and RegenOx^{TM}
Attachment 2	Figure 1- Route for Emergency Service

1.0 INTRODUCTION

This Health and Safety Plan (HASP) outlines the policies and procedures necessary to protect workers and the public from potential environmental hazards posed during remediation activities under the New York State Department of Environmental Protection (NYSDEC) Brownfield Cleanup Program (BCP). The subject property is approximately 1.12 acres addressed as 185 Mount Hope Avenue, City of Rochester, County of Monroe, New York (Site). Figure 1 included in Attachment 2 depicts the general location of the Site. As outlined in this HASP, the remedial activities shall be conducted in a manner to minimize the probability of injury, accident, or incident occurrence.

Although the HASP focuses on the specific work activities planned for this Site, it must remain flexible due to the nature of this work. Conditions may change and unforeseen situations can arise that require deviations from the original HASP.

1.1 Site History/Overview

The Site is improved with an apartment building with an associated paved parking lot. The apartment building totals approximately 143,000 square feet and consists of a multi-level eight to twelve-story brick and concrete-block, slab-on-grade building constructed in 1975. The apartment building houses 202 residential units. The units primarily are one bedroom and studio apartments. Prior to the residential development in 1975, past uses of the Site included commercial and warehouse uses. Also, portions of a feeder canal and rail yards, and possibly a portion of a gasoline/service station, were located on the Site. Historical use of adjoining/nearby properties to the north included gasoline/service station use.

The Site is located in a mixed-use urban area. The Site is bounded to the north by open parkland, to the east by Mt. Hope Avenue with commercial and residential properties beyond, to the south by residential properties, and to the west by the Genesee Gateway Park with the Genesee River beyond.

The Site is located in an urban area that is serviced by the public water system. The Monroe County Department of Public Health (MCDPH) has no records of public or private drinking water wells or process water wells within a 0.25-mile radius of the Site. A review of a document titled “Ground Water Resources of Monroe County” (1935) revealed no groundwater supply wells on, or in the immediate area of, the Site.

The Site and surrounding area are generally level. The Genesee River is located approximately 130 feet west of the site. Surface water appears to flow off the Site toward Mount Hope Avenue to the east, and into the City of Rochester sewer system. Groundwater flows toward the southeast away from the Genesee River. This flow direction may be modified locally due to buried utilities, seasonal conditions, or other factors.

An October 24, 2000 Phase I Environmental Site Assessment report prepared by Day Environmental, Inc. (DAY) identified the following recognized environmental conditions (RECs) at the Site:

1. **<u>Historic Use of the Site:</u>** Former uses at the Site include: rail yards, former Erie Canal feeder, and possibly a portion of a gasoline station.

2. **Historic Use of Adjoining Properties:** Historic uses of adjoining properties include: gasoline stations to the north and possibly east of the Site (i.e., east of Mt. Hope Avenue); former railroad infrastructure to the west of the Site; and a former Erie Canal feeder, a rail yard, a tannery, iron cutting, and auto repair to the south of the Site.

Subsequent intrusive environmental studies conducted between 2000 and 2003 identified petroleum contamination in soil and groundwater on the northeastern portion of the Site. In August 2004, the NYSDEC assigned Spill File # 0470234 due to the petroleum contamination that is present on the Site (i.e., 185 Mt. Hope Avenue).

A Remedial Investigation/Remedial Alternatives Analysis (RI/RAA) Report dated May 2007 was prepared by DAY. Tasks performed as part of the remedial investigation to evaluate or address the RECs identified above included:

- Conducting an EM-61 geophysical survey and subsequent test pit study to assist in evaluating the locations of suspect underground storage tanks (USTs);
- Evaluating surface soil conditions;
- Evaluating subsurface soil conditions;
- Evaluating groundwater quality conditions and groundwater movement characteristics;
- Conducting a vapor intrusion study to evaluate whether volatile organic compounds (VOCs) in soil or groundwater were volatilizing and impacting indoor air inside the apartment building on the Site; and
- Conducting a soil vapor study to evaluate whether VOCs were preferentially migrating along select buried utilities.

The findings of the remedial investigation are summarized below:

- Constituents were not detected in surface soil samples at concentrations above Track 2 soil cleanup objectives (SCOs) for Restricted Residential Use as set forth in Table 375-6.8(b) of the NYSDEC document titled “6 NYCRR Part 375 Environmental Remediation Program” dated December 14, 2006.
- Concentrations of petroleum-related VOCs and semi-volatile organic compounds (SVOCs) in subsurface soil and groundwater were generally highest on the northeastern portion of the Site in proximity to the portion of the adjoining property to the north that was formerly improved with gasoline/service stations. A plume associated with this area of petroleum contamination appears to extend southward across the Site. Based on the remedial investigation, the soil contamination starts between 7.0 feet and 10 feet below the ground surface and generally extends to depths between 14 feet and 18 feet below the ground surface. The groundwater on this portion of the Site has been measured at depths ranging between approximately 14 and 17 feet below the ground surface. As such, some of the soil contamination is located in the vadose zone (i.e., above the groundwater table) on at least a seasonal basis.
- Track 2 SCOs for Restricted Residential Use for the area of petroleum contamination on the northeast portion of the Site were only exceeded at one test location (i.e., test boring

SBDAY-09). In addition, test boring SBDAY-08 located within this area of petroleum contamination contained a concentration of manganese [i.e., 4,060 parts per million (ppm)] that exceeded its Track 2 SCO of 2,000 ppm for Restricted Residential Use.

- A sample of fill material at test location SBDAY-02 contained some polyaromatic hydrocarbon (PAH) SVOCs and the metal mercury at concentrations that exceeded Track 2 SCOs for Restricted Residential Use. This test boring was advanced within the footprint of the former feeder canal.
- Groundwater samples from wells MWDAY-01 and MW-3 contained concentrations of VOCs and/or SVOCs that exceeded groundwater standards or guidance values as referenced in the Division of Water Technical and Operational Guidance Series 1.1.1 document titled "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations" (TOGS 1.1.1), June 1998 (as amended by an April 2000 addendum). Concentrations of VOCs in groundwater tend to decrease as the distance away from the northeast portion of the Site is increased. Based on field findings and analytical laboratory testing of soil and groundwater samples, the length of the petroleum plume located south of the northeastern portion of the Site is estimated to be at least 140 feet long. Petroleum constituents were not detected in groundwater located in the right-of-way of Mt. Hope Avenue approximately 70 feet southeast of the northeast portion of the Site.
- The results of a vapor intrusion evaluation indicate indoor air quality inside the on-site high-rise apartment building has not been impacted as a result of VOC vapors present in subsurface soil and groundwater beneath and in proximity to this building.
- Evidence of light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL) was not detected at test boring, test pit or monitoring well locations.
- Evidence of underground storage tanks was not encountered on the Site.
- Apparent sources of petroleum identified during the remedial investigation include former gasoline/service station use on the northeast portion of the Site (i.e., gasoline tanks associated with a former gasoline station that may have been present at the site) and at locations on adjoining/nearby property(s) north of the Site.
- Apparent sources of other types of constituents (e.g., some PAH SVOCs, metals, cyanide, etc.) may be attributable to surficial fill materials that were documented at the Site.

1.2 Planned Activities Covered by HASP

This HASP is intended to be used during this NYSDEC BCP project for remedial activities. Currently, identified activities include:

- Site preparation activities (i.e., put up NYSDEC Remediation Project sign and construction fencing);
- Source area soil removal using heavy equipment;
- Possible dewatering of excavation;
- Post-excavation soil sampling;
- Bioremediation application in excavation using Regenesis' ORC-Advanced®;

- Backfilling the source area excavation;
- Installation and development of a new groundwater monitoring well;
- Contingency for limited in-situ remediation beyond the footprint of the source area soil removal excavation using Regenesis' RegenOx™ and ORC-Advanced®;
- Groundwater monitoring; and
- Miscellaneous on-site tasks that may arise during this project.

ORC-Advanced® is a proprietary formulation of calcium oxy-hydroxide that produces a controlled release of oxygen for a period of up to 12 months. ORC-Advanced® is used to accelerate the rate of naturally occurring aerobic contaminant biodegradation in groundwater and saturated soils. RegenOx™ is a solid alkaline oxidant that uses a sodium percarbonate complex with a multi-part catalytic formula. The product consists of an oxidizer complex ("Part A") and an activator complex ("Part B") that are mixed with water, combined aboveground, and then injected into the subsurface using common drilling or direct-push equipment or mixed with impacted media that are then placed back in the excavation. Once in the subsurface, the product produces an effective surface-mediated oxidation reaction comparable to that of Fenton's Reagent, without a violent exothermic reaction. RegenOx™ destroys a wide range of contaminants (including petroleum constituents) in both soil and groundwater. A copy of the material safety data sheets (MSDS) for ORC-Advanced® and RegenOx™ are included in Attachment 1.

This HASP can be modified to cover other site activities as deemed appropriate. The owner of the property, its contractors, and other site workers will be responsible for the development and/or implementation of health and safety provisions associated with normal construction activities or site activities.

2.0 KEY PERSONNEL AND MANAGEMENT

The Project Manager (PM) and Site Safety Officer (SSO) are responsible for formulating and enforcing health and safety requirements, and implementing the HASP.

2.1 Project Manager

The PM has the overall responsibility for the project and will coordinate with the SSO to ensure that the goals of the remedial program are attained in a manner consistent with the HASP requirements.

2.2 Site Safety Officer

The SSO has responsibility for administering the HASP relative to site activities, and will be in the field full-time while site activities are in progress. The SSO's operational responsibilities will be monitoring, including personal and environmental monitoring, ensuring personal protective equipment maintenance, and assignment of protection levels. The SSO will be the main contact in any on-site emergency situation. The SSO will direct field activities involved with safety and be responsible for stopping work when unacceptable health or safety risks exist. The SSO is responsible for ensuring that on-site personnel understand and comply with the safety requirements in this HASP.

2.3 Employee Safety Responsibility

Each employee is responsible for personal safety as well as the safety of others in the area. The employee will use the equipment provided in a safe and responsible manner as directed by the SSO.

2.4 Key Safety Personnel

The following individuals are anticipated to share responsibility for health and safety at the site.

Project Manager	Jeffrey A. Danzinger
Site Safety Officer	Mathew K. Dickinson, Glenn R. Miller, Kelly A. Crandall, or Samuel C. Price

3.0 SAFETY RESPONSIBILITY

Contractors, consultants, state or local agencies, or other parties, and their employees, involved with this project will be responsible for their own safety while on-site. Their employees will be required to understand the information contained in this HASP, and must follow the recommendations that are made in this document. As an alternative, contractors, consultants, state or local agencies, or other parties, and their employees, involved with this project can utilize their own health and safety plan for this project as long as it is found acceptable to the New York State Department of Health (NYSDOH) and/or the MCDPH.

4.0 JOB HAZARD ANALYSIS

There are many hazards associated with remedial work on a site, and this HASP discusses some of the anticipated hazards for this Site. The hazards listed below deal specifically with those hazards associated with the management of potentially contaminated media (e.g., soil, groundwater, fill, etc.).

4.1 Chemical Hazards

Chemical substances can enter the unprotected body by inhalation, skin absorption, ingestion, or injection (i.e., a puncture would, etc.). A contaminant can cause damage to the point of contact or can act systemically, causing a toxic effect at a part of the body distant from the point of initial contact.

A list of selected VOCs, SVOCs, and metals that have been detected at the Site and exceed soil or groundwater standards, criteria and guidance (SCG) values are presented below. This list also presents the Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs), National Institute for Occupational Safety and Health (NIOSH) recommended exposure limits (RELs), and NIOSH immediately dangerous to life or health (IDLH) levels.

CONSTITUENT	OSHA PEL	NIOSH REL	IDLH
Benzene	1 ppm	0.1 ppm	500 ppm
Toluene	200 ppm	100 ppm	500 ppm
Ethylbenzene	100 ppm	100 ppm	800 ppm
Xylenes	100 ppm	100 ppm	900 ppm
Isopropylbenzene	50 ppm	50 ppm	900 ppm
1,2-Dichloroethane	1 ppm	50 ppm	50 ppm
Naphthalene	10 ppm	10 ppm	250 ppm
Phenol	5 ppm	5 ppm	250 ppm
Benzo(a)anthracene	NA	NA	NA
Benzo(b)fluoranthene	0.2 mg/m^3	0.1 mg/m^3	80 mg/m^3
Benzo(a)pyrene	0.2 mg/m^3	0.1 mg/m^3	80 mg/m^3
Mercury	0.1 mg/m^3	0.05 mg/m^3	10 mg/m^3
Manganese	5 mg/m^3	1 mg/m^3	500 mg/m^3

NA = Not Available

The potential routes of exposure for these analytes and chemicals include inhalation, ingestion, skin absorption and/or skin/eye contact. The potential for exposure through any one of these routes will depend on the activity conducted. The most likely routes of exposure for the activities that are performed during remedial activities at the Site include inhalation and skin/eye contact.

4.2 Physical Hazards

There are physical hazards associated with this project, which might compound the chemical hazards. Hazard identification, training, adherence to the planned remedial measures, and careful housekeeping can prevent many problems or accidents arising from physical hazards. Potential physical hazards associated with this project and suggested preventative measures include:

- Slip/Trip/Fall Hazards - Some areas may have wet surfaces that will greatly increase the possibility of inadvertent slips. Caution must be exercised when using steps and stairs due to slippery surfaces in conjunction with the fall hazard. Good housekeeping practices are essential to minimize the trip hazards.

- Small Quantity Flammable Liquids - Small quantities of flammable liquids will be stored in "safety" cans and labeled according to contents.

- Electrical Hazards - Electrical devices and equipment shall be de-energized prior to working near them. All extension cords will be kept out of water, protected from crushing, and inspected regularly to ensure structural integrity. Temporary electrical circuits will be protected with ground fault circuit interrupters. Only qualified electricians are authorized to work on electrical circuits. Heavy equipment (e.g., excavator, backhoe, drill rig) shall not be operated within 10 feet of high voltage lines, unless proper protection from the high voltage lines is provided by the appropriate utility company.

- Noise - Work around large equipment often creates excessive noise. The effects of noise can include:

    - Workers being startled, annoyed, or distracted.
    - Physical damage to the ear resulting in pain, or temporary and/or permanent hearing loss.
    - Communication interference that may increase potential hazards due to the inability to warn of danger and proper safety precautions to be taken.

  Proper hearing protection will be worn as deemed necessary. In general, feasible administrative or engineering controls shall be utilized when on-site personnel are subjected to noise exceeding an 8-hour time weighted average (TWA) sound level of 90 dBA (decibels on the A-weighted scale). In addition, whenever employee noise exposures equal or exceed an 8-hour TWA sound level of 85 dBA, employers shall administer a continuing, effective hearing conservation program as described in the OSHA Regulation 29 CFR Part 1910.95.

- Heavy Equipment - Each morning before start-up, heavy equipment will be inspected to ensure safety equipment and devices are operational and ready for immediate use.

- Subsurface and Overhead Hazards - Before any excavation activity, efforts will be made to determine whether underground utilities and potential overhead hazards will be encountered. Underground utility clearance must be obtained prior to subsurface work.

4.3 Environmental Hazards

Environmental factors such as weather, wild animals, insects, and irritant plants can pose a hazard when performing outdoor tasks. The SSO shall make every reasonable effort to alleviate these hazards should they arise.

4.3.1 Heat Stress

The combination of warm ambient temperature and protective clothing increases the potential for heat stress. In particular:

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

Site workers will be encouraged to increase consumption of water or electrolyte-containing beverages such as Gatorade® when the potential for heat stress exists. In addition, workers are encouraged to take rests whenever they feel any adverse effects that may be heat-related. The frequency of breaks may need to be increased upon worker recommendation to the SSO.

4.3.2 Exposure to Cold

With outdoor work in the winter months, the potential exists for hypothermia and frostbite. Protective clothing greatly reduces the possibility of hypothermia in workers. However, personnel will be instructed to wear warm clothing and to stop work to obtain more clothing if they become too cold. Employees will also be advised to change into dry clothes if their clothing becomes wet from perspiration or from exposure to precipitation.

5.0 SITE CONTROLS

To prevent migration of contamination caused through tracking by personnel or equipment, work areas, and personal protective equipment staging/decontamination areas will be specified prior to beginning operations.

5.1 Site Zones

In the area where contaminated materials present the potential for worker exposure (work zone), personnel entering the area must wear the mandated level of protection for the area. A "transition zone" shall be established where personnel can begin and complete personal and equipment decontamination procedures. This can reduce potential off-site migration of contaminated media. Contaminated equipment or clothing will not be allowed outside the transition zone (e.g., on clean portions of the Site) unless properly containerized for disposal. Operational support facilities will be located outside the transition zone (i.e., in a "support zone"), and normal work clothing and support equipment are appropriate in this area. If possible, the support zone should be located upwind of the work zone and transition zone.

5.2 General

The following items will be requirements to protect the health and safety of workers during implementation of activities that disturb contaminated material.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand to mouth transfer and ingestion of contamination shall not occur in the work zone and/or transition zone during disturbance of contaminated material.

- Personnel admitted in the work zone shall be properly trained in health and safety techniques and equipment usage.

- No personnel shall be admitted in the work zone without the proper safety equipment.

- Proper decontamination procedures shall be followed before leaving the Site.

6.0 PROTECTIVE EQUIPMENT

This section addresses the various levels of personal protective equipment (PPE), which are or may be required at this job site. Personnel entering the work zone and transition zone shall be trained in the use of the anticipated PPE to be utilized.

6.1 Anticipated Protection Levels

TASK	PROTECTION LEVEL	COMMENTS/MODIFICATIONS
Site mobilization	D	
Site preparation	D	
Extrusive work (e.g., surveying, etc.)	D	
Intrusive work (e.g., advancement of borings, excavation of soils, collecting samples, etc.)	C/Modified D/D	Based on air monitoring, and SSO discretion
Support zone	D	
Site breakdown and demobilization	D	

It is anticipated that work conducted as part of this project will be performed in Level D or modified Level D PPE. If conditions are encountered that require Level A or Level B PPE, the work will immediately be stopped. The appropriate government agencies (e.g., NYSDEC, NYSDOH, MCDPH, etc.) will be notified and the proper health and safety measures will be implemented (e.g., develop and implement engineering controls, upgrade in PPE, etc.).

6.2 Protection Level Descriptions

This section lists the minimum requirements for each protection level. Modifications to these requirements can be made upon approval of the SSO. If Level A, Level B, and/or Level C PPE is required, Site personnel that enter the work zone and/or transition zone must be properly trained and certified in the use of those levels of PPE.

6.2.1 Level D

Level D consists of the following:

- Safety glasses
- Hard hat when working with heavy equipment
- Steel-toed or composite-toed work boots
- Protective gloves during sampling or handling of potentially contaminated media
- Work clothing as prescribed by weather

6.2.2 Modified Level D

Modified Level D consists of the following:

- Safety glasses with side shields
- Hard hat when working with heavy equipment
- Steel-toed or composite-toed work boots
- Work gloves
- Outer protective wear, such as Tyvek coverall [Tyveks (Sarans) and polyvinyl chloride (PVC) acid gear will be required when workers have a potential to be exposed to impacted liquids or impacted particulates].

6.2.3 Level C

Level C consists of the following:

- Air-purifying respirator with appropriate cartridges
- Outer protective wear, such as Tyvek coverall [Tyveks (Sarans) and PVC acid gear will be required when workers have a potential to be exposed to impacted liquids or particulates].
- Hard hat when working with heavy equipment
- Steel-toed or composite-toed work boots
- Nitrile, neoprene, or PVC overboots, if appropriate
- Nitrile, neoprene, or PVC gloves, if appropriate
- Face shield (when projectiles or splashes pose a hazard)

6.2.4 Level B

Level B protection consists of the items required for Level C protection with the exception that an air-supplied respirator is used in place of the air-purifying respirator. Level B PPE is not anticipated to be required during this project. If the need for level B PPE becomes evident, site remediation activities will be stopped until site conditions are further evaluated, and any necessary modifications to the HASP have been approved by the PM and SSO. Subsequently, the appropriate safety measures (including Level B PPE) must be implemented prior to commencing site activities.

6.2.5 Level A

Level A protection consists of the items required for Level B protection with the addition of a fully-encapsulating, vapor-proof suit capable of maintaining positive pressure. Level A PPE is not anticipated to be required during this project. If the need for level A PPE becomes evident, site remediation activities will be stopped until site conditions are further evaluated, and any necessary modifications to the HASP have been approved by the PM and SSO. Subsequently, the appropriate safety measures (including Level A PPE) must be implemented prior to commencing site activities.

6.3 Respiratory Protection

Any respirator used will meet the requirements of the OSHA 29 CFR 1910.134. Both the respirator and cartridges specified shall be fit-tested prior to use in accordance with OSHA regulations (29 CFR 1910). Air purifying respirators shall not be worn if contaminant levels exceed designated use concentrations. The workers will wear respirators with approval for: organic vapors <1,000 ppm; and dusts, fumes and mists with a TWA < 0.05 mg/m^3.

No personnel who have facial hair, which interferes with respirator sealing surface, will be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use.

Only workers who have been certified by a physician as being physically capable of respirator usage shall be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas that require respirator protection.

7.0 DECONTAMINATION PROCEDURES

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

7.1 Personnel Decontamination

Personnel involved with activities that involve disturbing contaminated media will follow the decontamination procedures described herein to ensure that material which workers may have contacted in the work zone and/or transition zone does not result in personal exposure and is not spread to clean areas of the Site. This sequence describes the general decontamination procedure. The specific stages can vary depending on the Site, the task, and the protection level, etc.

1. Leave work zone and go to transition zone
2. Remove soil/debris from boots and gloves
3. Remove boots
4. Remove gloves
5. Remove Tyvek suit and discard, if applicable
6. Remove and wash respirator, if applicable
7. Go to support zone

7.2 Equipment Decontamination

Contaminated equipment shall be decontaminated in the transition zone before leaving the Site. Decontamination procedures can vary depending upon the contaminant involved, but may include sweeping, wiping, scraping, hosing, or steam cleaning the exterior of the equipment. Personnel performing this task will wear the proper PPE.

7.3 Disposal

Disposable clothing will be disposed in accordance with applicable regulations. Liquids (e.g., decontamination water, etc.) or solids (e.g., soil) generated by remedial activities will be disposed in accordance with applicable regulations.

8.0 AIR MONITORING

Air monitoring will be conducted in order to determine airborne particulate and contamination levels. This ensures that respiratory protection is adequate to protect personnel against the chemicals that are encountered and that chemical contaminants are not migrating off-site. Additional air monitoring may be conducted at the discretion of the SSO. Readings will be recorded and be available for review.

The following chart describes the direct reading instrumentation that will be utilized and appropriate action levels.

Monitoring Device	Action level	Response/Level of PPE
PID Volatile Organic Compound Meter	< 1 ppm in breathing zone, sustained 5 minutes	Level D
	1-25 ppm in breathing zone, sustained 5 minutes	Level C
	26-250 ppm in breathing zone, sustained 5 minutes	Level B, Stop work, evaluate the use of engineering controls
	>250 ppm in breathing zone	Level A, Stop work, evaluate the use of engineering controls
RTAM Particulate Meter	< 150 $\mu g/m^3$ over an integrated period not to exceed 15 minutes.	Continue working
	> 150 $\mu g/m^3$	Cease work, implement dust suppression, change in way work performed, etc. If levels can not be brought below 150 $\mu g/m^3$, then upgrade PPE to Level C.

8.1 Particulate Monitoring

During activities where contaminated materials (e.g., fill) may be disturbed, air monitoring will include real-time monitoring for particulates using a real-time aerosol monitor (RTAM) particulate meter at the perimeter of the work zone in accordance with the 1989 NYSDEC Technical and Administrative Guidance Memorandum (TAGM) #4031 entitled, “Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites.” The TAGM uses an action level of 150 $\mu g/m^3$ (0.15 mg/m^3) over an integrated period not to exceed 15 minutes. If the action level is exceeded, or if visible dust is encountered, then work shall be discontinued until corrective actions are implemented. Corrective actions may include dust suppression, change in the way work is performed, and/or upgrade of personal protective equipment.

8.2 Volatile Organic Compound Monitoring

During activities where contaminated materials may be disturbed, a photoionization detector (PID) will be used to monitor total VOCs in the ambient air. The PID will prove useful as a direct reading instrument to aid in determining if current respiratory protection is adequate or needs to be upgraded. The SSO will take measurements before operations begin in an area to determine the amount of VOCs naturally occurring in the air. This is referred to as a background level. Levels of VOCs will periodically be measured in the air at active work sites, and at the transition zone when levels are detected above background in the work zone.

8.3 Community Air Monitoring Plan

This Community Air Monitoring Plan (CAMP) includes real-time monitoring for VOCs and particulates (i.e., dust) at the downwind perimeter of each designated work area when activities with the potential to release VOCs or dust are in progress at the Site. This CAMP is based on the NYSDOH Generic CAMP included as Appendix 1A of the NYSDEC document titled *"Draft DER-10, Technical Guidance for Site Investigation and Remediation"* dated December 2002. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of project activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air. Reliance on the CAMP should not preclude simple, common sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Continuous monitoring will be conducted during ground intrusive activities. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, advancement/installation of test borings or monitoring wells, etc.

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

8.3.1 VOC Monitoring, Response Levels, and Actions

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

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

The 15-minute readings must be recorded and made available for NYSDEC and NYSDOH personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

8.3.2 Particulate Monitoring, Response Levels, and Actions

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

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ 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 $\mu g/m^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

Readings will be recorded and made available for NYSDEC and NYSDOH personnel to review.

9.0 EMERGENCY RESPONSE

To provide first-line assistance to field personnel in the case of illness or injury, the following items will be made immediately available on the Site:

- First-aid kit;
- Portable emergency eye wash; and
- Supply of clean water.

9.1 Emergency Telephone Numbers

The following telephone numbers are listed in case there is an emergency at the Site:

Fire/Police Department:	911
Poison Control Center:	(800) 222-1222
NYSDEC	
Kelly Cloyd	(585) 226-5351
Spills	(585) 226-2466
NYSDOH	
Debra McNaughton	(585) 423-8069
MCDPH	
Joe Albert	(585) 753-5904
CONIFER HAMILTON LLC	
Allen Handelman	(585) 324-0512
DAY ENVIRONMENTAL, INC.	
Jeff Danzinger	(585) 454-0210 x114
Ray Kampff	(585) 454-0210 x108
Nearest Hospital	Highland Hospital 1000 South Avenue Rochester, NY 14620 (585) 473-2200 (Main) (585) 341-6880 (Emergency Department)
Directions to the Hospital:	Turn right (southwest) onto NY-15/Mount Hope Avenue travel approximately <0.1 miles. Turn left (east) onto Hamilton Street and travel approximately 0.3 miles. Turn right (south) onto South Avenue and travel approximately 0.7 miles. Turn left (east) into Highland Hospital and follow signs to the Emergency Department (refer to Figure 1 in Attachment 2).

9.2 Evacuation

A log of each individual entering and leaving the Site will be kept for emergency accounting practices. Although unlikely, it is possible that a site emergency could require evacuating personnel from the site. If required, the SSO will give the appropriate signal for site evacuation (i.e., hand signals, alarms, etc.).

All personnel shall exit the site and shall congregate in an area designated by the SSO. The SSO shall ensure that all personnel are accounted for. If someone is missing, the SSO will alert emergency personnel. The appropriate government agencies will be notified as soon as possible regarding the evacuation, and any necessary measures that may be required to mitigate the reason for the evacuation.

9.3 Medical Emergency

In the event of a medical emergency involving illness or injury to one of the on-site personnel, the Site should be shut down and immediately secured. The appropriate government agencies should be notified immediately. The area in which the injury or illness occurred shall not be entered until the cause of the illness or injury is known. The nature of injury or illness shall be assessed. If the victim appears to be critically injured, administer first aid and/or cardio-pulmonary resuscitation (CPR) as needed. Instantaneous real-time air monitoring shall be done in accordance with air monitoring outlined in Section 8.0 of this HASP.

9.4 Contamination Emergency

It is unlikely that a contamination emergency will occur; however, if such an emergency does occur, the Site shall be shut down and immediately secured. If an emergency rescue is needed, notify Police, Fire Department and Emergency Medical Service (EMS) Units immediately. Advise them of the situation and request an expedient response. The appropriate government agencies shall be notified immediately. The area in which the contamination occurred shall not be entered until the arrival of trained personnel who are properly equipped with the appropriate PPE and monitoring instrumentation as outlined in Section 8.0 of this HASP.

9.5 Fire Emergency

In the event of a fire on-site, the Site shall be shut down and immediately secured. The area in which the fire occurred shall not be entered until the cause can be determined. All non-essential site personnel shall be evacuated from the site to a safe, secure area. Notify the Fire Department immediately. Advise the Fire Department of the situation and the identification of any hazardous materials involved. The appropriate government agencies shall be notified as soon as possible.

The four classes of fire along with their constituents are as follows:

Class A:	Wood, cloth, paper, rubber, many plastics, and ordinary combustible materials.
Class B:	Flammable liquids, gases and greases.

Class C: Energized electrical equipment.

Class D: Combustible metals such as magnesium, titanium, sodium, potassium.

Small fires on-site may be actively extinguished; however, extreme care shall be taken while in this operation. Approaches to the fire shall be done from the upwind side if possible. Distance from on-site personnel to the fire shall be close enough to ensure proper application of the extinguishing material, but far enough away to ensure that the personnel are safe. The proper extinguisher shall be utilized for the Class(s) of fire present on the site. If possible, the fuel source shall be cut off or separated from the fire. Care must be taken when performing operations involving the shut-off values and manifolds, if present.

Examples of proper extinguishing agent as follows:

Class A: Water
Water with 1% AFFF Foam (Wet Water)
Water with 6% AFFF or Fluorprotein Foam
ABC Dry Chemical

Class B: ABC Dry Chemical
Purple K
Carbon Dioxide
Water with 6% AFFF Foam

Class C: ABC Dry Chemical
Carbon Dioxide

Class D: Metal-X Dry Powder

No attempt shall be made against large fires. These shall be handled by the Fire Department.

9.6 Spill or Air Release

In the event of spills or air releases of hazardous materials on-site, the Site shall be shut down and immediately secured. The area in which the spills or releases occurred shall not be entered until the cause can be determined and site safety can be evaluated. Non-essential site personnel shall be evacuated from the Site to a safe and secure area. The appropriate government agencies shall be notified as soon as possible. The spilled or released materials shall be immediately identified and appropriate containment measures shall be implemented, if possible. Real-time air monitoring shall be implemented as outlined in Section 8.0 of this HASP. If the materials are unknown, Level B protection is mandatory. Samples of the materials shall be acquired to facilitate identification.

9.7 Locating Containerized Waste and/or Underground Storage Tanks

In the event that unanticipated containerized waste (e.g., drums) and/or USTs are located during remedial activities, the Site shall be shut down and immediately secured. The area where unanticipated containerized wastes and/or tanks are discovered shall not be entered until site safety can be evaluated. Non-essential Site personnel shall be evacuated from the Site to a safe and secure area. The appropriate government agencies shall be notified as soon as possible. The SSO shall monitor the area as outlined in Section 8.0 of this HASP.

Prior to any handling, unanticipated containers will be visually assessed by the SSO to gain as much information as possible about their contents. As a precautionary measure, personnel shall assume that unlabelled containers and/or tanks contain hazardous materials until their contents are characterized. To the extent possible based upon the nature of the containers encountered, actions may be taken to stabilize the area and prevent migration (e.g., placement of berms, etc.). Subsequent to initial visual assessment and any required stabilization, properly trained personnel will sample, test, remove, and dispose of any containers and/or tanks, and their contents. After visual assessment and air monitoring, if the material remains unknown, Level B protection is mandatory.

10.0 ABBREVIATIONS

BCP	Brownfield Cleanup Program
CAMP	Community Air Monitoring Program
CPR	Cardio-Pulmonary Resuscitation
DAY	Day Environmental, Inc.
dBA	Decibels on the A-Weighted Scale
DNAPL	Dense Non-Aqueous Phase Liquid
EMS	Emergency Medical Service
HASP	Health and Safety Plan
IDLH	Immediately Dangerous to Life or Heath
LNAPL	Light Non Aqueous Phase Liquid
MCDPH	Monroe County Department of Public Health
mg/m^3	Milligram Per Meter Cubed
NIOSH	National Institute for Occupational Safety and Health
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
PAH	Polyaromatic Hydrocarbon
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PM	Project Manager
PM-10	Particulate Matter Less Than 10 Micrometers In Diameter
PPE	Personal Protection Equipment
ppm	Parts Per Million
PVC	Polyvinyl Chloride
REC	Recognized Environmental Condition
REL	Recommended Exposure Limit
RI/RAA	Remedial Investigation/Remedial Alternatives Analysis
RTAM	Real-Time Aerosol Monitor
SCG	Standards, Criteria and Guidance
SCO	Soil Cleanup Objective
SSO	Site Safety Officer
SVOC	Semi-Volatile Organic Compound
TAGM	Technical and Administrative Guidance Memorandum
TOGS	Technical and Operational Guidance Series
TWA	Time-Weighted Average
$\mu g/m^3$	Micrograms Per Meter Cubed
UST	Underground Storage Tank
VOC	Volatile Organic Compound

ATTACHMENT 1

Material Safety Data Sheets for Regenesis' ORC-Advanced® and RegenOx^{TM}

Oxygen Release Compound – Advanced (ORC *Advanced*™)
MATERIAL SAFETY DATA SHEET (MSDS)

Last Revised: March 13, 2007

Section 1 - Material Identification

Supplier:

REGENESIS

1011 Calle Sombra
San Clemente, CA 92673

Phone:	**949.366.8000**
Fax:	**949.366.8090**
E-mail:	**info@regenesis.com**
Chemical Description:	A mixture of Calcium OxyHydroxide [$CaO(OH)_2$] and Calcium Hydroxide [$Ca(OH)_2$].
Chemical Family:	Inorganic Chemical
Trade Name:	Advanced Formula Oxygen Release Compound (ORC *Advanced*™)
Chemical Synonyms	Calcium Hydroxide Oxide; Calcium Oxide Peroxide
Product Use:	Used to remediate contaminated soil and groundwater (environmental applications)

Section 2 – Composition

CAS No.	**Chemical**
682334-66-3	**Calcium Hydroxide Oxide [$CaO(OH)_2$]**
1305-62-0	**Calcium Hydroxide [$Ca(OH)_2$]**
7758-11-4	**Dipotassium Phosphate (HK_2O_4P)**
7778-77-0	**Monopotassium Phosphate (H_2KO_4P)**

Section 3 – Physical Data

Form:	Powder
Color:	White to Pale Yellow
Odor:	Odorless
Melting Point:	527 °F (275 °C) – Decomposes
Boiling Point:	Not Applicable (NA)
Flammability/Flash Point:	NA
Auto- Flammability:	NA
Vapor Pressure:	NA
Self-Ignition Temperature:	NA
Thermal Decomposition:	527 °F (275 °C) – Decomposes
Bulk Density:	0.5 – 0.65 g/ml (Loose Method)
Solubility:	1.65 g/L @ 68° F (20° C) for calcium hydroxide.
Viscosity:	NA
pH:	11-13 (saturated solution)
Explosion Limits % by Volume:	Non-explosive
Hazardous Decomposition Products:	Oxygen, Hydrogen Peroxide, Steam, and Heat
Hazardous Reactions:	None

Section 4 – Reactivity Data

Stability:	Stable under certain conditions (see below).
Conditions to Avoid:	Heat and moisture.
Incompatibility:	Acids, bases, salts of heavy metals, reducing agents, and flammable substances.
Hazardous Polymerization:	Does not occur.

Section 5 – Regulations

TSCA Inventory List:	Listed

CERCLA Hazardous Substance (40 CFR Part 302)

Listed Substance:	No
Unlisted Substance:	Yes
Reportable Quantity (RQ):	100 pounds
Characteristic(s):	Ignitibility
RCRA Waste Number:	D001

SARA, Title III, Sections 302/303 (40 CFR Part 355 – Emergency Planning and Notification)

Extremely Hazardous Substance:	No

SARA, Title III, Sections 311/312 (40 CFR Part 370 – Hazardous Chemical Reporting: Community Right-To-Know

Hazard Category:	Immediate Health Hazard Fire Hazard
Threshold Planning Quantity:	10,000 pounds

Section 5 – Regulations (cont)

SARA, Title III, Section 313 (40 CFR Part 372 – Toxic Chemical Release Reporting: Community Right-To-Know

Extremely Hazardous Substance:	No	
WHMIS Classification:	C	Oxidizing Material Poisonous and Infectious Material
	D	Material Causing Other Toxic Effects – Eye and Skin Irritant
Canadian Domestic Substance List:	Not Listed	

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage:	Keep in tightly closed container. Store in dry area, protected from heat sources and direct sunlight.
Handling:	Clean and dry processing pipes and equipment before operation. Never return unused product to the storage container. Keep away from incompatible products. Containers and equipment used to handle this product should be used exclusively for this material. Avoid contact with water or humidity.

Section 6 – Protective Measures, Storage and Handling (cont)

Personal Protective Equipment (PPE)

Engineering Controls:	Calcium Hydroxide ACGIH® TLV® (2000) 5 mg/m^3 TWA OSHA PEL Total dust–15 mg/m^3 TWA Respirable fraction– 5 mg/m^3 TWA NIOSH REL (1994) 5 mg/m^3
Respiratory Protection:	For many conditions, no respiratory protection may be needed; however, in dusty or unknown atmospheres use a NIOSH approved dust respirator.
Hand Protection:	Impervious protective gloves made of nitrile, natural rubbber or neoprene.
Eye Protection:	Use chemical safety goggles (dust proof).
Skin Protection:	For brief contact, few precautions other than clean clothing are needed. Full body clothing impervious to this material should be used during prolonged exposure.
Other:	Safety shower and eyewash stations should be present. Consultation with an industrial hygienist or safety manager for the selection of PPE suitable for working conditions is suggested.
Industrial Hygiene:	Avoid contact with skin and eyes.
Protection Against Fire & Explosion:	NA

Section 7 – Hazards Identification

Emergency Overview:	Oxidizer – Contact with combustibles may cause a fire. This material decomposes and releases oxygen in a fire. The additional oxygen may intensify the fire.
Potential Health Effects:	Irritating to the mucous membrane and eyes. If the product splashes in ones face and eyes, treat the eyes first. Do not dry soiled clothing close to an open flame or heat source. Any

	clothing that has been contaminated with this product should be submerged in water prior to drying.
Inhalation:	High concentrations may cause slight nose and throat irritation with a cough. There is risk of sore throat and nose bleeds if one is exposed to this material for an extended period of time.
Eye Contact:	Severe eye irritation with watering and redness. There is also the risk of serious and/or permanent eye lesions.
Skin Contact:	Irritation may occur if one is exposed to this material for extended periods.
Ingestion:	Irritation of the mouth and throat with nausea and vomiting.

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage/Gas Leakage:	Collect in suitable containers. Wash remainder with copious quantities of water.
Extinguishing Media:	See next.
Suitable:	Large quantities of water or water spray. In case of fire in close proximity, all means of extinguishing are acceptable.
Further Information:	Self contained breathing apparatus or approved gas mask should be worn due to small particle size. Use extinguishing media appropriate for surrounding fire. Apply cooling water to sides of transport or storage vessels that are exposed to flames until the fire is extinguished. Do not approach hot vessels that contain this product.
First Aid:	After contact with skin, wash immediately with plenty of water and soap. In case of contact with eyes, rinse immediately with plenty of water and seek medical attention. Consult an opthalmologist in all cases.

Section 8 – Measures in Case of Accidents and Fire

Eye Contact:	Flush eyes with running water for 15 minutes, while keeping the eyelids wide open. Consult with an ophthalmologist in all cases.
Inhalation:	Remove subject from dusty environment. Consult with a physician in case of respiratory symptoms.

Ingestion:	If the victim is conscious, rinse mouth and admnister fresh water. DO NOT induce vomiting. Consult a physician in all cases.
Skin Contact:	Wash affected skin with running water. Remove and clean clothing. Consult with a physician in case of persistent pain or redness.
Special Precautions:	Evacuate all non-essential personnel. Intervention should only be done by capable personnel that are trained and aware of the hazards associated with this product. When it is safe, unaffected product should be moved to safe area.
Specific Hazards:	Oxidizing substance. Oxygen released on exothermic decomposition may support combustion. Confined spaces and/or containers may be subject to increased pressure. If product comes into contact with flammables, fire or explosion may occur.

Section 9 – Accidental Release Measures

Precautions:	Observe the protection methods cited in Section 3. Avoid materials and products that are incompatible with product. Immediately notify the appropriate authorities in case of reportable discharge (> 100 lbs).
Cleanup Methods:	Collect the product with a suitable means of avoiding dust formation. All receiving equipment should be clean, vented, dry, labeled and made of material that this product is compatible with. Because of the contamination risk, the collected material should be kept in a safe isolated place. Use large quantities of water to clean the impacted area. See Section 12 for disposal methods.

Section 10 – Information on Toxicology

Toxicity Data

Acute Toxicity:	Oral Route, LD_{50}, rat, > 2,000 mg/kg (powder 50%) Dermal Route, LD_{50}, rat, > 2,000 mg/kg (powder 50%) Inhalation, LD_{50}, rat, > 5,000 mg/m^3 (powder 35%)
Irritation:	Rabbit (eyes), severe irritant

Sensitization:	No data
Chronic Toxicity:	In vitro, no mutagenic effect (Powder 50%)
Target Organ Effects:	Eyes and respiratory passages.

Section 11 – Information on Ecology

Ecology Data

Acute Exotoxicity:	10 mg $Ca(OH)_2$/L: pH = 9.0 100 mg $Ca(OH)_2$/L: pH = 10.6 Fishes, Cyprinus carpio, LC_{50}, 48 hrs, 160 mg/L Crustaceans, Daphnia sp., EC_{50}, 24 hours, 25.6 mg/L (Powder 16%)
Mobility:	Low Solubility and Mobility
Abiotic Degradation:	Water – Slow Hydrolysis. Degradation Products: Calcium Hydroxide Water/soil – complexation/precipitation. Carbonates/sulfates present at environmental concentrations. Degradation products: carbonates/sulfates sparingly soluble
Biotic Degradation:	NA (inorganic compound)
Potential for Bioaccumulation:	NA (ionizable inorganic compound)

Section 11 – Information on Ecology (cont)

Comments:	Observed effects are related to alkaline properties of the product. Hazard for the environment is limited due to the product properties of: • No bioaccumulation • Weak solubility and precipatation as carbonate or sulfate in an aquatic environment. Diluted product is rapidly neutralized at environmental pH.
Further Information:	NA

Section 12 – Disposal Considerations

Waste Disposal Method:	Consult current federal, state and local regulations regarding the proper disposal of this material and its emptied containers.

Section 13 – Shipping/Transport Information

D.O.T Shipping Name:	Oxidizing Solid, N.O.S [A mixture of Calcium OxyHydroxide [$CaO(OH)_2$] and Calcium Hydroxide [$Ca(OH)_2$].
UN Number:	1479
Hazard Class:	5.1
Label(s):	5.1 (Oxidizer)
Packaging Group:	II
STCC Number:	4918717

Section 14 – Other Information

HMIS® Rating	Health – 2 Flammability – 0	Reactivity – 1 PPE - Required

HMIS® is a registered trademark of the National Painting and Coating Association.

NFPA® Rating	Health – 2 Flammability – 0	Reactivity – 1 OX

NFPA® is a registered trademark of the National Fire Protection Association.

Reason for Issue:	Update toxicological and ecological data

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available.

Regen OX – Part A (Oxidizer Complex)

Material Safety Data Sheet (MSDS)

Last Revised: October 1, 2007

Section 1 – Supplier Information and Material Identification

Supplier:

REGENESIS
1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

Chemical Description:	A mixture of sodium percarbonate [$2Na_2CO_3 \cdot 3H_2O_2$], sodium carbonate [Na_2CO_3], sodium silicate and silica gel.
Chemical Family:	Inorganic Chemicals
Trade Name:	Regen Ox – Part A (Oxidizer Complex)
Product Use:	Used to remediate contaminated soil and groundwater (environmental applications)

Section 2 – Chemical Information/Other Designations

CAS No.	Chemical	Percentage
15630-89-4	Sodium Percarbonate	60 -100 %
5968-11-6	Sodium Carbonate Monohydrate	10 – 30 %
7699-11-6	Silicic Acid	< 1 %
63231-67-4	Silica Gel	< 1 %

Section 3 – Physical Data

Form:	Powder
Color:	White
Odor:	Odorless
Melting Point:	NA
Boiling Point:	NA

Section 3 – Physical Data (cont)

Flammability/Flash Point:	NA
Vapor Pressure:	NA
Bulk Density:	0.9 – 1.2 g/cm^3
Solubility:	Min 14.5g/100g water @ 20 ºC
Viscosity:	NA
pH (3% solution):	≈ 10.5
Decomposition Temperature:	Self-accelerating decomposition with oxygen release starts at 50 ºC.

Section 4 – Reactivity Data

Stability:	Stable under normal conditions
Conditions to Avoid/Incompatibility:	Acids, bases, salts of heavy metals, reducing agents, and flammable substances
Hazardous Decomposition Products:	Oxygen. Contamination with many substances will cause decomposition. The rate of decomposition increases with increasing temperature and may be very vigorous with rapid generation of oxygen and steam.

Section 5 – Regulations

TSCA Inventory Listed:	Yes

CERCLA Hazardous Substance (40 CFR Part 302)

Listed Substance:	*No*
Unlisted Substance:	*Yes*

SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know

Extremely Hazardous Substance:	No
WHMIS Classification:	C, D2B
Canadian Domestic Substance List:	Appears

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage:	Oxidizer. Store in a cool, well ventilated area away from all sources of ignition and out of the direct sunlight. Store in a dry location away from heat and in temperatures less than 40 ˚C. Keep away from incompatible materials and keep lids tightly closed. Do not store in improperly labeled containers. Protect from moisture. Do not store near combustible materials. Keep containers well sealed. Store separately from reducing materials. Avoid contamination which may lead to decomposition.
Handling:	Avoid contact with eyes, skin and clothing. Use with adequate ventilation. Do not swallow. Avoid breathing vapors, mists or dust. Do not eat, drink or smoke in the work area. Label containers and keep them tightly closed when not in use. Wash hands thoroughly after handling.

Personal Protective Equipment (PPE)

Engineering Controls:	General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Avoid creating dust or mists. Maintain adequate ventilation at all times. Do not use in confined areas. Keep levels below recommended exposure limits. To determine actual exposure limits, monitoring should be performed on a routine basis.
Respiratory Protection:	For many conditions, no respiratory protection is necessary; however, in dusty or unknown conditions or when exposures exceed limit values a NIOSH approved respirator should be used.
Hand Protection:	Wear chemical resistant gloves (neoprene, rubber, or PVC).

Section 6 – Protective Measures, Storage and Handling (cont)

Eye Protection:	Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.
Skin Protection:	Try to avoid skin contact with this product. Chemical resistant gloves (neoprene, PVC or rubber) and protective clothing should be worn during use.
Other:	Eye wash station.
Protection Against Fire & Explosion:	Product is non-explosive. In case of fire, evacuate all non-essential personnel, wear protective clothing and a self-contained breathing apparatus, stay upwind of fire, and use water to spray cool fire-exposed containers.

Section 7 – Hazards Identification

Potential Health Effects

Inhalation:	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.
Eye Contact:	Causes irritation, redness and pain.
Skin Contact:	Causes slight irritation.
Ingestion:	May be harmful if swallowed (vomiting and diarrhea).

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage:	Eliminate all ignition sources. Evacuate unprotected personnel and never exceed any occupational exposure limit. Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.
Extinguishing Media:	Water

First Aid

Eye Contact:	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.
Inhalation:	Remove affected person to fresh air. Seek medical attention if the effects persist.
Ingestion:	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **<u>Do Not</u>** induce vomiting.

Section 8 – Measures in Case of Accidents and Fire (cont)

Skin Contact:	Wash affected areas with soap and a mild detergent and large amounts of water.

Section 9 – Accidental Release Measures

Precautions:	
Cleanup Methods:	Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.

Section 10 – Information on Toxicology

Toxicity Data

LD50 Oral (rat):	2,400 mg/kg
LD50 Dermal (rabbit):	Min 2,000 mg/kg
LD50 Inhalation (rat):	Min 4,580 mg/kg

Section 11 – Information on Ecology

Ecology Data

Ecotoxicological Information:	NA

Section 12 – Disposal Considerations

Waste Disposal Method

Waste Treatment:	Dispose of in an approved waste facility operated by an authorized contactor in compliance with local regulations.
Package (Pail) Treatment:	The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

Section 13 – Shipping/Transport Information

D.O.T. Shipping Name:	Oxidizing Solid, N.O.S. [A mixture of sodium percarbonate [$2Na_2CO_3{\cdot}3H2O_2$], sodium carbonate [Na_2CO_3], sodium silicate and silica gel.]
UN Number:	1479
Hazard Class:	5.1
Labels:	5.1 (Oxidizer)
Packaging Group:	III

Section 14 – Other Information

HMIS® Rating	Health – 1 (slight)	Reactivity – 1 (slight)
	Flammability – 0 (none)	Lab PPE – goggles, gloves, and lab coat

HMIS® is a registered trademark of the National Painting and Coating Association.

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

Regen OX – Part B (Activator Complex)

Material Safety Data Sheet (MSDS)

Last Revised: November 7, 2005

Section 1 – Supplier Information and Material Identification

Supplier:

REGENESIS
1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

Chemical Description:	A mixture of sodium silicate solution, silica gel and ferrous sulfate
Chemical Family:	Inorganic Chemicals
Trade Name:	Regen Ox – Part B (Activator Complex)
Product Use:	Used for environmental remediation of contaminated soils and groundwater

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Section 2 – Chemical Information/Other Designations

CAS No.	Chemical
1344-09-8	Silicic Acid, Sodium Salt, Sodium Silicate
63231-67-4	Silica Gel
7720-78-7	Ferrous Sulfate
7732-18-5	Water

Section 3 – Physical Data

Form:	Liquid
Color:	Blue/Green
Odor:	Odorless
Melting Point:	NA
Boiling Point:	NA
Flammability/Flash Point:	NA
Vapor Pressure:	NA

Section 3 – Physical Data (cont)

Specific Gravity	1.39 g/cm^3
Solubility:	Miscible
Viscosity:	NA
pH (3% solution):	11
Hazardous Decomposition Products:	Oxides of carbon and silicon may be formed when heated to decomposition.

Section 4 – Reactivity Data

Stability:	Stable under normal conditions.
Conditions to Avoid:	None.
Incompatibility:	Avoid hydrogen fluoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, strong bases, oxidizers, aluminum, fiberglass, copper, brass, zinc, and galvanized containers.

Section 5 – Regulations

TSCA Inventory Listed: Yes

CERCLA Hazardous Substance (40 CFR Part 302)

Listed Substance: *No*

Unlisted Substance: *Yes*

SARA, Title III, Sections 302/303 (40 CFR Part 355) – Emergency Planning and Notification

Extremely Hazardous Substance: No

SARA, Title III, Sections 311/312 (40 CFR Part 370) – Hazardous Chemical Reporting: Community Right-To-Know

Hazard Category: Acute

SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know

Extremely Hazardous Substance: No

Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage:	Keep in a tightly closed container (steel or plastic) and store in a cool, well ventilated area away from all incompatible materials (acids, reactive metals, and ammonium salts). Store in a dry location away from heat and in temperatures less than 24 $^{?}$C. Do not store in aluminum, fiberglass, copper, brass, zinc or galvanized containers.
Handling:	Avoid contact with eyes, skin and clothing. Avoid breathing spray mist. Use with adequate ventilation. Do not use product if it is brownish-yellow in color.

Personal Protective Equipment (PPE)

Engineering Controls:	General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Safety shower and eyewash station should be within direct access.
Respiratory Protection:	Use NIOSH-approved dust and mist respirator where spray mist exists. Respirators should be used in accordance with 29 CFR 1910.134.
Hand Protection:	Wear chemical resistant gloves.
Eye Protection:	Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.
Skin Protection:	Try to avoid skin contact with this product. Gloves and protective clothing should be worn during use.
Other:	
Protection Against Fire & Explosion:	Product is non-explosive and non-combustible.

Section 7 – Hazards Identification

Potential Health Effects

Inhalation:	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.
Eye Contact:	Causes irritation, redness and pain.
Skin Contact:	Causes irritation. Symptoms include redness, itching and pain.
Ingestion:	May cause irritation to mouth, esophagus, and stomach.

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage (small):	Mop up and neutralize liquid, then discharge to sewer in accordance with local, state and federal regulations.
After Spillage/Leakage (large):	Keep unnecessary personnel away; isolate hazard area and do not allow entrance into the affected area. Do not touch or walk through spilled material. Stop leak if possible without risking injury. Prevent runoff from entering into storm sewers and ditches that lead to natural waterways. Isolate the material if at all possible. Sand or earth may be used to contain the spill. If containment is not possible, neutralize the contaminated area and flush with large quantities of water.
Extinguishing Media:	Material is compatible with all extinguishing media.
Further Information:	

First Aid

Eye Contact:	Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.
Inhalation:	Remove affected person to fresh air. Give artificial respiration if individual is not breathing. If breathing is difficult, give oxygen. Seek medical attention if the effects persist.
Ingestion:	If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **DO NOT** induce vomiting.
Skin Contact:	Wash affected areas with soap and a mild detergent and large amounts of water. Remove contaminated clothing and shoes.

Section 9 – Accidental Release Measures

Precautions:

PPE:	Wear chemical goggles, body-covering protective clothing, chemical resistant gloves, and rubber boots (see Section 6).
Environmental Hazards:	Sinks and mixes with water. High pH of this material may be harmful to aquatic life. Only water will evaporate from a spill of this material.
Cleanup Methods:	Pick-up and place in an appropriate container for reclamation or disposal. US regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities.

Section 10 – Information on Toxicology

Toxicity Data

Sodium Silicate:	When tested for primary eye irritation potential according to OECD Guidelines, Section 405, a similar sodium silicate solution produced corneal, iridal and conjunctival irritation. Some eye irritation was still present 14 days after treatment, although the average primary irritation score has declined from 29.7 after 1 day to 4.0 after 14 days. When tested for primary skin irritation potential, a similar sodium silicate solution produced irritation with a primary irritation index of 3 to abraded skin and 0 to intact skin. Human experience confirms that irritation occurs when sodium silicates get on clothes at the collar, cuffs, or other areas where abrasion may exist. The acute oral toxicity of this product has not been tested.
Ferrous Sulfate:	LD50 Oral (rat): 319 mg/kg not a suspected carcinogen.

Section 11 – Information on Ecology

Ecology Data

Ecotoxicological Information:	Based on 100% solid sodium silicate, a 96 hour median tolerance for fish of 2,320 mg/l; a 96 hour median tolerance for water fleas of 247 mg/L; a 96 hour median tolerance for snail eggs of 632 mg/L; and a 96 hour median tolerance for Amphipoda of 160 mg/L.

Section 12 – Disposal Considerations

Waste Disposal Method

Waste Treatment:	Neutralize and landfill solids in an approved waste facility operated by an authorized contactor in compliance with local regulations.
Package (Pail) Treatment:	The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

Section 13 – Shipping/Transport Information

D.O.T.	This product is not regulated as a hazardous material so there are no restrictions.

Section 14 – Other Information

HMIS® Rating	Health – 2 (moderate)	Reactivity – 0 (none)
	Flammability – 0 (none)	Lab PPE – goggles, gloves, and lab coat
	Contact – 1 (slight)	

HMIS® is a registered trademark of the National Painting and Coating Association.

Section 15 – Further Information

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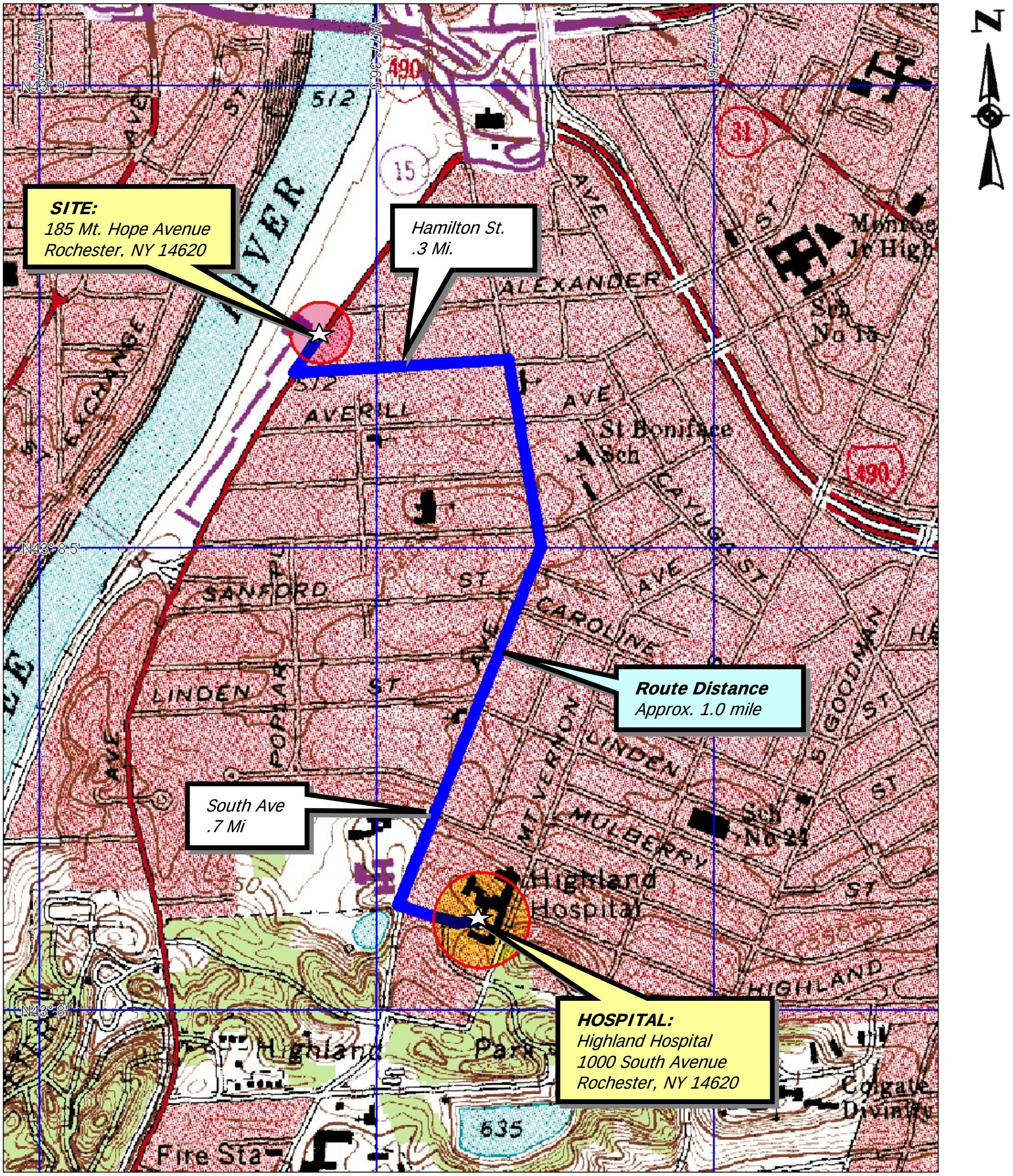
ATTACHMENT 2

Figure 1- Route for Emergency Services



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

250 ft Scale: 1 : 9,600 Detail: 13-6 Datum: WGS84

Drawing Produced From: 3-D TopoQuads, DeLorme Map Co., referencing USGS quad maps Rochester East (NY) 1995.

DATE **11-21-2007**	**day** DAY ENVIRONMENTAL, INC. ENVIRONMENTAL CONSULTANTS ROCHESTER, NEW YORK 14614-1008	PROJECT TITLE **185 MOUNT HOPE AVENUE** **ROCHESTER, NEW YORK** **HEALTH AND SAFETY PLAN**	**PROJECT NO.** **4003R-07**
DRAWN BY **TWW**		DRAWING TITLE **ROUTE FOR EMERGENCY SERVICES**	**FIGURE 1**
SCALE **As Noted**			

APPENDIX B

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN

This project-specific Quality Assurance Project Plan (QAPP) was prepared in accordance with Section 2.2 of the New York State Department of Environmental Conservation (NYSDEC) draft DER-10 document for NYSDEC Site ID C828124 (Site). The QAPP provides quality assurance/quality control (QA/QC) protocols and guidance that are to be followed when implementing the remedy for the Site to ensure that data of a known and acceptable precision and accuracy are generated. The QAPP also provides a summary of the remedial project, identifies personnel responsibilities, and provides procedures to be used during sampling of environmental media, other field activities, and the analytical laboratory testing of samples. The components of the QAPP are provided herein.

1.0 Project Scope and Project Goals

The QAPP applies to the aspects of the project associated with implementing a physical remedy and the collection of field data, the collection and analytical laboratory testing of field samples and QA/QC samples, and the evaluation of the quality of the data that is generated. Specifically, the physical remediation will include a source area soil removal and off-site disposal with post-excavation soil sampling and analysis from the sidewalls and bottom of the excavation. After review of the data, the site management plan (SMP) that is developed for the Site could include a contingency that involves limited in-situ remediation of soil and groundwater beyond the footprint of the source area soil removal excavation. If an in-situ remediation program is implemented, performance monitoring will be conducted that involves soil sampling and analysis. Groundwater monitoring will be conducted for up to five years that involves analytical laboratory testing of groundwater samples and the collection of groundwater quality measurements.

2.0 Project/Task Organization

Project organization and tentative personnel to implement the work are outlined in this section of the QAPP.

Principal in Charge

The Principal in Charge is responsible for review of project documents and ensuring the project is completed in accordance with relative work plans. Mr. David D. Day, P.E., a Day Environmental, Inc. (DAY) representative, will serve as the Principle-in-Charge on this project

Project Manager

The Project Manager has the overall responsibility for implementing the project and ensuring that the project meets the objectives and quality standards as presented in this QAPP. Mr. Jeffrey A. Danzinger, a DAY representative, will serve as the Project Manager on this project, and will serve as the primary point of contact and control for the project.

Quality Assurance Officer

The Quality Assurance Officer is responsible for QA/QC on this project. The Quality Assurance Officer's responsibilities on this project are not as a project manager or task manager involved with project productivity or profitability as job performance criteria. Ms. Hope Kilmer, a DAY representative, will serve as the Quality Assurance Officer on this project. The Quality Assurance

Officer may conduct audits of the operations at the site to ensure that work is being performed in accordance with the QAPP.

Technical Staff, Subconsultants and Subcontractors

DAY's technical staff for this project consist of experienced professionals (e.g., professional engineers, engineers-in-training, scientists, technicians, etc.) that possess the qualifications necessary to effectively and efficiently complete the project tasks. The technical staff will be used to gather and analyze data, prepare various project documentation, etc. Subconsultants and subcontractors used on this project will consist of firms and companies with experience in the services to be provided.

Analytical Laboratory

It is anticipated that Mitkem Laboratories, a Division of Spectrum Analytical, Inc., with facilities at 175 Metro Center Boulevard, Warwick, Rhode Island will be retained to complete the required analytical laboratory testing of samples as part of this project. Mitkem is a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory (ELAP ID11522).

Dr. Kin S. Chiu is the Laboratory Director for Mitkem. The laboratory director is responsible for analytical work and works in conjunction with the Laboratory Manager and QA unit regarding QA and chain-of-custody requirements.

Ms. Agnes Ng of Mitkem will act as the Laboratory Manager on this remediation project. The Laboratory Manager will report to the laboratory director and work in conjunction with the laboratory QA unit regarding QA elements of specific sample analyses tasks.

3.0 Sampling Procedures

This section of the QAPP provides the protocols for collection of post-excavation soil samples, and collection of groundwater samples that are to be collected as part of the remediation project.

Collection of Soil Samples from Test Borings

A subcontractor will be retained to provide vehicle-mounted direct-push soil sampling equipment to advance the test borings. However, if it is determined in the field that such equipment cannot adequately be advanced through the existing overburden soils, then a conventional rotary drill-rig will be used to advance test borings, and the NYSDEC will be consulted to approve any modifications to the drilling program.

Based on the results of the previous remedial investigation, it is anticipated that the test borings will be advanced to depths of approximately 20 feet below the ground surface. Sampling equipment will be used to collect soil samples in two-foot or four-foot intervals throughout the entire depth of the test borings. The soil samples will be collected in new disposable plastic liners.

The recovered soil samples will be visually examined by a DAY representative for evidence of suspect contamination (e.g., staining, unusual odors) and screened with a photoionization detector (PID). Portions of the samples will be placed in containers for possible analytical laboratory testing. Different portions of the soil samples will be placed in sealable Ziploc®-type plastic baggies, and will be field screened the same day the samples are collected. The sample will be agitated and homogenized for at least 30 seconds and allowed to equilibrate for at least three minutes. The ambient headspace air inside the baggie above the soil sample will be screened for total volatile organic compound (VOC) vapors with a RAE Systems MiniRAE 2000 PID equipped with a 10.6 eV lamp (or equivalent). The sampling port for the PID will be placed in the ambient air headspace inside the bag by opening a corner of the "locked" portion of the bag. The PID will monitor air inside the baggie for a period of at least 15 seconds and the peak readings measured will be recorded on a log sheet or log book.

A DAY representative will record pertinent information for each boring on a test boring log. The recorded information will include:

- Date, boring identification, and project identification.
- Name of individual developing the log.
- Name of drilling company.
- Drill make and model.
- Identification of any alternative drilling methods used.
- Depths recorded in feet and fractions thereof (tenths of inches) referenced to ground surface.
- The length of the sample interval and the percentage of the sample recovered.
- The depth of the first encountered water table, along with the method of determination, referenced to ground surface.
- Drilling and borehole characteristics.
- Sequential stratigraphic boundaries.
- Initial PID screening results of soil samples, and/or PID screening results of ambient headspace air above selected samples.

Each test boring will be backfilled with grout upon completion to preclude short-circuiting subsequent in-situ remediation injections, and soil cuttings will be placed in New York State Department of Transportation (NYSDOT)-approved drums that will be characterized and disposed off-site in accordance with applicable regulations.

Collection of Soil Samples from Excavations

The subcontractor retained to provide soil removal work will use an excavator to collect soil samples from the walls or bottom of the excavation. These post-excavation soil samples will be collected in general accordance with Section 5.4(a) of the NYSDEC Draft DER-10 document. Soil samples will be taken within 24 hours of excavation, and will be collected from sidewalls and the bottom of the excavation between zero and six inches from the soil surface. If soil samples are taken after 24 hours of excavation, the samples will be collected from sidewalls and the bottom of the excavation between six and twelve inches from the soil surface. Based on the scope of this project, it is not anticipated that soil samples would be taken more than two weeks after excavation.

The recovered soil samples will be visually examined by a DAY representative for evidence of suspect contamination (e.g., staining, unusual odors) and screened with a PID. Portions of the samples will be placed in containers for possible analytical laboratory testing. Different portions of the soil samples will be placed in sealable Ziploc®-type plastic baggies, and will be field screened the same day they are collected. The sample will be agitated and homogenized for at least 30 seconds and allowed to equilibrate for at least three minutes. The ambient headspace air inside the baggie above the soil sample will be screened for total VOC vapors with a RAE Systems MiniRAE 2000 PID equipped with a 10.6 eV lamp (or equivalent). The sampling port for the PID will be placed in the ambient air headspace inside the bag by opening a corner of the "locked" portion of the bag. The

PID will monitor air inside the baggie for a period of at least 15 seconds and the peak readings measured will be recorded on a log sheet or log book.

A DAY representative will record pertinent information for each sample in a bound log book. The recorded information will include:

- Date and time sample collected
- Sample identification/designation.
- Sample location (e.g., sidewall, bottom, relative location within excavation)
- Depth of sample recorded in feet and fractions thereof (tenths of inches) referenced to ground surface.
- Soil type of the sample collected.
- PID screening results of ambient headspace air above selected samples.

Collection of Groundwater Samples from Monitoring Wells

Static water level measurements will be obtained from each well using an oil/water interface meter. DAY will also look for light non-aqueous phase liquid (LNAPL) by using visual observations and the oil/water interface meter at each well location. DAY will document the results of this work in the field.

Subsequent to obtaining static water level measurements and monitoring the wells for free LNAPL, the following low-flow purge and sample techniques will be used to collect a groundwater sample from each well:

- A portable bladder pump connected to new disposable polyethylene tubing will be lowered and positioned at or slightly above the mid-point of the water column within the well screen when the screened interval is set in relatively homogeneous material. When the screened interval is set in heterogeneous materials, the pump will be positioned adjacent to the zone of highest hydraulic conductivity (as defined by geologic samples). Care will be taken to install and lower the bladder pump slowly in order to minimize disturbance of the water column.

- The pump will be connected to a control box that is operated on compressed gas (nitrogen, air, etc.) and is capable of varying pumping rates. An in-line flow-through cell attached to a Horiba U-22 water quality meter (or similar equipment) will be connected to the bladder pump effluent tubing to measure water quality data.

- The pump will be started at a pumping rate of 100 ml/min or less (for pumps that can not achieve a flow rate this low, the pump will be started at the lowest pump rate possible). The water level in the well will be measured and the pump rate will be adjusted (i.e., increased or decreased) until the drawdown is stabilized. In order to establish the optimum flow-rate for purging and sampling, the water level in the well will be measured on a periodic basis (i.e., every one or two minutes) using an electronic water level meter or an oil/water interface meter. When the water level in the well has stabilized (i.e., use goal of <0.33 ft of constant drawdown), the water level measurements will be collected less frequently.

- While purging the well at the stabilized water level, water quality indicator parameters will be monitored on a three to five minute basis with the Horiba U-22 water quality meter (or similar equipment). Water quality indicator parameters will be considered stabilized when the parameter readings listed below are generally achieved after three consecutive readings:

  - pH (± 0.1);
  - specific conductance (± 3%);
  - dissolved oxygen (± 10 %);
  - oxidation-reduction potential (± 10 mV);
  - temperature (± 10%); and
  - turbidity [± 10%, when turbidity is greater than 10 nephelometric turbidity units (NTUs)]

- Following stabilization of the water quality parameters, the flow-through cell will be disconnected and a groundwater sample will be collected from the bladder pump effluent tubing. The pumping rate during sampling will remain at the established purging rate or it may be adjusted downward to minimize aeration, bubble formation, or turbulent filling of sample containers. A pumping rate below 100 ml/min will be used when collecting VOC samples.

- The procedures and equipment used during the purging and groundwater sampling, and the field measurement data obtained, will be documented in the field and recorded on Monitoring Well Sampling Logs.

During sampling, the following parameters will be measured using a water quality meter(s) and will later be presented on Monitoring Well Sampling Logs:

- Dissolved Oxygen
- Conductivity
- Oxidation/Reduction Potential (redox)
- pH
- Temperature
- Turbidity

4.0 Decontamination Procedures

In order to reduce the potential for cross-contamination of samples collected during this project, the following procedures will be implemented to ensure that the data collected (primarily the laboratory data and groundwater quality measurement) is acceptable.

It is anticipated that most of the materials used to assist in obtaining samples will be disposable one-use materials (e.g., sampling containers, bailers, rope, pump tubing, latex gloves, etc.). When equipment must be re-used (e.g., static water level indicator, oil/water interface meter, drilling equipment, etc.), it will be decontaminated by at least one of the following methods:

- Steam clean the equipment; or
- Rough wash in tap water; wash in mixture of tap water and alconox-type soap; double rinse with deionized or distilled water; and air dry and/or dry with clean paper towel.

Split-spoon samplers used during rotary drilling, Macrocore cutting shoes used during direct-push drilling, and other re-usable equipment, will be decontaminated between each use.

When deemed necessary, a temporary decontamination pad will be constructed for decontamination of equipment. Any decontamination pad will be removed following completion of associated activities. Decontamination liquids and disposable equipment and personal protective equipment will be containerized in NYSDOT-approved 55-gallon drums and left on-site until the disposal method is determined.

5.0 Operation and Calibration of On-Site Monitoring Equipment

The field personnel will be familiar with the equipment being used. Volatile vapor monitoring will be conducted using a PID. It is anticipated that a RAE Systems MiniRAE 2000 PID equipped with a 10.6 eV lamp, or equivalent, will be used during this project. The PID will be calibrated in accordance with the manufacturer's specifications using an isobutylene gas standard prior to use and as necessary during fieldwork. Measurements will be collected in accordance with the protocols outlined in the HASP.

Other miscellaneous field instruments that may be used during this project include:

- An electronic static water level indicator;
- A low-flow bladder pump system;
- A global positioning system (GPS);
- Survey equipment;
- An oil/water interface meter; and
- A Horiba U-22 water quality meter, or similar.

These meters will be calibrated, operated, and maintained in accordance with the manufacturer's recommendations.

Mitkem's preventative maintenance procedures and calibration procedures for laboratory equipment are provided in its Quality Assurance Plan (QAP) included in Attachment 1.

6.0 Sample Handling and Custody Requirements

During sampling activities, personnel will wear disposable latex or nitrile gloves. Between collection of samples, personnel performing the sampling will discard used latex gloves and put on new gloves to preclude cross-contamination between samples. As few personnel as possible will handle samples or be in charge of their custody prior to shipment to the analytical laboratory.

New laboratory-grade sample containers will be used to collect soil and groundwater samples. Sufficient volume (i.e., as specified by the analytical laboratory and on Mitkem Table 2 included in Attachment 2) will be collected to ensure that the laboratory has adequate sample to perform the specified analyses.

Samples will be preserved as specified by the analytical laboratory for the type of parameters and matrices being tested. Mitkem Table 2 included in Attachment 2 provide sample preservation requirements. Sample holding times and preservation protocols will be adhered to during this project in accordance with the requirements presented on Mitkem's Table 2 in Attachment 2.

Chain-Of-Custody

Samples that are collected for subsequent testing as part of this project will be handled using chain-of-custody control. Chain-of-custody documentation will accompany samples from their inception to their analysis, and copies of chain-of-custody documentation will be included with the laboratory's report. The chain-of-custody will include the date and time the sample was collected, the sample identity and sampling location, the requested analysis, and any request for accelerated turnaround time.

Sample Labels

Sample labels for field samples and QC samples with adhesive backing will be placed on sample containers in order to identify the sample. Sample information will be clearly written on the sample labels using waterproof ink. Sufficient sample information will be provided on the label to allow for cross-reference with the field sampling records or sample logbook.

The following information will be provided on each sample label:
Name of company;
Initials of sampler;
Date and time of collection;
Sample identification;
Intended analyses; and
Preservation required.

Custody Seals

Custody seals are preprinted adhesive-backed seals that are designed to break if disturbed. Seals will be signed and dated before being placed on the shipping cooler. Seals will be placed on one or more location on each shipping cooler as necessary to ensure security. Shipping tape will be placed over the seals on the coolers to ensure that the seals are not accidentally broken during shipment. Sample receipt personnel at the laboratory will check and document whether the seals on the shipping coolers are intact when received.

Sample Identification

The following format will be used on the labels affixed to sample containers to identify samples:

Each sample will be numbered starting at 001, and continue in succession (i.e., 001, 002, 003, etc.). The sample test location will also be provided after the sample number using the following test location designations:

C-(x’)	Post-Excavation soil sample location with depth or depth interval in parentheses.
MWDAY-	Existing or new monitoring well location
MW-	Existing monitoring well location
MW-URS-	Existing monitoring well location
TBxx/xx/xx-	Trip Blank with day/month/year
FBxx/xx/xx-	Field Blank (equipment rinsate) with day/month/year

As an example, assuming the first project sample is a soil sample collected from post-excavation soil sample location C-1 at a depth of 10 feet, the sample will be designated as 001/C-1(10’).

Transportation of Samples

Samples will be handled, packaged and shipped in accordance with applicable regulations, and in a manner that does not diminish their quality or integrity. Samples will be delivered to the laboratory no later than 48 hours from the day of collection.

7.0 Analytical Quality Assurance/Quality Control

Analytical laboratory testing will be completed by Mitkem (NYSDOH ELAP ID #11522). The analytical laboratory test results for post-excavation soil samples and groundwater monitoring samples will be reported in NYSDEC ASP Category B deliverable reports. Analytical laboratory test results for soil samples will be reported on a dry-weight basis. Mitkem will analyze the samples using the lowest practical quantitation limits (PQLs) possible.

Mitkem will provide internal QA/QC checks that are required by NYSDEC ASP and/or United States Environmental Protection Agency (USEPA) CLP protocol, such as analyses performed, spike blanks, internal standards, surrogate samples, calibration standards, and reference standards. Laboratory reports will be reviewed by Mitkem as outlined in its 2007 QAP that is included in Attachment 1, and also by the Quality Assurance Officer.

Laboratory results will be compared to data quality indicators in accordance with Mitkem's QAP included in Attachment 1 and NYSDEC ASP. Data quality indicators include: precision, accuracy, representation, completeness, and comparability.

The analytical methods to be used for each type of sample and sample matrix are identified on Table 1 included in Attachment 3. These exclude analytical methods required by regulated landfill facilities or Monroe County Pure Waters (MCPW) for the purposes of waste disposal. As shown, sample methods include the following:

- Target compound list (TCL) VOCs including tentatively identified compounds (TICs) using NYSDEC ASP Method OLM04.3; and
- TCL semi-volatile organic compounds (SVOCs) including TICs using NYSDEC ASP Method OLM04.3.

In order to provide control over the collection, analysis, review, and interpretation of analytical laboratory data, the following QA/QC samples will be included as part of this project (refer to Table 1 in Attachment 3):

- During the groundwater monitoring, one trip blank will be included per 20 liquid samples, or per shipment if less than 20 samples, when the shipment contains liquid field samples (i.e., groundwater samples) that are to be analyzed by Mitkem for VOCs. These trip blanks will be analyzed for VOCs.

- One matrix spike/matrix spike duplicate (MS/MSD) will be analyzed during performance soil sampling, during performance groundwater sampling, and also during each groundwater sampling event for each 20 samples of each matrix that are shipped within a seven-day period. Specific parameters that MS/MSD samples will be tested for by Mitkem will be dependent upon the test parameters of the samples that are being analyzed.

- One field blank (i.e., rinsate sample) will be collected from reusable groundwater sampling equipment and reusable soil sampling equipment for each sampling event of 20 samples, or per shipment if less than 20 samples. It is anticipated that this equipment rinsate will be tested for the test parameters of the samples that are being analyzed by Mitkem.

Data Usability Summary Report

Ms. Hope Kilmer of DAY will complete a data usability summary report (DUSR) on some of the analytical laboratory data that is generated as part of the scope of work in the remedial work plan, to the extent required by the NYSDEC (e.g., analytical laboratory results for performance soil samples, and one or more rounds of groundwater monitoring events). The DUSR will be conducted in accordance with the provisions set forth in Appendix 2B of the Draft DER-10 Technical Guidance for Site Investigation and Remediation dated December 25, 2002. The findings of the DUSR will be incorporated in the Final Engineering Report (FER). A copy of Ms. Kilmer's resume is included in Attachment 4.

Reporting

Analytical and QC data will be included in the FER. The FER will summarize the remedial work and provide evaluation of the data that is generated, including the validity of the results in the context of QA/QC procedures.

8.0 Record Keeping and Data Management

DAY will document project activities in a bound field book on a daily basis. Information that will be recorded in the field book will include:

- Dates and time work is performed;
- Details on work being performed;
- Details on field equipment being used;
- Visual and olfactory observations during field activities;
- Field meter measurements collected during monitoring activities;
- Sampling locations and depths;
- Measurements of sample locations, and test locations, excavations, etc.;
- Personnel and equipment on-site;
- Weather conditions; and
- Other pertinent information as warranted.

Additionally, DAY will record information from test locations on designated logs (e.g., boring logs, well construction diagrams, etc.). Well development data and well sampling data will also be presented on designated logs.

The analytical data will be reported as electronic data deliverables (EDDs) and as hard copies. Differential global positioning system (GPS), swing ties from existing surveyed site structures, and/or a licensed surveyor will be used to collect spatial data. The spatial data will be plotted using integrated geographic information system (GIS) and/or computer-aided design (CAD) mapping. Electronic and hard copy files will be maintained by DAY.

ATTACHMENT 1

Mitkem Quality Assurance Plan (QAP)

Mitkem Corporation

QUALITY ASSURANCE PLAN
2007

Approved By:

Sharyn B Lawler
Sharyn B. Lawler
QA/QC Director

1/30/07
Date

Yihai Ding
Yihai Ding
Laboratory Manager

1/30/07
Date

MITKEM Corporation 175 Metro Center Boulevard, Warwick, RI 02886
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2.0 Table of Contents

Section		Revision#	Date
1	Title Page		01/01/07
2	Table of Contents		01/01/07
3	Introduction	7	10/22/05
4	Quality Assurance Policy Statement	7	12/22/05
5	Quality Assurance Management, Organization and Responsibility	8	3/30/06
6	Quality Assurance Objectives for Measurement Data in Terms of Precision, Accuracy, Representativeness, Completeness and Comparability	7	1/27/06
	6.1 Precision and Accuracy		
	6.2 Representation		
	6.3 Completeness		
	6.4 Comparability		
7	Sampling Procedures	8	10/31/06
8	Sample Custody	7	1/27/06
	8.1 Chain of Custody		
	8.2 Laboratory Security		
	8.3 Duties and Responsibilities of Sample Custodian		

2.0 Table of Contents (Cont.)

2.0 Table of Contents (Cont.)

Section		Revision#	Date
	11.7 Document Control		
	11.7.1 Logbooks		
	11.7.2 Workorder/Data Files		
	11.7.3 Standard Operating Procedures (SOPs)		
	11.7.3 Method Updates		
12	Laboratory Quality Control Checks	7	12/11/06
	12.1 Detection Limit Determination/Verification		
	12.2 Personnel Training		
	12.3 Control Charts		
	12.4 General QC Protocols		
13	Quality Assurance Systems Audits, Performance Audits and Frequencies	7	12/11/06
	13.1 Systems Audits		
	13.2 Performance Audits		
14	Preventive Maintenance	7	02/23/06
15	Specific Routine Procedures Used to Assess Data Precision, Accuracy, Completeness, Methods Detection Limits and Linear Dynamic Range	7	12/11/06
	15.1 Precision		
	15.2 Accuracy		
	15.3 Completeness		

2.0 Table of Contents (Cont.)

Tables **Page**

Figures **Page**

Table of Contents (Cont.)

Figures **Page**

Appendices

3.0 INTRODUCTION

MITKEM Corporation is a minority-owned small business environmental services company, incorporated in the State of Rhode Island.

Offices and laboratories are located in Warwick, Rhode Island. The laboratory occupies approximately 11,000 square feet of laboratory space.

This Quality Assurance Plan (QAP) describes the policies, organization, objectives, quality control activities. It also specifies quality assurance functions employed at MITKEM and demonstrates MITKEM's dedication to the production of accurate, consistent data of known quality. This QAP is developed by following the guidelines discussed in the EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations, EPA QA/R-5, Interim Final, Jan., 1994 and the National Environmental Laboratory Accreditation Conference (NELAC) standards, July 12, 2002.

4.0 QUALITY ASSURANCE POLICY STATEMENT

MITKEM is firmly committed to the production of valid data of known quality through the use of analytical measurements that are accurate, reproducible and complete. To ensure the production of such data, MITKEM has developed a comprehensive Quality Assurance/Quality Control Program that operates throughout the entire organization.

MITKEM Management considers Quality Assurance/Quality Control to be of the highest importance in the success of its Analytical Testing Laboratory and therefore fully supports the staff in the implementation and maintenance of a sound and thorough Quality Assurance Program.

MITKEM's corporate success is based on its participation in the most rigorous and quality-focused environmental testing programs, such as the EPA Contract Laboratory Program, US Department of Defense programs, NELAC, and other nationwide and state-specific certification and approval programs. These programs require consistent application of the QA/QC procedures described in this document. MITKEM's ability to demonstrate and document that analyses were performed in this manner is one of the foundations of its business. The other foundation of its business is to provide superior levels of customer service, above and beyond the norm for laboratories performing at this level of quality.

MITKEM's approach to customer service is to aggressively meet or exceed customer expectations, particularly in terms of turnaround time for results. While the production of rapid turnaround time data may require MITKEM employees to "go the extra mile" for the customer, without quality, the data are useless. MITKEM constantly strives to manage its business to rapidly provide data to meet all the requirements of its quality program.

- MITKEM management works to insure: that employees understand the primary importance of quality in its day to day operations,
- that employees will not be subjected to pressure to sacrifice quality for turnaround, financial or other considerations,
- that employees understand the importance of their ethical responsibilities in terms of data manipulation, falsification or other illegal or improper actions,
- that the company avoids involvement in activities that diminish its competence, impartiality, judgment or operational integrity.
- that employees maintain all client information in a confidential manner, and
- that employees understand that any short-term gain realized by disregarding the QA/QC program will be more than wasted by the serious penalties for these actions.
- That the laboratory has the technical personnel to identify occurrences of departure from the quality system and to initiate actions to prevent or minimize such departures.

All employees receive training in these issues as part of the initial orientation process, and are required to acknowledge that they understand their responsibilities in these areas.

These issues are also discussed among all laboratory staff at company meetings and re-training sessions. The QA Officer, Technical Director and other senior company management are readily available to all staff through their daily presence, "open door" policy and approachable manner. This allows any employee to readily discuss any questions, concerns or issues that may occur.

Quality Control is defined as an organized system of activities whose purpose is to demonstrate that quality data are being produced through documentation. Quality Assurance is more broadly defined as a system of activities designed to ensure that the quality control program is actually effective in producing data of the desired quality.

Quality Control is included as part of Quality Assurance. In supporting government regulatory and enforcement proceedings, a high degree of attention to quality is essential. Thorough application of quality control principles and routine quality assurance audits is required.

The basic components of the MITKEM QA/QC Program are control, evaluation and correction.

Control ensures the proper functioning of analytical systems through the implementation of an orderly and well-planned series of positive measures taken prior to and during the course of analysis including quality control practices, routine maintenance and calibration of instruments, and frequent validation of standards.

Evaluation involves the assessment of data generated during the control process. For example, precision and accuracy are determined from the results of duplicates and spikes, and other check samples. Long-term evaluation measures include performance and systems audit conducted by regulatory agencies, as well as the MITKEM quality assurance group.

Correction includes the investigation, diagnosis and resolution of any problems detected in an analytical system. Proper functioning of the system may be restored through method re-evaluation, analysis of additional check samples, trouble-shooting and repair of instrumentation or examination and comparison with historical data. Corrective actions are documented and reviewed to make sure they are implemented.

Certain situations may occur when there are occasional departures or exceptions from documented policies and procedures or standard specifications due to client or project specific protocols, unusual sample matrix, or special non-target analyte or non-routine analyses. MITKEM's policy is to fully document all such procedures and their associated QC, and notify the client or regulatory agency. If the situation is to continue, a Standard Operating Procedure will be written and implemented.

5.0 QUALITY ASSURANCE MANAGEMENT, ORGANIZATION AND RESPONSIBILITY

Quality Assurance at MITKEM is a company-wide function that depend on:

(1) cooperative working relationships at all levels within the laboratory and

(2) multi-level review through all working levels of responsibility.

Responsibilities for QA/QC functions begin with the bench scientist and extend to the chief executive officer.

The primary level of quality assurance resides with the bench scientist. After completion of the documented training program, his/her responsibilities include:

- complying with all aspects of formally approved analytical methods and SOPs,
- carefully documenting each step of the analytical process,
- conscientiously obtaining peer review as required,
- promptly alerting laboratory supervisors and/or QA staff members to problems or anomalies that may adversely impact data quality, and
- participation in corrective actions as directed by the laboratory supervisor or QA Director.

The supervisor of each laboratory is responsible for ensuring thorough oversight of the quality of the data generated by the bench scientists. The laboratory supervisor implements and monitors the specific QC protocols and QA programs with the laboratory to ensure a continuous flow of data meeting all control protocols and Mitkem QA requirements. The laboratory supervisor's responsibilities include providing the bench chemist with adequate resources to achieve the desired quality of performance.

The MITKEM organizational structure is shown in the Organization Chart. Resumes of the CEO/Technical Director, Quality Assurance Director, Operations Manager, Laboratory Manager, MIS Director, Project Manager, Laboratory Supervisors, and other key personnel are included.

Mitkem's lines of communication flow upward on the Organizational Chart. Mitkem's open door policy allows all employees access to anyone on the organization chart. If an employee has an issue with his/her immediate supervisor, he or she may, at any time, speak with someone in management higher up in the Organizational Chart.

Implementation of the entire Quality Assurance Program is the responsibility of the QA Director. While interacting on a daily basis with laboratory staff members, the QA Director remains independent of the laboratories and reports directly to the Chief Executive Officer/Technical Director. The QA Director evaluates laboratory compliance with respect to the QA program through informal and formal systems and performance audits as described in Section 13.0. Remedial action, to alleviate any detected problems, is suggested and/or discussed with the appropriate parties and implemented when necessary.

With input from the appropriate staff members, the QA Director writes, edits and archives QA Plans, QC protocols, safety procedures, and Standard Operating Procedures (SOPs) in accordance with US EPA approved methodologies, and GLP procedures. If sites-specific or project-specific QA Plans and/or QC protocols are required, these will be generated as needed.

An essential element of the QA program is record keeping and archiving all information pertaining to quality assurance including QA/QC data, pre-award check sample results, performance test sample results, scores, and follow-up; state certifications of the laboratory; external and internal audits with resolution of EPA and other audit team comments, recommendations and reports. The QA Director also plays an important role in the corrective action mechanism described in Section 16.

In addition, the QA Director works with scientists and management to continuously upgrade procedures and systems to improve the laboratory's efficiency and data quality.

Ultimately, the success of the QA program depends on the cooperation and support of the entire organization. MITKEM's most valuable resource is its staff of dedicated professionals who take personal pride in the quality of their performance.

Laboratory management works to ensure the competence of all who operate equipment, perform tests and calibrations, evaluate data and sign reports. When employees are in training, appropriate supervision will be provided until the employee has demonstrated the appropriate level of understanding, training, and skill.

Mitkem Corporation's personnel job descriptions:

Responsibilities of each staff area in the laboratory include:

Bench Scientist / Preparation Laboratory Areas:

- Analysis of samples through compliance with all aspects of formally approved analytical methods and laboratory SOPs.
- Carefully documenting each step of the analytical process.
- Noting in the appropriate logbook area any unusual occurrences or sample matrix problems.
- Conscientiously obtaining peer review as required.
- Promptly alerting laboratory supervisors and/or QA staff members to problems or anomalies. that may adversely impact data quality.
- Routine housekeeping duties for their laboratory area.

Bench Scientist / Instrument Laboratory Areas:

- Analysis of samples through compliance with all aspects of formally approved analytical methods and laboratory SOPs.
- Routine maintenance of instrumentation.
- Preparation of analytical standards and spiking solutions which are documented and traceable to their original source.
- Carefully documenting each step of the analytical process.
- Noting in the appropriate logbook area any unusual occurrences or sample matrix problems.
- Conscientiously obtaining peer and supervisor review as required.
- Promptly alerting laboratory supervisors and/or QA staff members to problems or anomalies that may adversely impact data quality.
- Documenting the initial review of analysis data to determine compliance with established company QA/QC protocols and any project-specific QA criteria, and noting any unusual occurrences or discrepancies on the data review checklist.
- Routine housekeeping duties for their laboratory area.

Data Reporting Staff:

- Assemble CLP-format data reports by organizing data report forms and raw data in proper order to allow for technical data review.
- Enter data into LIMS or other data reporting computer programs.
- Provide non-technical typographical review of data entered into computer systems by other individuals.
- Deliver data reports to customers by FAX or electronic mail.
- Paginate, photocopy, scan, archive Mitkem's copies of customer reports or other documentation to be retained by the laboratory.
- Ship, or organize for courier delivery, final data reports to customers.
- Assist the QA Director in management of the document control system.

Supervisor:

- Oversight of bench scientists in their laboratory areas.
- Monitors the status of all work in their laboratory area to insure compliance with holding time and turnaround time requirements.
- Training new scientists in the appropriate procedures and methods in the laboratory.
- Works with laboratory managers and the QA staff to review, revise and implement SOPs.
- Insures adequate resources to perform the needed tasks by working with administrative personnel to order needed supplies.

- Insures all supplies and reagents meet the QC requirements of their intended task prior to their use in the laboratory.
- Insures all staff are using proper safety protocols.
- Works with laboratory managers on the annual review of personnel performance.
- Interviews prospective new employees to insure they have the minimal level of qualifications, experience, education and skills necessary to perform their tasks, as well as the appropriate work ethic and social skills necessary for proper teamwork and productivity.
- Review of analytical data to insure compliance with method/SOP requirements prior to release to the client.
- Documents any non-compliance or other unusual occurrences noted during sample analysis and data review such that these can be included in the report narrative and explained to the client.

Senior Scientists:

- Review of analytical data to insure compliance with method/SOP requirements prior to release to the client.
- Documents any non-compliance or other unusual occurrences noted during sample analysis and data review such that these can be included in the report narrative and explained to the client.
- Assist laboratory Managers and Supervisors in other tasks as required.

Laboratory Manager:

- Works with laboratory Supervisors to coordinate laboratory areas in the completion of analytical projects.
- Review of analytical data to insure compliance with method/SOP requirements prior to release to the client.
- Works with QA Director to implement new SOPs and to annually review and revise existing SOPs.
- Works with the QA Director and laboratory Supervisors to develop and implement corrective action when needed.
- Works with management and supervisory staff to continuously improve the quality and efficiency of all company procedures.
- Assists laboratory Supervisors in the annual review of personnel performance.
- Supervises laboratory Supervisors to insure compliance with company QA policies and other company procedures.

Operations Manager:

- Prioritizes work in the laboratory areas to insure projects are completed on a timely basis.

- Works with laboratory Managers and Supervisors to coordinate laboratory areas in the completion of analytical projects.
- Review of analytical data to insure compliance with method/SOP requirements prior to release to the client.
- Writes project report narratives to document any unusual occurrences noted during sample analysis.
- Works with management and supervisory staff to continuously improve the quality and efficiency of all company procedures.
- Works with clients to insure all questions and concerns are addressed and answered.
- Assists laboratory Managers and Supervisors in the annual review of personnel performance.
- Supervises laboratory Managers and Supervisors to insure compliance with company QA policies and other company procedures.

Project Manager:

- Works with the client to completely understand the requirements of all incoming work.
- To evaluate the client's requirements as compared to the abilities of the laboratory as stated in Mitkem's Standard Operating Procedure (SOP); Project Management, SOP 110.0023.
- To communicate the customer's requirements to all laboratory staff working on the project.
- Works with the customer to determine the number and type of sample containers required for the project.
- Works with the Sample Custodian to resolve and communicate to the client any problem or discrepancies with incoming samples.
- Maintains open, responsive and continuous communication with the customer.
- Follows up with the client to assess level of satisfaction, and insure all project goals have been accomplished.

QA Director:

- Implements the entire QA program.
- Interact on a daily basis with laboratory staff.
- Evaluates compliance with the QA program through formal and informal reviews of data and processes.
- Implements the corrective action system.
- Works with laboratory Managers and Supervisors to implement new SOPs and to annually review and revise existing SOPs.
- Interfaces with certification authorities and agencies to maintain existing certifications and obtain new certifications.
- Maintains records of employee training and certification.

- Instructs laboratory personnel on ethics in the workplace.
- Oversees analytical trends that need to be evaluated and corrected.
- Oversees the implementation of MDLs and control limit studies.
- Directs both the internal and external audit programs.

CEO/Technical Director:

- Review of analytical data to insure compliance with method/SOP requirements prior to release to the client.
- Supervises all Management, QA and Supervisory staff to insure compliance with company QA policies and other company procedures.
- Provides technical assistance to all areas of the laboratory staff.
- Works with clients to insure their understanding of complex technical issues.
- Performs final review of select analytical data to ensure compliance with method/SOP requirements prior to release to the client.
- Acts as technical consultant for chemistry related issues that arise in the lab.
- Provides assistance with instrument optimization or performance issues as needed.
- Offers input on the purchase and operation of new instrumentation.
- Trains other analysts in procedures and methodologies.

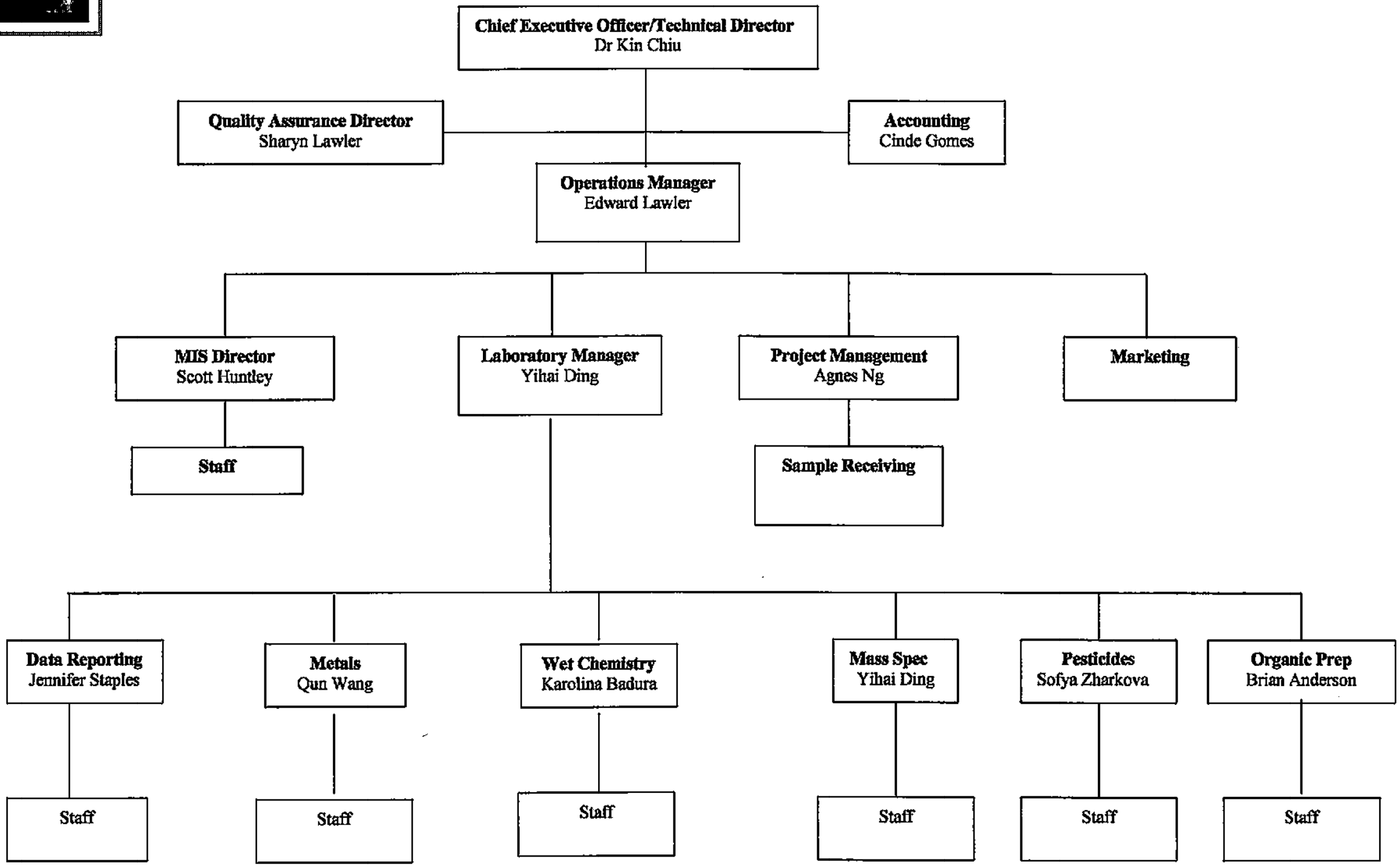
In Mitkem's organizational structure, the CEO/Technical Director is one of the principal owners of the company. He is the ultimate authority for all chemistry-related aspects of the company. The QA Director reports directly to the CEO/Technical Director. She has the authority within the management system to bring any issue to the highest levels of the company management and ownership, as well as to halt the release of data she believes to be questionable or suspend the performance of an analysis she believes to be unreliable. The Operations Manager is a Vice President of the company, and works with the project management and marketing staff and with the laboratory Supervisors to prioritize and coordinate work within the laboratories.

The personnel training records are located in the QA department. All individual training is documented including new employee training, individual training, annual retraining procedures, and Health and Safety training.

Figure 5-1
MITKEM Corporation's Organizational Chart

MITKEM
CORPORATION

Organizational Chart



6.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA IN TERMS OF PRECISION, ACCURACY, REPRESENTATION, COMPLETENESS AND COMPARABILITY AND QA REPORTING

As part of the evaluation component of the overall QA Program, laboratory results are compared with the data quality indicators defined as follows:

- Precision: the agreement of reproducibility among individual measurements of the same property usually made under identical conditions.
- Accuracy: the degree of agreement of a measurement with the true or accepted value.
- Representation: the degree to which data accurately and precisely represent a characteristic of a population, parameter variations of a sample of a finite process condition, or of a finite environmental condition.
- Completeness: a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions.
- Comparability: an expression of the confidence with which one laboratory data set can be compared with another laboratory data set in regard to the same property and laboratory sample population.

Quality Assurance objectives may vary by project and requested parameters. The accuracy, precision, and representation of data will be functions of the origins of the sample material, the procedures used to analyze sample and generate data, and the specific sample matrices involved in each project. Quality control practices utilized in the evaluation of these data quality indicators include blanks, replicates, spikes, standards, check samples, calibrations and surrogates. The process for quantifying or assessing the above indicators for data quality is addressed in Section 15.

6.1 Precision and Accuracy:

For each parameter analyzed, the QA objectives for precision and accuracy will be determined from:

- Published historical data;
- Method validation studies;
- MITKEM experience with similar samples and/or;
- Project-specific requirements, such as those stipulated by the USEPA in the CLP protocols and control documents.

6.2 Representation:

Analytical data should represent the sample analyzed regardless of the heterogeneity of the original sample matrix. In most cases, representation is achieved by mixing the laboratory sample well before removing a portion for analysis. On occasion, multi-phase laboratory samples may require that each phase be analyzed individually and reported in relation to its proportion in the whole sample.

6.3 Completeness:

The completeness goal is 100% in all cases and includes:

- Analysis of all samples;
- Generation and analysis of all required QC samples;
- Sufficient documentation of associated calibration, tuning and standardization;
- Records of data reduction processes, including manual calculations.

While the laboratory staff is responsible for achieving the completeness objective stated above, assigning each project a specific project manager whose functions include sample management and tracking ensures completeness.

6.4 Comparability:

To assure comparability, MITKEM employs established and approved analytical methods (e.g. USEPA protocols), consistent analytical bases (dry weight, volume, etc.) and consistent reporting units (mg/Kg, µg/L, etc.). Where data from different samples must be comparable, the same sample preparation and analysis protocols are used for all of the samples of interest.

6.5 QA Reporting

General QA procedures require that an MS/MSD or DUPLICATE/MS be reported with each sample batch up to 20 samples. In addition, each batch requires a method blank (MB) and laboratory control sample (LCS).

An acceptance criterion for the MB depends upon the method criteria. In-house control limits dictate the acceptability of the LCS. A high bias LCS is considered acceptable if the analyte is not present in the samples above the reporting limit. A low bias LCS will require re-extraction (if sample volume allows) and re-analysis.

DUP, MS, and MSD recoveries and calculated RSD's are specified in the methods of analyses. Recoveries outside the limits require some form of corrective action, whether that includes a post-digestion/distillation/extraction spike, re-extraction, re-analysis and/or notification to the client in the project narrative.

Omega LIMS will flag any QA samples outside method criteria on the reporting forms. Formal written corrective action reports are required for any incident that does not meet method criteria and cannot be remedied at the laboratory. The QA Officer signs off on any corrective actions and can also track QA trends in this manner.

7.0 SAMPLING PROCEDURES

For most projects, outside sampling teams deliver or send samples to the MITKEM laboratory. When sampling by MITKEM personnel is required, the sampling team follows the sampling procedures outlined in the EPA *Test Methods for Evaluating Solid Wastes*, SW-846, 3rd Edition, or procedures found in the EPA "Handbook for Sampling and Sample Preservation of Water and Wastewater".

Appropriately prepared sample containers are supplied by MITKEM at clients' request. When required, preservatives are added to the sample containers. Tables 7-1 through 7-3 provide the MITKEM Recommended Container, Preservation Techniques and Holding Times. Additional sample volumes may be required if additional QC functions are to be performed.

Holding times for SW846, CLP Methods, Standard Methods and certain USEPA methods are different and are presented in Tables 7-1 to 7-3. Holding times for most methods are calculated from the date of sample collection. Holding times for CLP methods are calculated from the Validated Time of Sample Receipt (VTSR). It should be noted that the CLP analysis program combines chemical analyses and contract compliance procedures in one document. For laboratory analysis and contract compliance purposes, holding times are calculated from VTSR, while post-analysis data usability and validation (generally performed by the client or a third party) compares holding times to the SW-846 method holding times calculated from date of sample collection.

Representative portions of samples are taken for analysis by following Mitkem SOP 110.0039, Standard Operating Procedure for Sub-Sampling.

Table 7-1
Recommended Container, Preservation Techniques and Holding Times for SW-846 Analyses

Analytes	Method	Containers	Required* Volume	Preservation	Holding Times
Volatile Organics					
Solid	8260C, 5030B	Amber glass jar with Teflon lining	Minimal head-space in jar	4°C	14 days
Solid [a]	8260C, 5035	40mL vial or Encore with Teflon lining	5.0gram ± 0.5	4°C, unpreserved	48 hours
				DI Water -10 to –20°C	14 days
				Sodium bisulfate -10 to –20°C, 4°C	14 days
				Methanol 4°C	14 days
Aqueous	8260C, 5030B	40mL VOA Vials with Teflon septum	40mL	4°C HCl, pH<2	14 days
Semivolatile Organics					
Solid	3540C, 3550B 8270D	Amber glass jar with Teflon lining	30gram	4°C	Extraction within 14 days Analysis within 40 days
Aqueous	3510C, 3520C 8270D	Amber glass bottles with Teflon lining	1L	4°C	Extraction within 7 days Analysis within 40 days
Polychlorinated Biphenyls					
Solid	3540C, 3550B 8082	Amber glass jar with Teflon lining	30gram	4°C	Extraction within 14 days Analysis within 40 days
Aqueous	3510C, 3520C 8082	Amber glass bottle with Teflon lining	1L	4°C	Extraction within 7 days Analysis within 40 days
Organochlorine Pesticides					
Solid	3540C, 3550B 8081A	Amber glass jar with Teflon lining	30gram	4°C	Extraction within 14 days Analysis within 40 days
Aqueous	3510C, 3520C 8081A	Amber glass bottle with Teflon lining	1L	4°C	Extraction within 7 days Analysis within 40 days
Chlorinated Herbicides					
Solid	8151A	Amber glass jar with Teflon lining	30gram	4°C	Extraction within 14 days Analysis within 40 days
Aqueous	8151A	Amber glass bottle with Teflon lining	1L	4°C	Extraction within 7 days Analysis within 40 days

Table 7-1 (cont'd)

Recommended Containers, Preservation Techniques and Holding Times for SW846 Analyses

Analytes	Method	Containers	Required* Volume	Preservation	Holding Times
Total Petroleum Hydrocarbons					
Gasoline Range Organics, including Maine-GRO**					
Solid	8015M, 5030B ME 4.1.17	Amber glass jar With Teflon lining	Minimal head-space in jar	4°C	14 days
Solid [a]	8015M, 5035	40mL vial or Encore with Teflon lining	5.0gram ± 0.5	4°C, unpreserved	48 hours
				4°C, Methanol	14days
Aqueous	8015M, 5030B ME 4.1.17	40mL VOA vials With Teflon septum	40mL	4°C HCl, pH<2	14 days
Diesel Range Organics, including Maine-DRO					
Solid	3540C, 3550B 8015M ME 4.1.25	Amber glass jar with Teflon lining	30gram	4°C	Extraction within 14 days Analysis within 40 days
Aqueous	3510C, 3520C 8015M ME 4.1.25	Amber glass bottle with Teflon lining	1L	4°C H_2SO_4, pH<2	Extraction within 7 days Analysis within 40 days
Total Metals except Mercury and Chromium (VI)					
Solid	3050B 6010C	Amber glass jar with Teflon lining	10g	4°C	180 days
Aqueous	3005A, 3010A	Polyethylene bottle	100mL	HNO_3, pH<2	180 days
Chromium (VI)					
Solid	7196A	Amber glass jar with Teflon lining	10g	4°C	Digestion within 30 days Analysis within 96 hours
Aqueous	7196A	Polyethylene bottle	25mL	4°C	24 hours
Mercury					
Solid	7471A	Amber glass jar	10g	4°C	28 days
Aqueous	7470A	Polyethylene bottle	100mL	4°C HNO_3, pH<2	28 days
Cyanide					
Solid	9012	Amber glass jar with Teflon lining	10g	4°C	14 days
Aqueous	9012	Polyethylene bottle	50mL	4°C NaOH, pH≥12	14 days
Flashpoint					
Aqueous	1010	Amber glass bottle	30mL	4°C	28 days

Table 7-2

Recommended Container, Preservation Techniques and Holding Times For CLP/ASP Analyses

Analytes	Method	Containers	Required* Volume	Preservation	Holding Times
Volatile Organics					
Solid	CLP/ASP	Amber glass jar with Teflon lining	Minimal head-space in jar	4°C	10 days from VTSR
Aqueous	CLP/ASP	40mL VOA vials with Teflon septum	40mL	4°C HCl, pH<2	10 days from VTSR
	CLP Low	40mL VOA vials with Teflon septum	40mL	4°C HCl, pH<2	10 days from VTSR
Semivolatile Organics					
Solid	CLP/ASP	Amber glass jar with Teflon lining	30gram	4°C	10 days from VTSR Analysis within 40 days
Aqueous	CLP/ASP	Amber glass bottle with Teflon lining	1L	4°C	5 days from VTSR Analysis within 40 days
	CLP Low	Amber glass bottle with Teflon lining	1L	4°C	5 days from VTSR Analysis within 40 days
Organochlorine Pesticide/PCB					
Solid	CLP/ASP	Amber glass jar with Teflon lining	30gram	4°C	10 days from VTSR Analysis with 40 days
Aqueous	CLP/ASP	Amber glass bottle with Teflon lining	1L	4°C	5 days from VTSR Analysis within 40 days
	CLP Low	Amber glass bottle with Teflon lining	1L	4°C	5 days from VTSR Analysis within 40 days
Cyanide					
Solid	CLP/ASP	Amber glass jar	10gram	4°C	12 days from VTSR
Aqueous	CLP/ASP	Polyethylene bottle	50mL	4°C NaOH, pH>12	12 days from VTSR
Total Metals except Mercury					
Solid	CLP/ASP	Amber glass jar	10gram	4°C	180 days from VTSR
Aqueous	CLP/ASP	Polyethylene bottle	100mL	HNO_3, pH<2	180 days from VTSR

Table 7-2 (con't)

Recommended Container, Preservation Techniques and Holding Times For CLP/ASP Analyses

Analytes	Method	Containers	Required* Volume	Preservation	Holding Times
Mercury					
Solid	CLP/ASP	Amber glass jar	10gram	4°C	26 days from VTSR
Aqueous	CLP/ASP	Polyethylene bottle	100mL	4°C HNO_3, pH<2	26 days from VTSR

Table 7-3

Recommended Containers, Preservation Techniques and Holding Times for Other Analyses

Analytes	Method	Containers	Required* Volume	Preservation	Holding Times
Volatile Organics					
Aqueous	624	40mL VOA vials with Teflon septum	40mL	4°C HCl, pH<2	14 days
Semivolatile Organics					
Aqueous	3510C, 3520C 625	Amber glass bottle with Teflon lining	1L	4°C	Extraction within 7 days Analysis within 40 days
Organochlorine Pesticide/PCB					
Aqueous	3510C, 3520C 608	Amber glass bottle with Teflon lining	1L	4°C	Extraction within 7 days Analysis within 40 days
EDB/DBCP					
Aqueous	504.1	40mL VOA vials with Teflon septum	35mL	4°C HCl, pH<2	28 days
MA Extractable Petroleum Hydrocarbons (EPH)					
Solid	3540C, 3550B MADEP	Amber glass jar with Teflon lining	10gram	4°C	Extraction within 7 days Analysis within 40 days
Aqueous	3510C, 3520C MADEP	Amber glass bottle with Teflon lining	1L	4°C HCl, pH<2	Extraction within 14 days Analysis withinn 40 days
MA Volatile Petroleum Hydrocarbons (VPH)					
Solid	MADEP	Amber glass jar with Teflon lining	10gram	4°C 10mL Methanol	14 days
Aqueous	MADEP	40mL VOA vial with Teflon lining	40mL	4°C HCl, pH<2	14 days
Oil & Grease					
Aqueous	1664	Amber glass bottle with Teflon lining	1L	4°C HCl, pH<2	28 days
Alkalinity					
Aqueous	SM2320	Polyethylene bottle	100mL	4°C	14 days
Ammonia					
Aqueous	SM4500NH3B	Polyethylene bottle	100mL	4°C H_2SO_4, pH<2	28 days
Chloride					
Aqueous	EPA 325.2	Polyethylene bottle	100mL	4°C	28 days

Table 7-3 (cont'd)

Recommended Containers, Preservation Techniques and Holding Times
for
Other Analyses

Analytes	Method	Containers	Required Volume	Preservation	Holding Times
Chloride	E300.0	Polyethylene bottle	50mL	4°C	28 days
COD					
Aqueous	SM5220D	Amber VOA vial	40mL	4°C H2SO4, pH<2	28 days
Color					
Aqueous	E110.2Modified	Polyethylene bottle	50mL	4°C	Immediate
Nitrate/Nitrite					
Aqueous	E353.2	Polyethylene bottle	50mL	4°C H_2SO_4, pH<2	28 days
Nitrate/Nitrite					
Aqueous	E300.0	Polyethylene bottle	50mL	4°C	48 hours
Nitrite					
Aqueous	SM4500NO2B E300.0	Polyethylene bottle	50mL	4C	48 hours
Orthophosphate					
Aqueous	SM4500-P, E E300.0	Polyethylene bottle	50mL	4°C	48 hours
Total phosphate					
Aqueous	SM4500-P B,E	Polyethylene bottle	50mL 50mL	4°C H_2SO_4, pH<2	28 days
Phenols					
Aqueous	SM5530B	Polyethylene bottle	250mL	4°C H_2SO_4, pH<2	28 days
Sulfates					
Aqueous	SM4500SO4 E E300.0	Polyethylene bottle	50mL	4°C	28 days
Sulfide Total					
Aqueous	SM4500-S D	Polyethylene bottle	50mL	4°C NaOH, pH>12 ZnAc	28 days
Reactivity					
Solid	Chapter 7 SW846	Amber glass jar	10gram	4°C	28 days
Aqueous	Chapter 7	Polyethylene bottle	250mL	4°C	28 days
Total Organic Carbon (TOC)					
Solid	Lloyd Kahn	Amber glass jar	10g	4°C	14 days

Table 7-3 (cont'd)

Recommended Containers, Preservation Techniques and Holding Times For Other Analyses

Analytes	Method	Containers	Required* Volume	Preservation	Holding Times
Total Organic Carbon					
Aqueous	E415.1	40mL VOA vials	40mL	4°C HCl, pH<2	28 days
TKN					
Aqueous	SM4500Norg C	Polyethylene bottle or Amber glass bottle	50mL	4°C H_2SO_4, pH<2	28 days
Total Solids (TS)					
Aqueous	SM2540B	Polyethylene bottle	200mL	4°C	7 days
Total Dissolved Solids (TDS)					
Aqueous	SM2540C	Polyethylene bottle	200mL	4°C	7 days
Total Suspended Solids (TSS)					
Aqueous	SM2540D	Polyethylene bottle	200mL	4°C	7 days
Settleable Solids					
Aqueous	SM2540F	Polyethylene bottle	200mL	4°C	48 hours

* These represent minimum required volume. Additional sample volumes should be collected to minimize headspace loss for volatile analysis. Additional sample aliquot are also required to perform QA/QC functions (e.g. spikes, duplicates), % moisture for solid samples and sample re-analysis (if needed).

[a] For Massachusetts analyses, the Volatile Organics soil samples are preserved in Methanol in the field.

EPA SW-846 Method 5035 provides several options for preservation of soil samples for volatile organics. Certain state jurisdictions (NY for example) have not adopted these options to-date, and continue to recommend the collection of unpreserved soil sample aliquots for volatiles analysis. Mitkem's preference for low-level analysis is to collect approximately 5 grams of soil into 5mL of organic-free DI water and to preserve by freezing within 48hours of collection. A separate container with approximately 5 grams of soil into 5mL of methanol is also collected for potential medium-level analysis. A separate container of unpreserved soil also must be collected to perform percent moisture analysis.

** Maine GRO soil analysis requires a medium level methanol extraction. A 10 gram sample and 10mL methanol volume is used.

8.0 SAMPLE CUSTODY

8.1 Chain of Custody:

Samples are physical evidence collected from a facility or the environment. In hazardous waste investigations, sample data may be used as evidence in (EPA) enforcement proceedings. In support of potential litigation, laboratory chain-of-custody procedures have been established to ensure sample traceability from time of receipt through the disposal of the sample.

A sample is considered to be in the custody under the following conditions:

- It is in an authorized person's actual possession, or
- It is in an authorized person's view, after being in that person's physical possession, or
- It was in an authorized person's possession and then was locked or sealed to prevent tampering, or
- It is in a secure area.

Chain-of-custody originates as samples are collected. Chain-of-custody documentation accompanies the samples as they are moved from the field to the laboratory with shipping information and appropriate signatures indicating custody changes along the way.

Laboratory chain-of-custody is initiated as samples are received and signed for by the Sample Custodian or his/her designated representative at MITKEM. Documentation of sample location continues as samples are signed in and out of the central storage facility for analysis in the several MITKEM departments, using the Sample Tracking Forms (Fig 8.4-1). After analysis, any remaining sample is held in the central storage area to await disposal. Mitkem's policy is to hold spent samples for a period of at least thirty days from submittal of final report, unless other arrangements are agreed upon with the client.

8.2 Laboratory Security:

Samples and all data generated from the analyses of samples at MITKEM are kept within secure areas during all stages of residence, including the periods of time spent in preparation for analysis, while undergoing analysis, and while in storage.

The entire laboratory is designated as a secure area. The doors to the laboratory are under continuous surveillance, are kept locked after regular business hours and may only be accessed by key or keypad entry. Only authorized personnel are allowed to enter the secure areas. The central laboratory facility and IT office are only accessed through keypad entry. A MITKEM staff member must accompany visitors to the laboratory.

8.3 Duties and Responsibilities of Sample Custodian:

Duties and responsibilities of the Sample Custodian include:

8.3.1 Receiving samples.

8.3.2 Inspecting and documenting sample shipping containers for presence/absence and condition of:

8.3.2.1 Custody seals, locks, "evidence tape", etc.;

8.3.2.2 Container breakage and/or container integrity, including air space in aqueous samples, or proper preservation for soil samples for Volatiles analysis.

8.3.3 Recording condition of both shipping containers and sample containers (cooler temperature, bottles, jars, cans, etc.).

8.3.4 Signing documents shipped with samples (i.e. air bills, chain-of-custody record(s), Sample Management Office (SMO) Traffic Reports, etc.)

8.3.5 Verifying and recording agreement or non-agreement of information on sample documents (i.e. sample tags, chain-of-custody records, traffic reports, air bills, etc.). If there is non-agreement, recording the problems, contacting the project manager for direction, and notifying appropriate laboratory personnel. (Client's corrective action directions shall be documented in the case file.)

8.3.6 Initiating the paper work for sample analyses on laboratory documents (including establishing sample workorder files) as required for analysis or according to laboratory standard operating procedures.

8.3.7 Label samples with laboratory sample identification numbers and cross-referencing laboratory numbers to client numbers and sample tag numbers.

8.3.8 Placing samples and spent samples into appropriate storage and/or secure areas.

8.3.9 Where applicable, making sure that sample tags are removed from the sample containers and included in the workorder file.

8.3.10 Where applicable, accounting for missing tags in a memo to the file or documenting that the sample tags are actually labels attached to sample containers or were disposed of, due to suspected contamination.

8.3.11 Monitoring storage conditions for proper sample preservation such as refrigeration temperature and prevention of cross-contamination.

8.3.12 Sending shipping containers with prepared sample bottles and sample instructions to clients who request them.

8.3.13 Recording temperatures of freezers and refrigerators in the laboratories.

8.3.14 Calibrating the non-contact infrared temperature gun quarterly.

8.3.15 Disposal of samples after a specified time period determined by contract or client request.

8.4 Sample Receipt:

The Sample Custodian or his/her designated representative receives sample shipments at MITKEM. Unless the shipment is a continuation of a previous workorder, a new workorder file is started for the sample. The information is logged into the Sample Receipt Logbook (Figure 8.4-1).

The cooler is inspected for the following (if applicable) and findings are documented on the Sample Login Form (Figure 8.4-2) for USEPA CLP samples, and on the Sample Condition Form (Figure 8.4-3) for all other samples:

- Custody seal (conditions and custody number)
- Air bill (courier and air bill #)

The cooler is then opened and the following items are checked (in order). Make sure the hood is turned on when the cooler is opened.

- Chain of custody (COC) records (or traffic report). These are usually taped to the inside of the cooler cover.
- Radioactivity using the Geiger counter, which continuously monitors the receiving area for radiation
- Cooler temperature using the non-contact infrared temperature gun. Record the temperature of a temperature blank if available, using a calibrated thermometer. Record each temperature on the COC.

The Sample Custodian will perform the following:

- Remove the sample containers and arrange them in the same order as documented in the chain of custody report.
- Inspect condition of the sample containers.
- Assign laboratory sample ID and cross-reference the laboratory ID to the client ID.
- Remove tags and place in the workorder file.
- Check preservative and document in the Sample Condition Form (Figure 8.4-3) if needed. If additional preservative is needed, it is added at this time.
- Check for air bubbles in aqueous samples and for proper preservation and immersion of soil samples designated for volatile organic analysis.
- Ensure peer review occurs for proper cross-referencing and labeling of sample containers.

Any discrepancies or problems are noted in the Sample Condition Notification Form (Figure 8.4-4).

The sample custodian conveys the information to the project manager who will in turn inform the client, or may directly inform the client of the discrepancies.

Samples can be rejected at Mitkem for any of the following reasons:

1. Complete and proper documentation was not sent with the samples.
2. Sample labels cannot be identified because indelible ink was not used during the sampling procedure.
3. Hold times had already been exceeded when samples arrived at the laboratory.
4. Inadequate sample volume.
5. Potential cross-contamination has occurred among samples.
6. Samples are inadequately preserved.
7. The samples or shipping container is badly destroyed during shipping.
8. The samples are potentially radioactive.
9. The samples represent untreated fecal waste for which Mitkem employees are currently not inoculated against.

In all instances, the client is contacted initially before any action is taken at Mitkem.

The Sample Custodian signs the Sample Receipt Form and originates a file folder for the set of samples. The following forms are included in the file: the Sample Receipt Form, chain of custody records, shipping information, and an orange Sample Condition Notification Form if any problems or discrepancies need to be addressed.

When the Sample Custodian is not available to receive samples, another MITKEM staff member signs for the sample container. The time, date and name of the person receiving the container are recorded on the custody records. In addition, the cooler temperature is measured and recorded on the Sample Condition Form. The samples are then stored in the centralized walk-in refrigerator in the sample receipt area. The sample receipt area is located in the secure central storage facility of the laboratory. VOA samples are stored in the VOA analysis laboratory. The samples are officially received and documented by the Sample Custodian or designee before the next business day.

At times, samples will be sent to another lab for analysis not performed at MITKEM. These subcontracted analyses are performed by laboratories certified to perform the analyses. The use of a subcontractor laboratory is discussed with the client prior to sending samples, per Mitkem's Project Management Standard Operating Procedure.

These samples are packed to prevent breakage and stored in a cooler in the walk-in or stored in the small refrigerator in the central storage facility. The samples are either hand delivered to a local sub-contract lab, or shipped with sufficient coolant to maintain a 4 degree temperature by air courier under MITKEM's chain-of-custody (Figure 8.4-5).

8.5 Sample Log-in Identification:

8.5.1 Sample Identification:

To maintain sample identity, each sample received at MITKEM is assigned a unique sample identification (Sample ID) number. Samples are logged into MITKEM via the Omega Laboratory Information Management System (LIMS).

After inspecting the samples, the Sample Custodian logs each sample into the Omega LIMS, which assigns a MITKEM Sample ID Number. These Numbers are assigned sequentially in chronological order. MITKEM Sample Identification Numbers appear in the following format:
YXXXX-NNF

In which: Y – represents the current year with A for 2002, B for 2003, C for 2004, etc.
XXXX – represents a four-digit work order number that is assigned sequentially to each submittal of samples
NN – represents the sample number within the group or workorder.
F – represents the fraction. All sample portions that are received in identical bottles with identical preservatives are grouped into one fraction.

For example, the first fraction of the fifth sample of the 20th workorder of 2003 would have the number: B0020-05A

The MITKEM Sample ID Numbers are recorded on the Sample Login Form (Figure 8.4-2) for USEPA CLP samples, and on the Sample Condition Form (Figure 8.4-3) for all other samples. Information on these forms cross-reference the Sample ID Numbers with SDG numbers, sample tag numbers and/or other client identifiers. Each sample is clearly labeled with its MITKEM Sample ID Number by the Sample Custodian. The same sample ID Number appears on the LIMS status report, on each sample preparation container and extract vial associated with the sample.

8.5.1.1 Sample Extract Identification:

As described in Section 8.5.1, a sample extract is identified with the same unique sample identification number as the sample from which it derives

8.5.2 Sample Login:

Sample login system at MITKEM consists of computerized entry using Omega LIMS (Figure 8.5-1). The information recorded onto the Workorder Report includes:

- Workorder number
- Client name
- Project name and location
- Final data report format
- Date of receipt
- Date sample collected
- Due date, fax and/or hardcopy
- EDD requirements
- Comments or notes on the workorder
- MITKEM Sample Identification numbers
- Client Sample Identification numbers
- Sample matrix
- Analyses required
- Case number, where used by the client
- SDG number, where used by the client

8.5.3 Sample Information:

After sample information is properly recorded (Sample Receipt Logbook, Sample Receipt Forms) and the samples have been properly logged into the LIMS, bottle labels are generated and applied to the sample containers. The Sample Custodian notifies the Project Manager or peer or supervisor to review the sample bottle labeling. This person reviews all the information associated with the samples. He/she verifies (by initialing) the correctness of the information on the Sample Condition Form or Sample Log-In Form. Sample login information is available through the Omega LIMS to all appropriate laboratory staff.

The Sample Custodian initiates a red workorder file. This file contains the original Sample Log-In Form or Sample Condition Form, air bills, SMO traffic reports, sample tags, workorder reports and all correspondence with the Client or SMO or others. The red workorder file is forwarded to the Project Manager for review of the login paperwork, and for updating status of the workorder in the LIMS. Once the login information is thoroughly reviewed for correctness, the red workorder file is stored in the data reporting area. Analytical data are placed in this as analyses are completed and data are reviewed.

8.6 Sample Storage and Disposal:

Samples at MITKEM are stored in a central storage facility. After sample receipt and login procedures are completed, the Sample Custodian places the samples in the centralized walk-in refrigerator. Volatile Organic sample aliquots are released to the volatile organic lab with documentation (Figure 8.6-1).

The central storage facility is for samples only; no standards or reagents are to be stored there. Access to the centralized sample storage facility is limited by keypad entry at all times.

All sample/extract refrigerators are maintained at 4°C ± 2°C. Standards are kept in freezers maintained at -10 to -20°C. They are monitored twice every working day and once daily on the weekends. Temperatures are recorded in the Temperature Log (Figure 8.6-2).

When analysis is complete, any remaining sample is retained in the central storage facility until it may be removed for disposal (see SOP 30.0024 for Sample Disposal). Broken and damaged samples are promptly disposed in a safe manner. Unless there is a specific request by the client, excess, unused sample aliquots are stored for at least 30 days after the submission of compliant data. The samples are then disposed after such period. USEPA and NYS ASP extracts are stored under refrigeration for at least one year. Other extracts are stored under refrigeration for up to three months, unless there is a specific agreement with the client. After such time, the extracts are disposed. All disposals are performed in a manner compliant with federal and state regulations.

8.6.1 Extract Transfer:

The extracts generated during the preparation for the organic analyses are transferred from the Organic Prep Lab to the Analysis Labs. The extracts, for Semivolatiles, TPH, Pesticides and PCBs, are checked in the Analysis Lab by entries in the appropriate Extract Transfer Logbook (Figures 8.6-3 and 8.6-4).

Metals analysis samples that are transferred from the prep area to the analysis room are signed for by the metals analyst. This entry occurs in the Metals Preparation Logbooks at the time of the transfer (Figures 8.6-5).

There is no extract transfer that occurs with either Wet Chemistry or VOA samples.

8.6.2 Extract Storage:

Semivolatile, Pesticide/PCB, and TPH extracts, which are contained in crimp top vials or screw cap vials with Teflon lined septa, are stored at 4°C ± 2°C. Semivolatile and Pesticide/PCB extracts are stored in refrigerators in the Organic Analysis room. They are catalogued numerically by workorder number that approximates chronological order, according to date of receipt. USEPA CLP extracts are stored separately within the refrigerator from sample extracts of other clients.

Excess Pesticide extracts, not analyzed, are stored in screw cap vials with Teflon lined septa in the Organic Prep Lab. In most instances, they consist of the remaining 8 mL portions of aqueous and soil sample extracts and are stored chronologically by workorder.

8.7 Sample Tracking:

When a sample is removed from storage, the analyst who has custody signs the Sample Receipt Log. The Sample Receipt Log records the initials of the sample custodian or other authorized lab personnel who relinquishes custody of the sample(s) to the analyst, as well as the initials of the analyst who receives the sample. When the sample(s) are returned to the central storage facility, the analyst relinquishes the sample to the sample custodian or other authorized lab personnel. In addition to the individual's initials, the date is recorded. This information indicates the location of the sample at any point in time.

Chain-of-custody of a sample ensures that the sample is traceable from the field, where it was taken, through laboratory receipt, preparation, analysis and finally disposal. The primary chain-of-custody documents are used to locate a sample at any point in time.

1. The chain-of-custody form from the field describes the origin and transportation of a sample;

2. The MITKEM Sample Receipt Logbook and supporting login records document acceptance of a sample by the Mitkem laboratory; and

3. The MITKEM Sample Receipt Logbook documents which analyst has custody of the sample after removal from storage.

4. The sample preparation logs and/or extract transfer logs document when the extracts or digestates were received by the analytical labs and where they are stored..

Figure 8.4-1
Sample Receipt Tracking Logbook Form

MITKEM CORPORATION

Sample Receiving Logbook

Workorder No. ________________

Client Name: ______________________________

Date Recv'd__________ **Sample #s**____________________ **Storage Locations:**____________________

Date Recv'd__________ **Sample #s**____________________ **Storage Locations:**____________________

Date Recv'd__________ **Sample #s**____________________ **Storage Locations:**____________________

Date Recv'd__________ **Sample #s**____________________ **Storage Locations:**____________________

Date Recv'd__________ **Sample #s**____________________ **Storage Locations:**____________________

OUT		IN	
Relinquished By	**Received By**	**Relinquished By**	**Received By**
Date: Init:	Date: Init:	Date: Init:	Date: Init:
Samp. #s			
Date: Init:	Date: Init:	Date: Init:	Date: Init:
Samp. #s			
Date: Init:	Date: Init:	Date: Init:	Date: Init:
Samp. #s			
Date: Init:	Date: Init:	Date: Init:	Date: Init:
Samp. #s			
Date: Init:	Date: Init:	Date: Init:	Date: Init:
Samp. #s			
Date: Init:	Date: Init:	Date: Init:	Date: Init:
Samp. #s			
Date: Init:	Date: Init:	Date: Init:	Date: Init:
Samp. #s			
Date: Init:	Date: Init:	Date: Init:	Date: Init:
Samp. #s			

Comments: ____

____

Please record analyst's initials, date, and sample #s removed. Add any comments if necessary (broken bottles, empty jars, etc.)
Include the abbreviated name of the test to be performed., ie: SVOA, PCB...near the "samp. #s".
Include bottle or jar number when more than one.

Reviewed:____________

Logbook ID: 30.0287-11/06

Figure 8.4-2
USEPA CLP Sample Login Form

SAMPLE LOG-IN SHEET

Lab Name Mitkem Corporation

Page __ of __

Received By (Print Name)

Log-in Date

Received By (Signature)

Case Number

Sample Delivery Group No.

SAS Number

Remarks: (1) Please see associated sample/extract transfer logbook pages submitted with this data package.

1. Custody Seal(s) Present/Absent* Intact/Broken
2. Custody Seal Nos. ______ ______
3. Chain of Custody Records Present/Absent*
4. Traffic Reports or Packing Lists Present/Absent*
5. Airbill Airbill/Sticker Present/Absent*
6. Airbill No. ______ ______
7. Sample Tags Present/Absent*

   Sample Tag Numbers Listed/Not Listed on Chain-of-Custody
8. Sample Condition Intact/Broken*/Leaking
9. Cooler Temperature ______
10. Does information on custody records, traffic reports, and sample tags agree? Yes/No*
11. Date Received at Lab ______
12. Time Received ______

EPA Sample #	Corresponding		Remarks: Condition of Sample Shipment, etc.
	Sample Tag #	Assigned Lab #	

Sample Transfer

Fraction BNA & Pest/PCB (1)	Fraction VOA (1)
Area # R1	Area # VOA Lab
By	By
On	On

* Contact SMO and attach record of resolution

Reviewed By	Logbook No.
Date	Logbook Page No.

SAMPLE LOG-IN SHEET
FORM DC-1

Lab Name Mitkem Corporation		Page __ of __
Received By (Print Name)		Log-in Date
Received By (Signature)		
Case Number	Sample Delivery Group No.	Mod. Ref. No.

Remarks:
(1) Please see associated sample/extract transfer logbook pages submitted with this data package.

			Corresponding		
		EPA Sample #	Sample Tag #	Assigned Lab #	Remarks: Condition of Sample Shipment, etc.
1. Custody Seal(s)	Present/Absent* Intact/Broken				
2. Custody Seal Nos.	______ ______				
3. Traffic Reports/ Chain of Custody Records (TR/COCs) or Packing Lists	Present/Absent*				
4. Airbill	Airbill/Sticker Present/Absent*				
5. Airbill No.	______ ______				
6. Sample Tags	Present/Absent*				
Sample Tag Numbers	Listed/Not Listed on Chain-of-Custody				
7. Sample Condition	Intact/Broken*/ Leaking				
8. Cooler Temperature Indicator Bottle	Present/Absent				
9. Cooler Temperature	______				
10. Does information on TR/COCs and sample tags agree?	Yes/No*				
11. Date Received at Laboratory	______				
12. Time Received	______				
Sample Transfer					
Fraction VOA (1)	Fraction BNA/Pest/Aro(1)				
Area #	Area #				
By	By				
On	On				

* Contact SMO and attach record of resolution.

Reviewed By	Logbook No.
Date	Logbook Page No.

Figure 8.4-3
Sample Condition Form

MITKEM CORPORATION

Sample Condition Form

Page ___ of ___

Received By: | Reviewed By: | Date: | MITKEM Workorder #:

Client Project: | Client:

1) Cooler Sealed Yes / No

2) Custody Seal(s) Present / Absent

Coolers / Bottles

Intact / Broken

3) Custody Seal Number(s) ______________

4) Chain-of-Custody Present / Absent

5) Cooler Temperature ______________

Coolant Condition ______________

6) Airbill(s) Present / Absent

Airbill Number(s) ______________

7) Sample Bottles Intact/Broken/Leaking

8) Date Received ______________

9) Time Received ______________

Preservative Name/Lot No:

____

____

____

Lab Sample ID		Preservation (pH)				VOA Matrix	Soil Headspace or Air Bubbles ≥ 1/4"
		HNO$_3$	H$_2$SO$_4$	HCl	NaOH		

VOA Matrix Key:

US = Unpreserved Soil	**A** = Air
UA = Unpreserved Aqu.	**H** = HCl
M= MeOH	**E** = Encore
N = NaHSO$_4$	**F** = Freeze

See Sample Condition Notification/Corrective Action Form yes / no

Rad OK yes/ no

SampleCond.Form-non-CLP.xls12/20/2006

Figure 8.4-4
Sample Condition Notification Form

Sample Condition Notification

Mitkem Project#:______________ **Date of Receipt:**______________

Client:______________________ **Received By:**_________________

Client project #/name:________________________

Unusual Occurance Description:

Client Contacted:

Contacted via: Phone/Fax/E-mail
Date:___________ **Time:**____________
Contacted By:_________________________
Name of person contacted:________________________

Client Response:

Responded via: Phone/Fax/E-mail
Date:_____________
Name of person responding:__________________________
Responding to:_________________________

Mitkem Action Taken:

Figure 8.4-5
MITKEM Chain-of-custody Form

MITKEM CORPORATION

175 Metro Center Boulevard
Warwick, Rhode Island 02886-1755
(401) 732-3400 • Fax (401) 732-3499
email: mitkem@mitkem.com

CHAIN-OF-CUSTODY RECORD

Page ____ of ____

REPORT TO		INVOICE TO		
COMPANY	PHONE	COMPANY	PHONE	LAB PROJECT #:
NAME	FAX	NAME	FAX	
ADDRESS		ADDRESS		TURNAROUND TIME
CITY/ST/ZIP		CITY/ST/ZIP		

CLIENT PROJECT NAME:	CLIENT PROJECT #:	CLIENT P.O.#:

SAMPLE IDENTIFICATION	DATE/TIME SAMPLED	COMPOSITE	GRAB	WATER	SOIL	OTHER	LAB ID	# OF CONTAINERS	REQUESTED ANALYSES												COMMENTS
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				
	/																				

TSF#	RELINQUISHED BY	DATE/TIME	ACCEPTED BY	DATE/TIME	ADDITIONAL REMARKS:	COOLER TEMP
1		/		/		
2		/		/		
3		/		/		

WHITE: LABORATORY COPY **YELLOW:** REPORT COPY **PINK:** CLIENTS COPY

Figure 8.5-1
Workorder Information Form

Mitkem Corporation *20/Dec/06 11:35* **WorkOrder: E1468**

Client ID: MITKEM_WARWICK
Project: WW 9/25
Location:
Comments: N/A

Case:
SDG:
PO: --

Report Level: LEVEL 2
EDD:
HC Due: 10/10/06
Fax Due:

Sample ID	Client Sample ID	Collection Date	Date Recv'd	Matrix	Test Code	Lab Test Comments	Hold	MS	SEL	Storage
E1468-01A	WW-9/25-C	09/25/2006 0:00	09/26/2006	Aqueous	SM5220		☐	☐	☐	Disposed
E1468-01B	WW-9/25-C	09/25/2006 0:00	09/26/2006	Aqueous	E200.7	Cd, Cr, Cu, Pb, Ni, Ag, Zn	☐	☐	☑	Disposed
E1468-02A	WW-9/25-G	09/25/2006 0:00	09/26/2006	Aqueous	E624		☐	☐	☐	Disposed
E1468-02B	WW-9/25-G	09/25/2006 0:00	09/26/2006	Aqueous	E335.4		☐	☐	☐	Disposed

Client Rep:

Figure 8.6-1
Volatiles Receiving Logbook Form

MITKEM CORPORATION: VOLATILES RECEIVING LOGBOOK

VOA Log-In Date	Workorder	Client	Sample Numbers	Relinquished By	Comments

Logbook ID 90.0191-04/05

Reviewed By:

Figure 8.6-2
Temperature Logbook Form

MITKEM CORPORATION: Refrigerator/Freezer Temperature Logbook

Date: ____________ Analyst ____________

		Time1 :		Time 2 :		Time 3 :		Comments
Refrigerator ID	Freezer ID	R-Temp	F-Temp	R-Temp	F-Temp	R-Temp	F-Temp	
R-1-Front	N/A							
R-1- Back	N/A							
R2	F2							
R3	F3							
R4	F4							
R5	F5							
R7	F7							
R8	F8							
R9	F9							
R10	F10							
R11	N/A							
R12	F12							
R13	F13							
R14	N/A							
N/A	F15							
N/A	F16							
R17	F17							
N/A	F18							
R19	N/A							
R20	N/A							

Temperature Requirements

Freezers between-10 and -20 degree C
Refrigerators between 2 and 6 degree C

Logbook ID: 30.0108-12/06 **Reviewed by:** ____________

Figure 8.6-3
Extracts Transfer Logbook Form – Semivolatile Analysis

MITKEM CORPORATION EXTRACT TRANSFER LOGBOOK: SEMIVOLATILE ANALYSIS

Date Transferred from Prep Lab	Lab ID		Transferred By	Received By	Storage Location	Comments

Logbook ID 70.0141-12/06

Reviewed By: ____________________

Figure 8.6-4
Extracts Transfer Logbook Form – Pesticide/PCB Analysis

MITKEM CORPORATION EXTRACTS TRANSFER LOGBOOK: PESTICIDES/PCB ANALYSIS

Date Transferred from Prep Lab	Lab ID		Transferred by	Received by	Storage Location	Comments

Logbook ID: 60.0132 - 07/06 **Reviewed by**________________

Figure 8.6-5
Preparation Logbook Form – Metals Analysis

MITKEM CORPORATION: Aqueous Metals Preparation Logbook

Date	Sample ID		Client ID	Sample Vol (ml)	pH	Sample Color Before	Clarity Before	Conc. HNO_3 (ml)	Conc. HCl (ml)	1:1 HCl (ml)	Sample Color After	Sample Clarity After	Final Volume (ml)	Comments	Analyst

HCl Lot# ____________________

HNO3 Lot# ____________________

Method: __________

Digestion Temp: __________ **oC**

LCSS/Spike ID: ____________________

____

____

SOP#: __________

Digestate Relinquished to: ____________________

Logbook ID 100.0125 -11/06

REVIEWED BY: ____________________

9.0 CALIBRATION PROCEDURES AND FREQUENCIES

9.1 Instruments:

Specific calibration and check procedures are given in the analytical methods referenced in Section 10. The frequencies of calibration and the concentrations of calibration standards are determined by the cited methods and any special project or contract-specific requirements. Standard calibration curves of signal response versus concentration are generated on each analytical instrument used for a project, prior to analysis of samples. A calibration curve of the appropriate linear range is established for each parameter that is included in the analytical procedure employed and is verified on a regular basis with check standards as specified in the appropriate CLP Protocols. For non-CLP work, MITKEM adheres to the calibration criteria specified by SW-846 and/or Standard Methods for both organic and inorganic analyses. Where requested, other method specific calibration criteria are used.

For organic analyses whenever possible, unless otherwise specified in the individual methods, the initial calibration standards (ICAL), continuing calibration verification standards (CCV), laboratory control sample spike (LCS) and matrix spike (MS) will all be from the same source. The initial calibration verification (ICV) standards are prepared from a separate source. The following are examples of calibration procedures for various instrumental systems. Refer to the Standard Operating Procedures for the specific calibration requirements.

GC/ECD and GC/FID – An initial calibration is performed using five different concentration levels for each parameter of interest for SW-846 analyses. The initial calibration is done on each column and each instrument, and is repeated each time a new column is installed or whenever a major change is made to the chromatographic system.

An initial calibration verification (ICV), near mid level concentration for all analytes, is performed immediately after the calibration. If the ICV does not meet method specific criteria, a new calibration curve is generated and an ICV is analyzed. If repeated ICV failures are encountered, the system is checked to find the cause of these failures, and the problem is corrected. For certain GC/FID analyses (i.e. GRO or DRO), the instrument is calibrated using individual compounds while the laboratory control sample or ICV uses a petroleum product (diesel or gasoline).

A continuing calibration verification (CCV), near a mid-level concentration for all analytes, is run at ten (10) sample intervals. If CCV values are determined outside the upper limit of the method specified range and if no analytes were detected in the samples, the run will be accepted as valid and ‘No Detects’ reported for the sample. If an analyte is detected and the CCV is out at the high end, the problem will be identified and corrected and the affected samples will be re-analyzed with a compliant CCV.

If a CCV value is out of the method specified limits at the lower limit, the cause of the problem will be identified and corrected, and all samples affected by the out of control CCV will be rerun with a compliant CCV.

For CLP-type analyses, the continuing calibration takes place at the beginning of the analytical sequence and once every twelve (12) hours throughout the analytical sequence. The percent difference in calibration factors for each standard must not exceed the criteria specified by the method.

If a CCV fails to meet criteria limits, a new calibration curve will be generated and all samples affected will be re-analyzed.

GC/MS – For CLP methods, a minimum of five-level calibration (four-level for selected semivolatile compounds) is carried out for each analyte per system before analysis of samples take place.

Continuing calibrations, near midpoint levels, are analyzed every twelve hours of instrument analysis time for CLP analyses.

Re-calibration takes place whenever a major change occurs in the system, such as a column change in the GC or a source cleaning of the mass spectrometer or when the continuing calibration fails to meet method specific requirements.

Tunes are performed once every twelve (12) hours. The GC/MS system is tuned to USEPA specifications for bromofluorobenzene (BFB) or decafluorotriphenylphosphine (DFTPP) for volatile and semivolatile analyses, respectively. Verification of tuning criteria occurs every twelve hours of instrument run time for all CLP-type and SW846 analyses.

More detailed instrument and method-specific calibration procedures and criteria are described in the individual analysis SOPs.

ICAP – Instrument calibration, for each wavelength used, occurs at the start of each analysis. The calibration curve is constructed per method specification.

An initial calibration verification and initial calibration blank (ICB) are analyzed before analysis of samples. If the ICV and ICB do not meet method specific criteria for an analyte, the analyte is re-analyzed with a new calibration.

During the analysis, a continuing calibration verification (CCV) and continuing calibration blank (CCB) is analyzed at least every ten (10) samples. If either the CCV or CCB fails to meet method specific criteria for an analyte, the source of the problem is investigated. If it can be determined that the failed CCV and/or

CCB is not representative (such as for instrument carryover from previous sample or from an empty autosampler tube), the CCV and/or CCB are re-analyzed and the reason for the failure documented. If a failure still occurs, further corrective action is performed, and the analyte is re-analyzed with a new calibration.

The CCV is obtained from a source independent from that of the standards. The CCV concentration for the different analytes are at method specified levels.

The Flow Injection Mercury System (FIMS) - Instrument calibration occurs at the start of each analysis. The calibration curve is constructed per method specification.

An initial calibration verification (ICV) and initial calibration blank (ICB) are analyzed before analysis of samples. If the ICV and ICB do not meet method specific criteria for Mercury, re-calibration and reanalysis are required.

During the analysis, a continuing calibration verification (CCV) and continuing calibration blank (CCB) is analyzed at least every ten (10) samples. If either the CCV or CCB fails to meet method specific criteria for Mercury, the source of the problem is investigated. If it can be determined that the failed CCV and/or CCB is not representative (such as for instrument carryover from previous sample or from an empty autosampler tube), the CCV and/or CCB are re-analyzed and the reason for the failure documented. If a failure still occurs, further corrective action is performed, and the analyte is re-analyzed with a new calibration.

The CCV is obtained from a source independent from that of the standards. The CCV concentration for Mercury is at method specified levels.

Other instrumentation:

pH- the meter is calibrated at two pH levels (4.0 and 10.0) before analyses of samples. The pH 7.0 buffer is analyzed as an LCS and recovery is calculated.

Lachat 8000- automated flow-through spectrophotometer is calibrated per method specification before the analyses of samples.

An initial calibration verification and initial calibration blank (if required) are analyzed before analysis of samples. If the ICV and/or ICB do not meet method specific criteria for an analyte, re-calibration must occur.

During the analyses, a continuing calibration verification and continuing calibration blank is analyzed at least every ten (10) samples. If either the CCV or CCB fails to meet specified criteria for an analyte, the source of the problem is investigated. If it can be determined that the failed CCV and/or CCB is not representative (such as for instrument carryover from previous sample or from an empty autosampler tube), the CCV and/or CCB are re-analyzed and the reason for the failure documented. If a failure still occurs, further corrective action is performed, and the analyte is re-analyzed with a new calibration.

The CCV is obtained from a source independent from that of the standards. The CCV concentration for the different analytes are at method specified levels.

SpecGenesys- manual spectrophotometer is calibrated per method specification.

A calibration curve calibration verification is analyzed at the beginning, end, and at least every 10 samples. The verification standard is from an independent source. If the calibration verification does not meet method specific criteria for an analyte, it is re-analyzed once. If failure still occurs, a new calibration curve is established and any affected samples are reanalyzed. Calibration curves are established at least quarterly.

Balances: are calibrated by an outside source on an annual basis. The balances are calibrated with Class "S" weights each day of use. A calibration check is performed with NIST Class "1" traceable weights monthly. The Class "1" weights are NIST certified by an outside certified service on a regular basis.

Thermometers are calibrated once a year against a NIST-verified thermometer or as they are replaced. The NIST-verified thermometers are certified by an outside certified service annually.

Gel Permeation Chromatography is used to clean samples according to CLP and client requirements. GPCs are calibrated using a calibration standard provided by Ultra Scientific, Cat. # CLP-340. Once a successful calibration is achieved it is valid for a period of seven days.

9.2 Standards and Reagents:

Standard reference materials used for routine calibration, calibration checks, and accuracy are obtained from commercial manufacturers. These reference materials are traceable to the source and readily compared to EPA references. Most standards are traceable to NIST; however, certain projects, especially those involving pesticide registration, may necessitate the use of reference standards supplied by the client. New standards are also routinely validated against known standards that are traceable to EPA or NBS reference materials.

Standards are purchased from valid vendors with proven expertise in their field. All standards come with a Certificate of Analysis which is kept on record in the appropriate laboratories. Intermediate standards, if necessary, are prepared in the labs and then QA'd by spiking reagent water with the standard. The spike sample is then carried through the normal extraction and analysis procedures. Criteria for the intermediate spike must meet the method or in-house criteria. If acceptable, the spike is able to be used. If unacceptable, another intermediate standard is prepared and the same steps repeated.

Intermediate and working standards are prepared in the same solvent or solution as the samples that the standard will be spiked.

Primary, intermediate and working standards are all named with specific nomenclature as designated in the QA Department SOP No. 80.0013, Reagent Purchasing and Tracking.

Standards are dated and labeled upon arrival. Any material exceeding its shelf life as described by the methods in QAP Section 10 is discarded and replaced. Standards are periodically analyzed for concentration changes/degradation and inspected for signs of deterioration such as color change and precipitate formation. Standards Receiving and Preparation Logbooks, which contain all pertinent information regarding the source and preparation of each analytical standard, are maintained by each of the MITKEM laboratory departments (Examples, Figures 9.2-1 to 9.2-4).

See Mitkem individual analytical SOPs, sections 7 and 8 for standards preparation procedures.

Solvents are examined for purity prior to use to ensure there is no external source of contamination. For organic solvents, each lot number of solvent is QC'd prior to use. This is accomplished by concentrating or extracting an aliquot of solvent or reagent media in the same manner as the samples and analyzing it for contamination. Any detectable analyte could render the solvent or reagent unsuitable for use. Supervisors make the final decision as to the suitability of the solvent or reagent.

Reagents are stored in the respective laboratories during use. Backup supplies are stored in Mitkem's stockroom. All chemicals and reagents are given a 3-year expiration period unless designated otherwise by the manufacturer. Sometimes the viability of the reagent does not remain throughout the entire 3-year period. In this case, the chemical or reagent is readily discarded.

Chemicals and reagents are logged into the laboratory and each bottle is given a unique ID. The ID is based upon the date of its arrival at Mitkem. The only exceptions include cases/cycletainers of solvents and cases of acids.

Any applicable certificates of analysis (COA) are stored in the individual laboratories or in the QA Department. When a bottle is opened in the laboratory, it is inspected to ensure it meets the requirements of the method. The analyst records his or her initials on the bottle along with the date opened and the ID.

9.3. Lab Pure Water:

For wet chemistry, most standards are prepared in DI reagent water. For inorganic analyses Mitkem uses a US Filter mixed-bed deionization system followed by particle and carbon filters. This is followed by a polishing system using Barnstead E-Pure cartridges optimized for removal of inorganic constituents. Purity is monitored each day of use, using an on-line electrical resistivity meter while drawing water through the DI system, as well as reading the conductivity of the water with a hand-held conductivity meter.

Mitkem uses several systems to generate analyte-free water for use in the Organics laboratory. These systems generate high quality, analyte free water dedicated to the needs of specific analyses. The extractable organics laboratory uses a Barnstead E-Pure system optimized for removal of organic constituents. The volatile organics laboratory uses an in-house activated carbon filtration system to provide analyte free water. As organic contaminants are not measured by a resistivity meter, this is not relied-upon to monitor the quality of organic analyte-free water. Instead laboratory method blanks are used, typically several per working day, to monitor the acceptability of the water for its intended use. Any analyte detected above (half of) the reporting limit is investigated. If this can be traced to the water purification system as its source, maintenance is performed on the water purification system.

9.4. All purchased equipment, materials, and services must meet either specific method requirements, standard requirements, or project specific requirements. These requirements are documented in the individual analytical or project SOPs. Reagents requirements are specified in the Mitkem SOP, SOP 80.0013 Reagent Purchasing and Tracking. The equipment requirements are specified in the individual methods and SOPs.

Figure 9.2-1

Metals Primary Standard Receipt Logbook – Instrument Laboratory

MITKEM CORPORATION **METALS PRIMARY STD RECEIPT LOGBOOK:INSTRUMENT LAB**

DATE REC	PRIMARY STD ID	VENDOR	CATALOG#	LOT #	ANALYTE(S)	REC BY	DATE OPENED	EXPIR. DATE	MITKEM ID

Page: ______________

Figure 9.2-2
Semivolatile Primary Standard Logbook – Preparation Laboratory

MITKEM CORPORATION SEMIVOLATILE PREP WORKING STANDARD LOGBOOK

PREP DATE	ANALYTE(S)	PRIMARY STD ID	INITIAL CONC.ug/L	AMT. ADDED ml	FINAL VOL (ml)	FINAL CONC ug/L	Solvent Name: LOT #	WORKING STD ID	PREP BY	EXP DATE

Reviewed by:______________________

Figure 9.2-3
Pesticide/PCB Primary Receipt Logbook

MITKEM CORPORATION PESTICIDE/PCB PRIMARY STD RECEIPT LOGBOOK

DATE REC	PRIMARY STD ID	VENDOR	CATALOG#	LOT #	CONC.	ANALYTE(S)	REC BY	DATE OPENED	DATE EXPIR.

Reviewed By: ______________________

Figure 9.2-4
Reagent Preparation Logbook – Inorganic Preparation Laboratory

Mitkem Corporation
Inorganic Laboratory
Reagent Preparation Logbook

Date:________________

Reagent/Analysis	Chemical ID	Chemical Lot#	g/mL	Final Volume (ml)	Diluent	Final Conc.	Reagent ID	Exp. Date	Analyst

Reviewed By:____________

10.0 ANALYTICAL PROCEDURES

MITKEM uses the methods specified in Tables 10-1 through 10-6 unless otherwise specified by the client.

Table 10-1
Potable Water Analytical Methods

Parameter	Method Description	Method Reference
1,2-Dibromo-3-chloropropane	Micro extraction	504.1
1,2-Dibromomethane	GC\ECD Analysis	

Table 10-2
Non-potable Water Priority Pollutant Analytical Methods

Parameter	Method Description	Method Reference
Metals Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Silver, Thallium, Potassium Vanadium, Zinc, Sodium	ICP	200.7
Mercury	Cold Vapor	245.1
Cyanide		
Aqueous	Midi-distillation Automated	EPA 335.4
Alkalinity	Titration	SM2320
Anions Chloride Sulfate Nitrate Nitrite Phosphate Bromide	Ion Chromatography	EPA 300.0
Chloride	Colorimetric	EPA 325.2
pH	Electrode	SM4500 H+ B
Sulfate	Turbidimetric	SM4500-SO4 E
Ammonia	Distillation/Nesslerization	SM4500-NH3 B
Nitrate	Autoanalyzer	EPA 353.2
Nitrite	Colorimetric	SM4500-NO2 B
Orthophosphate	Ascorbic, Manual	SM4500-P E
Total phosphate	Persulfate, Manual	SM4500-P B3 & E

Table 10-2
Non-potable Water Priority Pollutant Analytical Methods (cont.)

Parameter	Method description	Method Reference
Chemical Oxygen Demand	Spectrophotometric(Closed Reflux)	SM5220-D
Total Organic Carbon	Combustion	EPA 415.1
Phenols	Distillation, Color, Automated	SM5530 B
Total Dissolved Solids	Gravimetric	SM2540 C
Total Solids	Gravimetric	SM2540 B
Total Suspended Solids	Gravimetric	SM2540 D
Total Settleable Solids	Imhoff cones	SM2540 F
Volatile Organics		
Halocarbons	Purge & Trap, GC/MS	624
Aromatics	Purge & Trap, GC/MS	624
Semivolatile Organics	Extraction, GC/MS	625
Organochlorine Pesticides/ PCBs	Extraction, GC/ECD	608
Oil & Grease	Extraction, Gravimetric	1664

Table 10-3
SW-846 Inorganic Analytical Methods

Parameter	Method Description	Method Reference
Metals		
Aqueous	Acid digestion ICAP analysis	Method 3005A/3010A Method 6010C
Solid	Acid digestion ICAP analysis	Method 3050B Method 6010C
Mercury		
Aqueous	Permanganate digestion Cold Vapor analysis	Method 7470A
Solid	Permanganate digestion Cold Vapor analysis	Method 7471A
Hexavalent Chromium		
Aqueous	Diphenyl Carbazide Colorimetric	SM 3500Cr D
Solid	Acid Digestion colorimetric	Method 3060A/7196A
Cyanide		
Aqueous	Midi-distillation Automated	Method 9012B
Solid	Midi-distillation Automated	Method 9012B
pH		
Solid	Electrode	Method 9045C
Ignitability (Flashpoint)		
Aqueous	Pensky-Martens closed cup	Method 1010
Solid	Pensky-Martens closed cup	Method 1010 Mod.
Reactive Cyanide		
Solid & Aqueous	Distillation Automated	SW 846 7.3.3.2
Reactive Sulfide Solid & Aqueous	Distillation Colorimetric	SW 846 7.3.4.2

Table 10-3
SW-846 Inorganic Analytical Methods (cont.)

Parameter	Method Description	Method Reference
Toxicity Characteristic Leaching Procedure (TCLP)		
Aqueous	Leachate by Filtration	Method 1311
Solid	Leachate Generation	Method 1311
Synthetic Precipitation Leaching Procedure (SPLP)		
Aqueous	Leachate by Filtration	Method 1312
Solid	Leachate Generation	Method 1312

Table 10-4
SW-846 Organic Analytical Methods

Parameter	Sample Preparation	Sample Analysis
Volatile Organic Compounds		
Aqueous	Method 5030	Method 8260C
Solid	Method 5035	Method 8260C
Semivolatile Organic Compounds		
Aqueous	Method 3510C Method 3520C	Method 8270D
Solid	Method 3540C Method 3550B Method 3545 Method 3570	Method 8270D
Organochlorine Pesticides		
Aqueous	Method 3510C Method 3520C	Method 8081A
Solid	Method 3540C Method 3550B Method 3545 Method 3570	Method 8081A
Polychlorinated Biphenyls (Aroclors and Congeners)		
Aqueous	Method 3510C Method 3520C	Method 8082
Solid	Method 3540C Method 3550B Method 3545 Method 3570	Method 8082
Total Petroleum Hydrocarbons		
Aqueous	Method 3510C Method 3520C	Method 8015M
Solid	Method 3540C Method 3550B Method 3545 Method 3570	Method 8015M

Table 10-4
SW-846 Organic Analytical Methods (cont.)

Parameter	Sample Preparation	Sample Analysis
Herbicides		
Aqueous	Method 8151A	Method 8151A
Solid	Method 8151A	Method 8151A
Toxicity Characteristic Leaching Procedure (TCLP)		
Aqueous	Method 1311	
Solid	Method 1311	
Synthetic Precipitation Leaching Procedure (SPLP)		
Aqueous	Method 1312	
Solid	Method 1312	
Gel Permeation Chromatography (GPC)		
Aqueous	Method 3640A	
Solid	Method 3640A	
Florisil Cleanup		
Aqueous	Method 3620B	
Solid	Method 3620B	
Silica Gel Cleanup		
Aqueous	Method 3630C	
Solid	Method 3630C	
Sulfur Cleanup		
Aqueous	Method 3660B	
Solid	Method 3660B	
Sulfuric Acid Cleanup		
Aqueous	Method 3665A	
Solid	Method 3665A	

Table 10-5
CLP-Type Analytical Methods

Parameter	Method Reference
USEPA CLP Organics	OLM04.3, SOM01.1
USEPA CLP Inorganics	ILM04.1, ILM05.3
USEPA Low Level Organics	OLC03.2
NYS-ASP CLP Organics	ASP 2000/2003 SOW
NYS-ASP CLP Organics	ASP 2000/2003 SOW

Table 10-6
Other Analytical Methods

Parameter	Method Reference
Volatile Petroleum Hydrocarbons	
Aqueous	MADEP VPH 1.1
Solid	MADEP VPH 1.1
Extractable Petroleum Hydrocarbons	
Aqueous	MADEP EPH 1.1
Solid	MADEP EPH 1.1
New York State Total Petroleum Hydrocarbon	
Solid	310.13 Mod.
Extractable Total Petroleum Hydrocarbons	
Aqueous	CT ETPH 99-3
Solid	CT ETPH 99-3
Deisel Range Organics	
Aqueous	ME 4.1.25
Solid	ME 4.1.25
Gasoline Range Organics	
Aqueous	ME 4.1.17
Solid	ME 4.1.17

10.1 Analytical References

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2. Analytical Services Protocol, Volume 1-8, New York State Department of Environmental Conservation, 2003.

3. Annual Book of ASTM Standards. Part 31-Water. American Society for Testing and Materials, Philadelphia, PA, 1981.

4. Chemical Characteristics of Marine Samples, API Publications No. 4307, API, Washington, D. C.

5. Federal Register. Vol. 55, No. 61, March 29, 1990

6. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, 3/83 Revision.

7. The EPA 600 Series. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, Appendix A, 40 CFR Part 136, Federal Register, Vol. 49, No. 209, 1984.

8. Methods of Soil Analysis. Part 2, Chemical and Microbiological Properties, Second Edition, American Society of Agronomy, Inc., Soil Science Society of America, Inc., Madison, WI, 1982.

9. Standard Methods for the Examination of Water and Wastewater, 20th Edition, APHA, Washington, D. C., 1998.

10. Test Methods for Evaluating Solid Waste-Physical/Chemical Methods, SW-846, 3rd Edition Update IV. Office of Solid Waste and Emergency Response, USEPA, Washington, D. C., 1998.

11. USEPA Contract Laboratory Program. Statement of Work for Organic Analysis, USEPA, OLM04.3, OLC03.2, and SOM01.1.

12. USEPA Contract Laboratory Program. Statement of Work for Inorganic Analysis, USEPA, ILM04.1, ILM05.3.

11.0 DATA COLLECTION, REDUCTION, VALIDATION AND REPORTING

11.1 Data Collection:

Most of Mitkem's data is uploaded into the Omega LIMS systems directly from the instruments. The exception is the GC's and GC/MS's in which data is first processed in Target and then uploaded into the LIMS. Mitkem is making progress in that the elimination of the Target reporting will occur in the near future.

Either the instrument analyst or data reporting group will upload the data into the LIMS. The person who performs the upload does a technical review to ensure recoveries of CCVs, MS, MSD, and LCS all seem to be correct. A completeness review is done at this time to ensure all applicable samples have been uploaded for all the necessary analytes.

Next, an employee with a technical background will perform the QA process of the uploaded data. This person is either a supervisor or someone with extensive experience in environmental chemistry. Corrections to the run are made at this step if necessary. When the review is complete, this technical person authorizes the data to be reported by "QA-ing" the run in the LIMS. For a more detailed view of the LIMS uploading/review procedure, see SOP No. 110.0028.

11.2 Data Reduction:

Instrument printouts, computer terminal displays, chromatograms, strip chart recordings and physical measurements provide raw data that are reduced to concentrations of analytes through the application of the appropriate calculations.

Equations are generally given within the analytical methods referenced in Section 10. Data reduction may be performed automatically by computerized data systems on the instrument, manually by the analyst, or by PCs using spreadsheet and/or data base software. This software includes Thru-Put's 'TARGET' for the analyses of organic analytes and Omega LIMS for metals, cyanide and mercury analysis. Currently all OLC analyses are processed and reported through Omega at this time. Mitkem expects that all organic data, both CLP and non-CLP, will be processed completely through the LIMS System during 2006.

11.3 Data Verification:

The verification process requires the following checks to be made on data before they are submitted to the client:

- A completeness inspection is required which ensures that all required data are included in the data packages submitted to the client and that the appropriate signatures are present on the data packages.

- A contract compliance screening to ensure that contractual requirements have been satisfied.

- A consistency check to ensure that nominally identical or similar data appearing in different places within a data package are consistent with respect to value and units.

- A correctness check to ensure that reported data have been calculated correctly or transcribed correctly.

11.4 Data Validation:

Data validation is an essential element of the QA evaluation system. Validation is the process of data review and subsequent acceptance or rejection based on established criteria.

The following analytical criteria are employed by MITKEM in the technical evaluation of data:

- Accuracy requirements.
- Precision requirements.
- Detection limit requirements.
- Documentation requirements.

As in the case of EPA/CLP procedures, data acceptance limits may be defined within the method. As one means of tracking data acceptability, quality control charts are plotted for specific parameters determined in similar, homogeneous matrices. Control limits for non-CLP methods are statistically determined annually as analytical results are accumulated.

Upon completion of the evaluation, the evaluator dates and initials the data review checklist as described in Section 11.5 below.

11.5 Data Interpretation and Reporting:

Interpretation of raw data and calculation of results are performed by a scientist experienced in the analytical methodology. Upon completion of data reduction, the scientist signs for the reported results on the data review checklist. For GC/ECD and GC/MS, a technical peer review is performed using the data processing software prior to form generation.

The laboratory supervisor is responsible for the data generated in that department. The supervisor or other senior technical staff performs an independent review of data and completed report forms. Members of the QA staff also check the results on selected sets of data (usually 10%).

11.5.1 Report Formats:

Mitkem uses a flexible data reporting system where final report format is based on the requirements of the client. The two most common types of data reports generated by Mitkem are Level 2 or "commercial-format" and Level 4 or "CLP-format". Mitkem adapts its data report format, wherever possible, to meet customer requirements. Occasionally reports are generated that are a compromise between "commercial" and CLP-format deliverables or are designed to meet the needs of a particular regulatory format or sampling program.

Commercial data reports are generated using the Omega LIMS or MS EXCEL. For the Omega LIMS system, all instrumental analysis data are uploaded from instruments to the LIMS by electronic data transfer. Non-instrumental analysis data or sample preparation data are manually entered into the LIMS. All manual data entry steps are double-checked to insure they are correct, and instrumental data are spot-checked to insure the proper functioning of the data upload system. For data entered into MS-EXCEL, all the pertinent client information and the analysis results are entered manually. The draft report is subject to a 100% technical and completeness review before it is printed in its final form. All data receive a 100% review before they are released to the client as final.

CLP data reports are generated using specialized software, Thru-Put TARGET for many organics analyses, and the CLP report modules in the Omega LIMS for all inorganic and certain organic analyses. These reports also undergo a 100% review before they are released to the client in their final form.

Records are maintained for all data, even those results that are rejected as invalid.

11.5.2 Data Reporting for Massachusetts Drinking Water Samples:

Drinking water data reports generated for clients in the State of Massachusetts need to be reported on state forms. These reports are sent to the client. The client is responsible for forwarding copies of the report to the regional DEP Offices and local officials.

11.6 Levels of Data Review:

MITKEM employs five (5) levels of data review. These are based on requirements outlined in several government and other environmental analysis programs including the U. S. Army Corps of Engineers, Air Force Center for Environmental Excellence (AFCEE), Naval Facilities Engineering Service Center (NFESC), HAZWRAP, EPA Contract Laboratory Program (CLP), as well as commercial engineering firm programs.

The data review and evaluation process is structured to insure that all data reported to customers has been thoroughly reviewed and approved using a multi-step process designed to identify and correct any error. At any step in the data evaluation and review process, the reviewer has the responsibility and authority to return any data not meeting requirements back to the previous step for re-analysis or correction. No reports are released to the client as final data without successfully passing through each step in the data evaluation and review process. The steps of the data review process are documented, generally using a checklist. Several checklists are used, depending on the type and format of analysis data being reviewed. Any data released prior to the completion of the full review process are released with the statement that the data is preliminary pending final review. The word "Preliminary" is automatically printed on the bottom of all data sheets that are generated prior to completion of data review.

The five levels of data review are detailed in **SOP No. 110.0028**. A Flow chart of the data review process follow in Figure 11.6-1.

11.7 Document Control:

All login sheets, Chains-of-Custody (COC) and Sample Condition Forms (SCF) and other sample transmittal documentation are generated in Sample Receiving. A red Workorder File is initiated to contain all workorder-specific hard copy documents. Samples are signed in/out of the sample receiving area by analysts. In the Prep lab, samples and all pertinent information is recorded into logbooks. Once samples are moved to the instrument lab, the transfer of extracts is documented in the transfer logbook. In the instrument lab, the analysis of extracts is recorded in the instrument run log. All analysis data, including ICAL, CAL and raw data are acquired using computer-controlled instruments, and stored on the hard drive of the computer performing data acquisition. Data are automatically copied to the company file server after acquisition. Organics analysis data are processed using Thru-Put Systems' Target software. This system creates a folder on the file server for each analysis fraction for each work order or SDG. This folder contains raw data, processed analysis results, instrument tune, initial calibration and continuing calibration results as well as a copy of the data processing method used. This allows for long-term archiving and complete reconstruction of the data at any time in the future. Data reporting forms and raw data are printed and arranged with all appropriate sample-preparation logbook page copies for technical review.

Inorganic data files are uploaded into Omega LIMS and reporting forms are printed. The original instrument data files and the processed SDG are stored on the file server where they can later be archived by the LIMS Administrator. Hard copy printouts for reporting forms, instrument data hardcopy output and all associated preparation logbook page copies are assembled for technical data review.

The company file server consists of two separate computers, each with an array of multiple hard disk drives, that are continuously mirrored, such that the failure of any single component or computer will not impact the operation of the system, or the ability to recover data. All new files or data are copied to magnetic tape on a daily basis. On a monthly basis full system back up to tape is performed. Following technical review, and generation of the report narrative results go into the workorder file in data reporting. The original copy of the report is sent to the client. The report is also scanned into an optical file database for long-term archiving. As documents are scanned into the database they are recorded for permanent storage on CD-ROM disks. Mitkem's system includes a "jukebox" to provide access to numerous CD-ROMS on an as-needed basis. All other information associated with the report, including data review checklists are kept in the red workorder file. The workorder files are kept onsite in a storage area for approximately 6 months. The files are then shipped to an offsite storage area where they will remain for a total of 7 years. After this time, the files will be destroyed.

11.7.1 Logbooks:

All logbooks are issued and controlled by the QA Department. Logbooks are given a unique ID that includes the mm/yy the logbook was printed. Laboratory personnel must sign for the logbook when it has been released by the QA Department. When logbooks are complete, the analyst returns them to the QA Department for archiving. At that point, a new logbook is released. The archived logbooks are stored in an on-site storage area for approximately 4-6 months and then are boxed and stored in a locked off-site storage facility. Mitkem will archive logbooks for a minimum of ten (10) years.

11.7.2 Workorder/Data Files:

MITKEM is a secured, limited access building. The doors are secured with a keypad entry system. All hard copy information pertaining to the analysis of samples is maintained and stored in a workorder file folder. This information includes all login sheets, COC, SCF, bench sheets and analytical data. Electronic data are also stored by laboratory workorder number on the company file server, and in the optical file database of completed reports. File folders containing all hard copy data and other workorder information are stored in an off-site storage facility for a total of 7 years. The off-site storage facility is a locked storage area. Access is limited to the CFO or his designee and request to retrieve a file will be made to this person.

In the event Mitkem Corporation changes ownership, the maintenance, control, storage and eventual disposal at the end of the appropriate time period, of all records, including client data and QA/QC files, will transfer to the new owners.

In the event Mitkem Corporation decides to cease operations, clients will be notified prior to the cessation of operations and their files/records will be made available to them. Within a designated time period after notification, the client will be responsible for taking custody and the future maintenance of their records. If the client determines they do not want to maintain the records, these will be disposed of properly.

11.7.3 Standard Operating Procedures (SOPs):

SOPs are prepared by the Lab Supervisor and laboratory personnel in conjunction with the QA/QC Director. The QA Director/Staff downloads a copy of the current SOP to the network. The SOPs can be found in Avogadro/Public/QA Public. In addition a .pdf file of the SOP is located in Avogadro/Public/QA Public/SOP-PDF Versions, for sending to clients or for analyst reference.

The laboratory staff revises the SOPs by making changes to the document that is then reviewed by the department supervisor only if the supervisor is not the party responsible for the revisions. Any additional changes are made at this point.

The QA Department is notified that revisions are completed. The QA Director/Staff moves the revised copy of the SOP to the QA directory, QA Safety/SOPs Needing QA Revision. The QA Director makes changes to the document to include revision number and date and title clarification, if necessary.

The QA Director prints a copy of the SOP that is signed by the Lab Manager or Operations Manager, and the QA Director. Copies of the signed SOP are then made for the relevant departments. Each copy is assigned a control number that is recorded on the SOP cover sheet. Copies are distributed to the relevant departments with a review sheet attached. At this time the old copies of the SOP are collected from the labs and destroyed.. Each analyst who performs any duties related to the SOP must review the new version and sign that he or she has read and understands the material there. The signed review sheets are then returned to the QA Department. The SOP copy is stored in the department for easy reference. A new .pdf file is made to overwrite the "old" version in QA Public/SOP-PDF Versions.

SOP review/revisions occur on an annual basis. . The procedure for preparing, reviewing, approving, revising and distributing SOPs as well as the SOP Revision Schedule are described in SOP No. 80.0012.

Minor changes to the SOP between revision dates can be done by making hand-written changes to the document and its copies. The changes must be initialed by the QA Director and incorporated into the next version SOP. Minor changes are recorded in the Minor Revision Record that is a part of the master copy.

11.7.4 Method Updates:

In most cases it is the laboratory's policy to implement new revisions of frequently used methods within six months of the date the method revision is promulgated or published as a final method. The QA/QC Director and Technical Director make the final decision on when a method revision will be adopted by the laboratory. Additionally, if a client specifically requests or mandates that an "older" method, Mitkem will advise the client that it is not the most recent method. If the client still insists upon the older method, Mitkem will comply and make a note in the narrative.

When the laboratory is in the middle of a client's project, the lab will continue using the same revision for the entire sampling event unless advised otherwise by the client. Consequently, once the laboratory has formally adopted a new method revision, both the old and new revision may be in use at the same time, depending on the project.

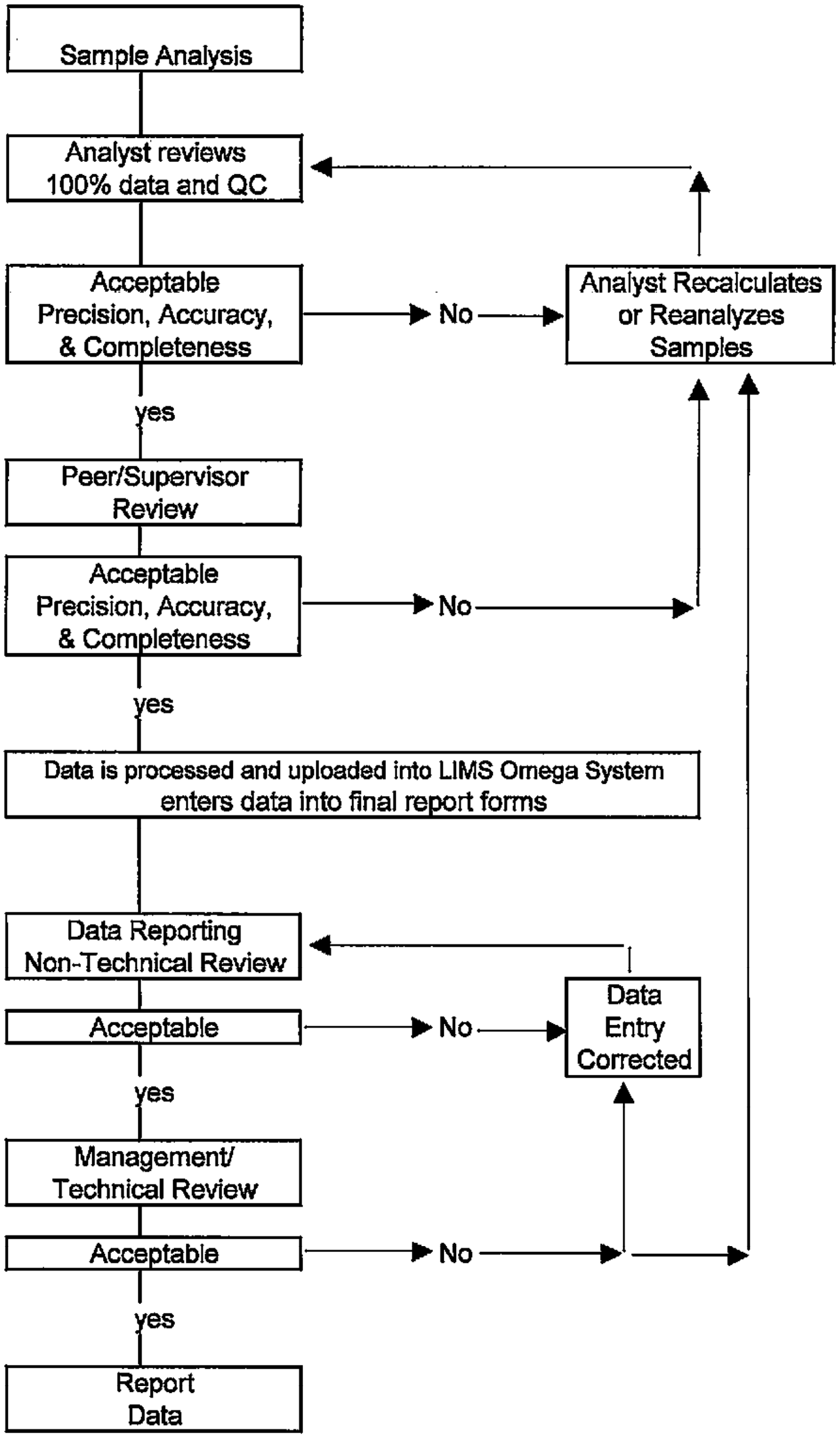
If a client should not specify which methods to be used, the methods employed by the laboratory shall be fully documented and validated. Additionally, the methods shall be published in a reputable technical journal or text or by a reputable technical organization or instrument manufacturer.

Laboratory-developed methods can be used as long as they have been documented and validated by qualified personnel. In all cases the client should be notified.

Figure 11.6-1
Data Review Flow Diagram

MITKEM CORPORATION

Review Process Flow Diagram



12.0 LABORATORY QUALITY CONTROL CHECKS

MITKEM analytical procedures are based on sound quality control methodology, which derives from three primary sources:

1. Specific EPA and other approved analytical methods, and
2. "Handbook for Analytical Quality Control in Water and Wastewater Laboratories" (EPA 600/4-79-019).
3. Standards for Good Laboratory Practice.

In the application of established analytical procedures MITKEM employs, at a minimum, the QC protocols described in the references found in the Analytical Methods section of this document. Specific projects may require additional quality control measures, due to such factors as difficult sample matrices or use of innovative techniques. For those projects MITKEM will recommend and implement, subject to client approval, QC measures to produce data of known quality.

Each of the MITKEM laboratory departments have an individual QC program, which includes, but is not limited to, the practices described below.

12.1 Method Detection Limit Determination/Verification:

Method Detection Limits are developed annually for certain inorganic and many organic analyses. Per NELAC Standards, MDLs are not required where target analytes are not reported below the lowest calibration standard concentration. For these analyses, results are only reported within the calibration range, and MDLs are not appropriate or needed. For certain inorganic analyses and most organic analyses, Mitkem typically reports analytes below the lowest level of the calibration range, but above the MDL, as estimated and are qualified with the "J" flag. For these analyses MDLs are developed. Mitkem reports estimated values below the calibration range for those analyses where results are able to be confirmed as in dual column confirmation, or by two concurrent determinative tests such as retention time and mass spectra as in GC/MS analyses.

To address special project requirements, MDLs can be determined for those tests which are not routinely reported below calibration range. If a client requests results to be reported below the calibration range without an MDL study, this is clearly identified in the workorder narrative.

Following an MDL study, the determined limits are verified by the analysis of an MDL Verification Standard. This standard is analyzed at approximately 2 to 3 times the calculated MDL.

12.2 Personnel Training:

Chemists who begin their employment at MITKEM are to be instructed under the MITKEM Safety Training Program within the first month. The Safety Training Program includes laboratory basics, safety video and testing, and MSDS instruction.

Before performing any analyses, a chemist is required to read the appropriate protocols and SOPs. The chemist is required to complete an SOP review form which lists all the SOPs he or she has read and understands.

The new analyst must become familiar with the laboratory equipment and the analytical methods, and begins a training period during which he or she works under strict supervision. Independent work is only permitted after the chemist successfully completes an accuracy and precision study.

The study is also commonly referred to as a Demonstration of Capability exercise. Upon the successful completion of the Demonstration of Capability exercise, the QA Department issues a Demonstration of Capability Certificate (DOCC) which is signed by both the QA Director and Operations Manager and filed in the employee's personnel folder, which is stored in the QA Department.

Demonstration of Capability studies require the acceptable recovery of 4 LCS samples for each matrix or the acceptable analysis of a blind spike sample such as a Performance evaluation sample. Acceptance limits are established by the method. It is necessary to pass the study whether for extraction and/or analysis.

Initial and on-going personnel training includes data integrity training. The 4 required elements of the data integrity system include: 1) data integrity training, 2) signed data integrity documentation, 3) in-depth, periodic monitoring of data integrity, and 4) data integrity procedure documentation.

Data integrity training topics will include the need for honesty and full disclosure in all analytical reporting, how and when to report integrity issues and what those issues could be. Employees will understand that infractions of data integrity procedures can result in an investigation that could lead to serious consequences which include immediate termination, and civil or criminal prosecution. At the start of employment all new employees read, discuss and sign a Confidentiality, Ethics and Data Integrity Agreement. Annually, an on-going integrity training session is held. An attendance sheet will be generated for every integrity session.

Data integrity procedures are reviewed and updated annually by senior management.

Training for the EPA Statement of Work occurs according to the above requirements. In addition, analysts are required to read the CLP Statement of Work as a part of the documentation training.

12.3 Control Charts:

For organic and inorganic analyses, the recoveries of analytes in the lab control samples are plotted on control charts. These charts are used to establish control and warning limits.

12.3.1 Control limits are calculated ,compared, and/or updated at least annually from the LCS, MS/MSD, and Surrogate data points for each analyte and matrix using the following equations:

$$Average(\bar{x}) = \frac{\left[\sum_{i=1}^{n} x_i\right]}{n}$$

$$SD = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}}$$

In which:
SD = Standard Deviation
N = number of data points

Warning Limits = Average ± 2 * SD

Control Limits = Average ± 3 * SD

12.3.2 Control limits must be approved by the QA/QC Director and by the Technical Director or Operations Manager prior to adoption by the laboratory. In the event that limits are wider than method recommended limits, the method recommended limits may be adopted and the analytical procedure will be re-evaluated and/or re-determined to identify possible causes. Additionally, in the event that control limits are tighter than 15% from the average, the lab may adopt a control limit of ±15% from the average. If in the experience of the laboratory, statistical control limits are unreasonably wide or narrow, alternative limits may be used until appropriate statistical limits are developed. Alternative limits are based on sources such as Department of Defense Quality Systems Manual published guidelines, EPA limits from the specific test method or from similar methods, laboratory experience with the method or other sources.

12.3.3 Control charts are plotted in EXCEL using the Omega LIMS system.

Data from each laboratory is uploaded into the LIMS. The compounds, recoveries, and date analyzed for each test are recorded in the system. In order for LIMS generated control limits to be valid, all data, including data not meeting existing recovery criteria, must be uploaded. As the laboratory uploads data for a wider range of tests, control charts will be available for these tests. Control charts may be generated for each analyte in the inorganic department to include both metals and wet chemistry parameters, and for a representative sampling of analytes in the organic sections. Each control chart is then printed for review by the QA/QC Director and by the Lab Supervisor. Out of control situations noted on the control chart are discussed with the Supervisor or Technical Director by the QA/QC Director.

An example control chart is presented as Figure 12.3-1. LCS data must be reviewed and evaluated daily against the Control Limits to establish that the system is in control.

12.3.4 The following situations constitute an out of control situation on a control chart:

- One data point above or below the Control Limit line.
- Two consecutive data points above or below the Warning Limit line.
- Six or more consecutive data points above the Average Line or six or more consecutive data points below the Average Line. This situation suggests a trend and suggests the procedure has been changed in some way (for better or worse). The cause for this trend must be investigated.

12.4 General QC Protocols:

12.4.1. Organics Laboratory:

- Trip blanks and holding blanks, when applicable, are analyzed to detect contamination during sample shipping, handling and storage.

- Method blanks, at a minimum of one in every 20 samples, are analyzed to detect contamination during analysis.

- Volatile organic method blanks are analyzed once during each analytical sequence.

- One blank spike (Laboratory Control Sample or LCS) consisting of an analytical sample of laboratory water, anhydrous sodium sulfate, or Ottawa sand with every batch of 20 or fewer samples, is analyzed to determine accuracy.

- Sample spikes and spike duplicates, as requested, are analyzed to determine accuracy and the presence of matrix effects. The Relative Percent Difference (RPD) is also determined for matrix spike/matrix spike duplicates to measure precision. The criteria followed are stated in the individual methods. For batches without a sample duplicate (for example, if insufficient sample volume is provided), a duplicate blank spike (LCSD) is performed to provide for precision measurement.

- Performance evaluation samples from EPA and state agencies are analyzed to verify continuing compliance with EPA QA/QC standards.

- Surrogate standards are added to samples and calculations of surrogate recoveries are performed to determine matrix effect and extraction efficiency.

- Internal standards for GC/MS analysis are added to sample extracts to account for sample-to-sample variation.

- GC analysis of EPA traceable standards to verify working standard accuracy and instrument performance.

- Initial multi-level calibrations are performed to establish calibration curves.

- Instrument calibration is established or verified with every analytical sequence.

- Tuning of GC/MS systems once every 12 hours for CLP and SW-846 methods or 24 hours for methods 624/625 to method specifications is implemented for consistency in data generation.

When QC limits are not met during an analytical run, the source of the problem must be investigated. Following an evaluation of the data, those samples affected must be re-analyzed after the problem has been solved. If QC limits continue to be out of control, the instrument must be checked and/or a service call made and/or further corrective action implemented.

12.4.2. Inorganic Laboratory:

- Trip blanks are analyzed when applicable, to detect contamination during sample shipping, handling and storage.

- Method blanks are analyzed at a minimum of one every 20 samples, to detect contamination during analysis.

- One matrix spike of an analytical sample or laboratory water or soil is made and spike recoveries are calculated with every batch up to 20 samples to determine accuracy. Duplicate samples are analyzed and the RPD between the sample and duplicate is calculated for every batch up to 20 samples. If insufficient volume of sample is received, a note is made in the appropriate preparation logbook.

- Performance evaluation samples from EPA and state agencies are analyzed to verify continuing compliance with EPA QA/QC standards.

- Metals analysis instruments are calibrated for every analytical run.

- QC/LCS checks samples are analyzed during every analytical batch of up to20 samples in order to document accuracy.

When QC limits are not met during an analytical run, the source of the problem must be investigated. Following an evaluation of the data, those samples affected must be re-analyzed after the problem has been solved. If QC limits continue to be out of control, the instrument must be checked and/or a service call made and/or further corrective action implemented.

12.5. Lab Pure Water used for method blanks and dilutions:

Mitkem uses several systems to generate analyte-free water for use in the laboratory. These systems generate high quality, analyte free water dedicated to the needs of specific analyses.

12.5.1. For inorganic analyses Mitkem uses a US Filter mixed-bed deionization system followed by particle and carbon filters. This is followed by a polishing system using Barnstead E-Pure cartridges optimized for removal of inorganic constituents. Purity is monitored using an on-line electrical resistivity meter.

12.5.2. For organic analyses,the extractable organics laboratory uses a Barnstead E-Pure system optimized for removal of organic constituents. The volatile organics laboratory uses an in-house activated carbon filtration system to provide analyte free water. As organic contaminants are not measured by a resistivity meter, this is not a relied-upon method to monitor the quality of organic analyte-free water. Instead, laboratory method blanks are used, typically several per working day, to monitor the acceptability of the water for its intended use. Any analyte detected above (half of) the reporting limit is investigated. If this can be traced to the water purification system as its source, maintenance is performed on the water purification system.

Figure 12.3-1
Example Control Chart

Mitkem Corporation

REC QUALITY CONTROL CHART

Date: *20-Dec-06*

Test Code: SW8260B_W Analyte: BROMOFLUOROBENZENE

SampType	Sample ID	Analysis Date	Batch ID	Low Limit	High Limit	% Recovery
SAMP	E1838-08A	12/1/2006	27316	75	120	92.6
SAMP	E1838-06A	12/1/2006	27316	75	120	98.9
SAMP	E1838-05A	12/1/2006	27316	75	120	91.7
MBLK	MB-27333	12/3/2006	27333	75	120	92.6
LCS	LCS-27333	12/3/2006	27333	75	120	104.3
SAMP	E1838-01A	12/3/2006	27333	75	120	98.2
SAMP	E1838-03A	12/3/2006	27333	75	120	100.7
SAMP	E1838-02A	12/3/2006	27333	75	120	97.6
SAMP	E1838-04A	12/4/2006	27340	75	120	76.1
SAMP	E1838-07A	12/4/2006	27340	75	120	106.1
LCS	LCS-27340	12/4/2006	27340	75	120	102.2
MBLK	MB-27340	12/4/2006	27340	75	120	95.7
MBLK	MB-27441	12/8/2006	27441	75	120	90.4
SAMP	E1878-04A	12/8/2006	27441	75	120	89.6
SAMP	E1879-05A	12/8/2006	27441	75	120	89.3
SAMP	E1879-04A	12/8/2006	27441	75	120	90.4
SAMP	E1879-03A	12/8/2006	27441	75	120	89.5
SAMP	E1879-02A	12/8/2006	27441	75	120	88.6
SAMP	E1879-01A	12/8/2006	27441	75	120	87.6
SAMP	E1878-07A	12/8/2006	27441	75	120	88.4
SAMP	E1878-06A	12/8/2006	27441	75	120	90.0
SAMP	E1878-05A	12/8/2006	27441	75	120	89.1
SAMP	E1879-06A	12/8/2006	27441	75	120	89.3
LCSD	LCSD-27437	12/8/2006	27437	75	120	97.4
MBLK	MB-27437	12/8/2006	27437	75	120	93.1
LCSD	LCSD-27441	12/8/2006	27441	75	120	91.4
SAMP	E1871-04A	12/8/2006	27437	75	120	98.9
SAMP	E1878-03A	12/8/2006	27441	75	120	89.2
SAMP	E1871-02A	12/8/2006	27437	75	120	92.7
SAMP	E1871-03A	12/8/2006	27437	75	120	92.3
SAMP	E1871-01A	12/8/2006	27437	75	120	91.8
LCS	LCS-27441	12/8/2006	27441	75	120	92.3
SAMP	E1878-02A	12/8/2006	27441	75	120	89.3
LCS	LCS-27437	12/8/2006	27437	75	120	96.9
SAMP	E1879-07A	12/9/2006	27441	75	120	88.2
SAMP	E1843-02A	12/11/2006	27471	75	120	90.7
MBLK	MB-27471	12/11/2006	27471	75	120	89.6
LCS	LCS-27471	12/11/2006	27471	75	120	92.7
LCSD	LCSD-27471	12/11/2006	27471	75	120	90.9
SAMP	E1878-01A	12/11/2006	27471	75	120	87.2

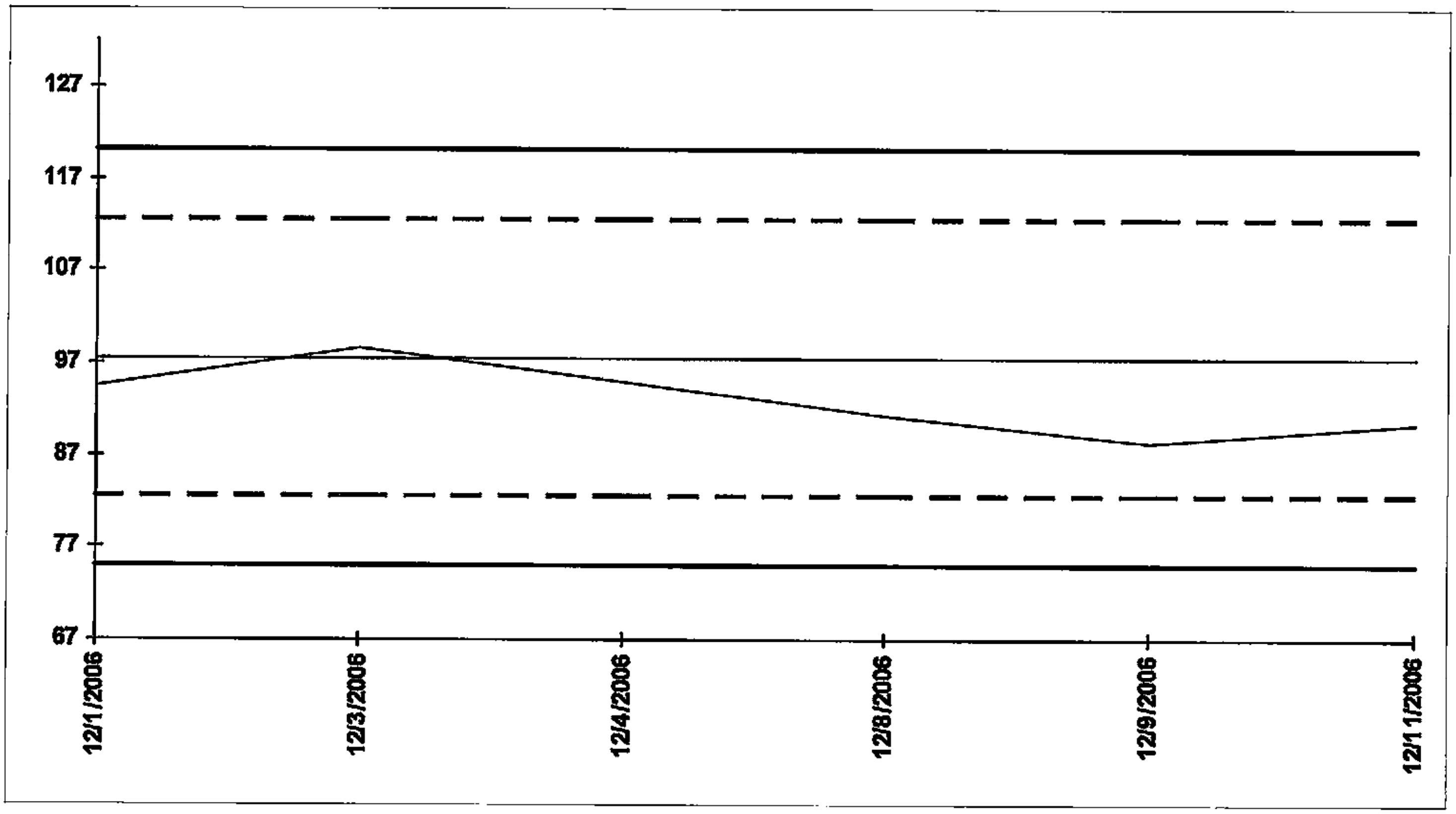
Mitkem Corporation

REC QUALITY CONTROL CHART

Date: ***20-Dec-06***

Test Code: **SW8260B_W** **Analyte:** **BROMOFLUOROBENZENE**

SampType	Sample ID	Analysis Date	Batch ID	Low Limit	High Limit	% Recovery



13.0 QUALITY ASSURANCE SYSTEMS AUDITS, PERFORMANCE AUDITS AND FREQUENCIES

The MITKEM Quality Assurance Director and/or staff performs routine internal audits of the laboratory. The frequency of such audits depends on the workload in-house but is done annually, at a minimum. The audits entail reviewing laboratory logbooks and all appropriate operations to ensure that all laboratory systems including sample control, analytical procedures, data generation and documentation meet contractual requirements and comply with good laboratory practices.

13.1 System Audits:

The QA/QC Director audits each individual laboratory annually in order to detect any sample flow, analytical or documentation problems and to ensure adherence to good laboratory practices as described in MITKEM's Standard Operating Procedures and Quality Assurance Plan. An example checklist used in an internal systems audit at MITKEM is presented in Figure 13.1-1.

Areas covered by the internal audit include logbook documentation and review, standard traceability, standard storage and expiration dates, method criteria adherence, instrument maintenance records, SOP review, and knowledge/training of the analysts. Often, deficiencies that have been noted during "outside" audits and outstanding Corrective Actions will also be reviewed.

Upon the completion of the internal audit, a formal audit report is presented to the laboratory supervisor who is given a specific timeframe to respond in writing regarding the deficiencies. The QA Department will do a follow up audit to check that at least the major deficiencies have been corrected. The follow-up audit occurs within 30-45 days from the date of the lab's audit response.

13.2 Performance Audits:

MITKEM participates in external Performance Test (PT) studies under the National Environmental Accreditation Program (NELAP) through the State of New Jersey (Mitkem Laboratory's Primary Accreditation Authority). The QA department of the laboratory administers the Performance Evaluation Samples for Wastewater/Solid Waste (WW/SHW). The Performance Evaluation Samples generally follow a quartely schedule, with wastewater alternating with soil/solid waste.

Several times a year outside agencies (federal, state, or private) may schedule an audit at Mitkem in order to check the laboratory's processes. Most often these audits begin and end with a meeting between auditors and laboratory management. Each individual laboratory is then examined. The QA Department and/or Senior Management Staff are most likely to remain with the auditors at all times during the audit.

Sometime after the audit, Mitkem receives a formal written audit report to which it must respond. The audit report is initially reviewed by the QA Director who may copy and distribute the report to each laboratory supervisor. In several instances, the report is sent electronically and supervisors may receive an electronic version. The supervisors are required to respond to the findings that pertain to his or her department. The QA Director compiles the formal corrective action plan that may undergo several revisions before the auditing authority accepts it.

The QA Director then sends a memo to each supervisor to detail what needs to be done in each department within a specific timeframe. The QA Department then follows up with the labs to ensure procedures have been modified and the corrective actions are in place. In some instances, a LIMS corrective action report is also initiated as a result of an audit finding.

Internally, performance is monitored on a daily basis at MITKEM through the use of surrogate standards, LCS, and MS/MSD samples. Check samples from independent commercial sources are employed routinely in each of the MITKEM laboratory departments and ensure continuing high-level performance. The QA Director may distribute internal blind PE samples to each laboratory department. These blind PE samples can also be used to show on-going analyst proficiency in lieu of 4 LCS studies.

Figure 13.1-1
QA Systems Audit Checklist

Quality Assurance Department
Mitkem Corporation
Warwick, RI

Laboratory Audit Checklist

Date: ______ Auditor: ______________ Department: ________________

Category:

1. Facility

Adequate ventilation ____

____

____

Adequate work areas, counter space ____

____

Chemical storage areas Acids, Flammables____

____

____

Eyewash, showers, inspected? ____

Tanks Secured ____

Hoods calibrated, adequate ____

2. Personnel

Do analysts follow the SOP?				Yes / No
Do analysts do an initial demonstration of proficiency study?				Yes / No
Are analysts adequately trained and knowledgeable?				Yes / No

Wearing appropriate PPEs ____

____

Dressed appropriately____

____

Trained in procedure, training documented?____

____

____

____

Passed proficiency Documented?

3. SOPs

Standard_Operating_Procedures				
Are the general SOPs updated annually?				Yes / No
Are SOPs updated annually for each analytical method?				Yes / No
Are SOPs controlled documents?				Yes / No
Are SOPs signed by appropriate individuals?				Yes / No

Notes

4. Chemicals

Labeled correctly?

Chemicals stored correctly?

Standard ID #

Standards traceable?

Are standards QC'd against a second source after each ICAL?				Yes / No
Are standards traceable throughout the lab?				Yes / No
Are expired standards present in the lab?				Yes / No
Is there a defined system for assigning expiration dates?				Yes / No
Is standard freezer temperature monitored?				Yes / No

Notes

5. Logbooks

Does a run logbook exist for each analytical instrument?	Yes / No
Does an instrument maintenance log exist for each instrument?	Yes / No
Are logbooks peer reviewed weekly?	Yes / No
Proper correction techniques?	Yes / No
Empty spaces "z"'d out?	Yes / No
Paginated?	Yes / No
Controlled?	Yes / No
Do logbooks contain all pertinent information to the procedure?	Yes / No
(I.e., method, matrix, reagent lot #, etc.)	

Check good for documentation ______________________________

____

____

Clear, legible, corrections complete______________________________

____

In-dated,______________________________

____

____

6. Equipment

General_Laboratory_Equipment	
Is an NIST traceable thermometer available?	Yes / No
Are lab thermometers calibrated annually against the NIST thermometer?	Yes / No
Are correction factors in use on lab thermometers?	Yes / No
Are Class "S" weights calibrated NIST every 2 years?	Yes / No
Are balances serviced annually?	Yes / No
Are balances calibrated as needed and the calibration recorded?	Yes / No
Is balance calibration acceptance criteria clearly defined and posted?	Yes / No

Maintenance ______________________________

____

Preventive maintenance ____________________

Calibrated:
Scales ____________________

Thermometers ____________________

Hoods ____________________

Syringes ____________________

Timers ____________________

Equipment stored correctly, Glassware, syringes, tools etc.

____

____

____

____

____

:

Analytical_Methods				
Is ICAL documentation maintained on file in the lab?				Yes / No
When %RSD > 15%, is the average adopted?				Yes / No
Is a CCV run at the end of the analytical sequence? (USACE)				Yes / No
Is a Method Blank analyzed after each CCV?				Yes / No
Does analyst review data for false negatives?				Yes / No

14.0 PREVENTIVE MAINTENANCE

Preventive maintenance is a routine practice at MITKEM for all instrumentation. Scheduled preventive maintenance minimizes instrument downtime and subsequent interruption of analysis. All major instrumentation is under service contracts so that downtime (due to catastrophic events) is minimized.

Only those equipment items meeting or exceeding applicable performance requirements are used for data collection. This includes items such as laboratory balances as well as major analytical instruments such as ICPs, GCs and GC/MSs.

MITKEM's laboratory personnel are familiar with the routine and non-routine maintenance requirements of the instruments they operate. This familiarity is based on education, hands-on experience and manufacturer's training courses.

GC Maintenance:

1. The injection septum will be replaced once approximately fifty (50) injections or earlier if a leak develops.
2. The injection liner will be replaced once approximately fifty (50) injections or when initial and/or continuing calibrations fails repeatedly to meet method requirements.
3. The gold seal will be replaced except for septum and liner, and the column will be trimmed whenever an initial calibration is run.
4. The column will be replaced if chromatograms show excessive peak tailing and/or initial and continuous calibration verifications fail repeatedly to meet method requirements.

GC/MS Maintenance:

1. GC injector and liner are cleaned daily for semivolatiles and monthly for volatiles.
2. The column will be replaced if chromatograms show excessive peak tailing and/or initial and continuous calibration verifications fail repeatedly to meet method requirements.
3. The ion source will be cleaned when initial and/or continuing calibration repeatedly fail method specified criteria.

4. The pump oil will be replaced once a year.

ICAP Maintenance:

1. Peristaltic pump tubing will be replaced every sixteen (16) hours of instrument time or sooner when memory effects are manifested.
2. The plasma torch is cleaned with (aqua regia) every 1-2 weeks. If memory effects are manifested the torch will be cleaned immediately.
3. The sample introduction (spray chamber and nebulizer) is cleaned every 2-3 weeks.
4. Air filters are cleaned each time the torch is cleaned or as needed upon visual inspection.
5. Once every six (6) months, under service contract, the instrument undergoes extensive maintenance by a manufacturer's service engineer.

Mercury FIMS 100 Maintenance:

1. Pump tubing is replaced every 48 hours of instrument run time.
2. Sample loops, gas tubing extensions and sample capillaries are replaced as needed.

Lachat 8000 Maintenance:

1. All pump tubing is replaced every 48 hours of instrument run time.
2. Auto sampler arm is lubricated every 48 hours of instrument run time.
3. The manifolds, tubing connections, valves, etc. are cleaned or replaced as needed.

TCLP/SPLP Tumbler Maintenance:

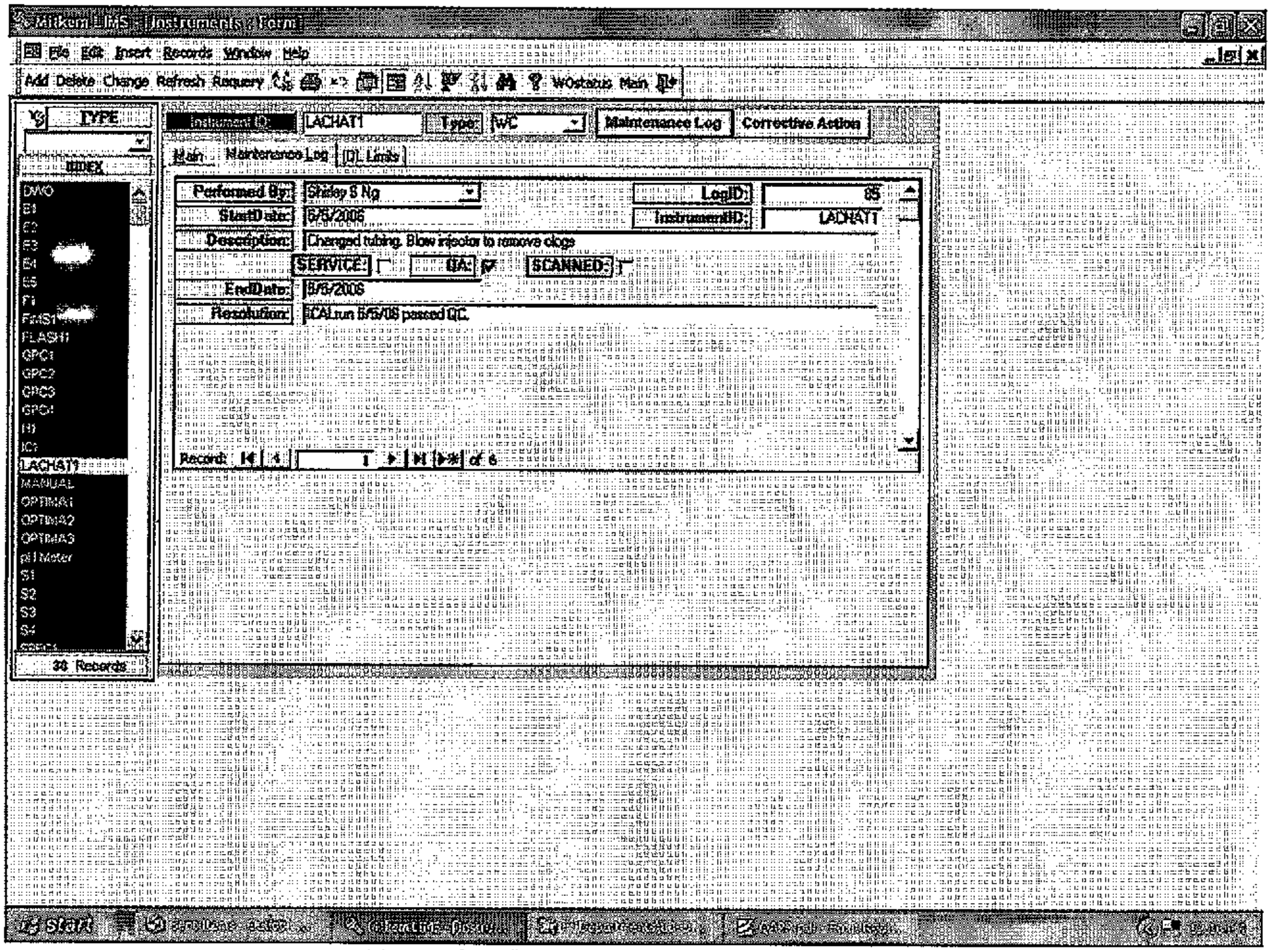
1. The tumbler is checked at every use for number of rotations per minute (30rpms), the ambient temperature checked and documented in the RPS Logbook.
2. If the tumbler is not spinning at 30rpms, motor is cleaned and oiled.
3. If tumbler is not spinning at 30rpms after maintenance, the motor will be replaced.

Instrument maintenance logs are kept for each instrument in the OMEGA LIMS System (figure 14-1). All employees have access to the LIMS system. The person performing the maintenance is required to provide the following information in the online log:

- Equipment identifier
- The inspection, maintenance, calibration or corrective action(s) performed.
- The trigger(s) for the maintenance action(s)
- The identity of the person(s) performing the maintenance
- The date on which the work was performed, and
- The condition of the equipment upon completion of the work.

MITKEM maintains an inventory of replacement parts required for preventive maintenance and spare parts that often need replacement, such as filaments for GC/MS systems and the more mundane electrical fuses and GC column ferrules. To control cost, the appropriate supervisor shall decide the types and numbers of spare parts kept on hand for each equipment item.

Figure 14-1



Instrument ID: LACHAT1
Type: WC
Performed By: Shirley S Ng
LogID: 85
StartDate: 6/5/2006
InstrumentID: LACHAT1
Description: Changed tubing. Blow injector to remove clogs
SERVICE: ☐ QA: ☑ SCANNED: ☐
EndDate: 6/6/2006
Resolution: ICAL run 6/5/06 passed QC.
Record: 1 of 6

Example of Instrument Maintenance Log

Figure 14-2
Instrument Maintenance Schedule

Figure 14-2

MITKEM CORPORATION

Preventive Maintenance Schedule

Instrument	Activity	Frequency
Gas Chromatograph (GC)	Injection septum replaced	Every 50 injections
	Injection liner replaced	Every 50 injections
	The column will be replaced if chromatograms show excessive peak tailing and/or initial and continuing calibration verifications fail repeatedly to meet method requirements.	As needed
GC/MS	GC injector and liner replaced	Daily
	The column will be replaced if chromatograms show excessive peak tailing and/or initial and continuing calibration verifications fail repeatedly to meet method requirements.	As needed
	The ion source will be cleaned when initial and/or continuing calibration repeatedly fail method specified criteria.	As needed
	The pump oil is replaced.	Annually
Inductively Coupled Plasma (ICP)	Peristaltic pump tubing is replaced	Every 16 hours of instrument run time
	The plasma torch is cleaned (aqua regia).	Weekly
	The sample introduction (spray chamber and nebulizer) is cleaned	Weekly
	Air filters are cleaned.	Biweekly
	The instrument undergoes extensive maintenance by the manufacturer's service engineer.	Semiannually
Mercury FIMS 100	Pump tubing is replaced	Every 48 hours of instrument run time
	Sample capillary and tubing are replaced	Every 48 hours of instrument run time
	Inside of optical cell is cleaned	Every 48 hours of instrument run time
Lachat 8000	All pump tubing is replaced	Every 48 hours of instrument run time
	Autosampler arm is lubricated	Every 48 hours of instrument run time
	The instrument undergoes extensive maintenance by the manufacturer's service engineer.	Semiannually

15.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, COMPLETENESS, METHODS DETECTION LIMIT AND LINEAR DYNAMIC RANGE

These mathematical equations represent the means of calculating analytical figures of merit on a routine basis at MITKEM. However, they may be supplanted with other calculations if requested by the client. Precision, accuracy and completeness are also discussed in Section 6.

15.1 Precision:

Precision is frequently determined by the comparison of replicates, where replicates result from an original sample that has been split for identical analyses. Standard deviations, *s*, of a sample are commonly used in estimating precision.

Sample standard deviation, *s*:

$$s = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2}$$

where a quantity, x_i (e.g. a concentration), is measured n times with a mean, $\bar{x}$.

The relative standard deviation, *RSD* (or sample coefficient of variation, *CV*), which expresses standard deviation as a percentage of the mean, is generally useful in the comparison of three or more replicates (although it may be applied in the case of n = 2).

$$\%RSD = 100\,(s\,/\,\bar{x})$$

or

$$CV = 100\,(s\,/\,\bar{x})$$

In which: RSD = relative standard deviation, or
CV = coefficient of variation
s = standard deviation
$\bar{x}$ = mean

For duplicates (samples that result when an original sample have been split into two for identical analyses), the relative percent difference (*RPD*) between the two samples may be used to estimate precision.

$$RPD = \frac{2(D_1 - D_2)}{(D_1 + D_2)} \times 100\%$$

In which: D_1 = first sample value
D_2 = second sample value (duplicate)

15.2 Accuracy:

The determination of accuracy of a measurement requires knowledge of the true or accepted value for the signal being measured. Accuracy may be calculated in terms of bias as follows:

$$Bias = X - T$$

$$\%Bias = 100\frac{(X - T)}{T}$$

In which: X = average observed value of measurement
T = "true" value

Accuracy also may be calculated in terms of the recoveries of analytes in spiked samples:

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

where: SSR = spikes sample result
SR = sample result
SA = spike added

15.3 Completeness:

Determine whether a database is complete or incomplete may be quite difficult. To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. Less obvious is whether the data are sufficient to achieve the goals of the project. All data are reviewed in terms of goals in order to determine if the data set is sufficient.

Where possible, the percent completeness for each set of samples is calculated as follows:

$$\%\text{Completeness} = \frac{\text{valid data obtained}}{\text{total data planned}} \times 100$$

15.4 Method Detection Limit:

The method detection limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is not zero. It is computed as follows from data obtained by repeatedly determining an analyte in a given sample matrix:

1. Analyze at least seven samples of a homogeneous matrix spike that contains the analyte(s) of interest at concentrations of three to five times the expected MDL. The entire sample preparation and analysis protocol must be applied in each analysis; simply preparing one sample and repeating a measurement three or more times on the sample in not acceptable.

2. Upload the acceptable data into LIMS Omega.

3. The LIMS will compute the standard deviation of the results for each analyte using the following equation:

$$\mathrm{MDL} = t_{(n-1,\ \alpha=0.99)}\ (s)$$

   Where t is the one-sided student's t value appropriate for the number of samples analyzed, n; α is the statistical confidence level; and s is the standard deviation.

   The one-sided t-values are presented below:

Number of samples	t-value
7	3.14
8	2.996
9	2.90
10	2.82

4. The MDL is then checked against 40CFR136 requirements by the QA Department. If the MDL is acceptable then it is uploaded into the LIMS by either the QA Department or LIMS Administrator.

5. Immediately following the determination of the MDL, MDL check samples are analyzed at a concentration approximately equal to 2 x the new MDL. The analyte of interest must be detected at this concentration, or the MDL may require raising.

6. An elevated MDL can be uploaded if necessary into the LIMS as long as documentation is available to show that the applicable method can produce an MDL at least that low. This can commonly occur for ICP

analysis in which extremely low MDLs can cause method compliance issues.

15.5 Linear Dynamic Range:

The linear dynamic range is the concentration range over which the instrument response is linear. It is determined by analyzing a series of standard solutions that extends beyond the non-linear calibration region at both the low and high extremes, and selecting that range of standards which demonstrates a linear relationship between instrument response and concentration.

For ICP analysis, the linear dynamic range is determined by analyzing each metal at 3 different concentrations. The concentration which produces results within a 10% error is determined to be the linear dynamic range. This procedure must be performed per individual method requirements.

ILM5.3 requires the analysis of the linear dynamic range be determined quarterly, with a 5 % error.

16.0 CORRECTIVE ACTION

An essential element of the QA Program, Corrective Action provides systematic, active measures taken in the resolution of problems and the restoration of analytical systems to their proper functioning.

Corrective actions for laboratory problems are described in MITKEM Corporation laboratory standard operating procedures. Personal experience often is most valuable in alerting the bench scientist to questionable results or the malfunctioning of equipment. Specific QC procedures are designed to help the analyst determine the need for corrective actions (see Section 11, Data Reduction, Validation and Reporting). Corrective actions taken by scientists in the laboratory help avoid the collection of poor quality data. Mitkem's corrective action program divides these issues into routine and non-routine corrective actions as described below.

<u>Routine Corrective Action</u> – A routine corrective action is taken when the out-of-control event encountered is one that is detected at the appropriate level in the QA process. Routine corrective actions are defined in the analytical SOP with specific steps to be taken as corrective action (i.e., low surrogate recovery, continuing calibration verifications, project specific protocols that do not meet acceptance criteria, etc.) Routine corrective actions must be documented as described in the analytical SOP, but do not require further documentation in the corrective action logbook. Examples of routine corrective action situations: surrogate/surrogates out, LCS out, CCV out, ICV out, IS area/areas out, typographical errors, random blank contamination, or false positive hit/spectral ID match corrected during data review.

<u>Non-Routine Corrective Action</u> – A non-routine corrective action is taken when the out-of-control event encountered is not typical for the method. For example, QC failures that pass through the final review to the client, procedural errors – not following the SOP, or a situation not being detected by normal QA procedures that could adversely impact the accuracy, precision, etc. of a result. Non-routine corrective actions must be documented in the Corrective Action Request (CAR) logbook. The analyst, using his/her own judgement, may deem any corrective action situation non-routine and formally document it on a CAR. When in doubt about a corrective action, the analysts are instructed to err on the side of formal CAR documentation. Examples of non-routine corrective action situations include: bad standard, expired standard mix being used, incorrect equation, "client-detected" problems, not following SOP protocols, using bad or contaminated lot of chemical/reagent/solvent, deciding to release data not conforming to SOP requirements, compound retention time outside of range, or improper library spectrum that leads to re-occurring mis-identification of compounds.

The essential steps in MITKEM Corporation corrective action system are:

1. Identify and define the problem.
2. Assign responsibility for investigating the problem. Usually this individual is the department supervisor.
3. Investigate and determine the cause of the problem.
4. Determine a corrective action to eliminate the problem and prevent recurrence. Any changes that result from the corrective action investigation must be documented.
5. Assign and accept responsibility for implementing the corrective action.
6. Establish effectiveness of the corrective action and implement it.
7. Verify that the corrective action has eliminated the problem.
8. Both the laboratory and the QA Department need to monitor the corrective action to ensure it is effective.
9. Any corrective actions that cast doubt on the laboratory's compliance with its own policies and procedures may require an internal audit by the QA Department.

This scheme is generally accomplished through the use of Corrective Action Report Forms available to each of MITKEM's laboratories within the OMEGA LIMS system. Use of this report notifies the QA Department of a potential problem as described in SOP No. 80.0007. The QA Director initiates the corrective action by relating the problem to the appropriate laboratory managers and/or project managers who then investigate or assign responsibility for investigating the problem and determine its cause. Once determined, the QA Director will approve appropriate corrective action. Its implementation is later verified through and internal laboratory audit. Once the QA Director feels the system has returned to control, s/he will finalize the CAR using a password protected QA step.

Information contained on corrective action forms is kept confidential within MITKEM and is generally limited to the individuals involved. Severe problems and difficulties may warrant special reports to the President of MITKEM who will ensure that the appropriate corrective actions are taken.

Nonconformance:

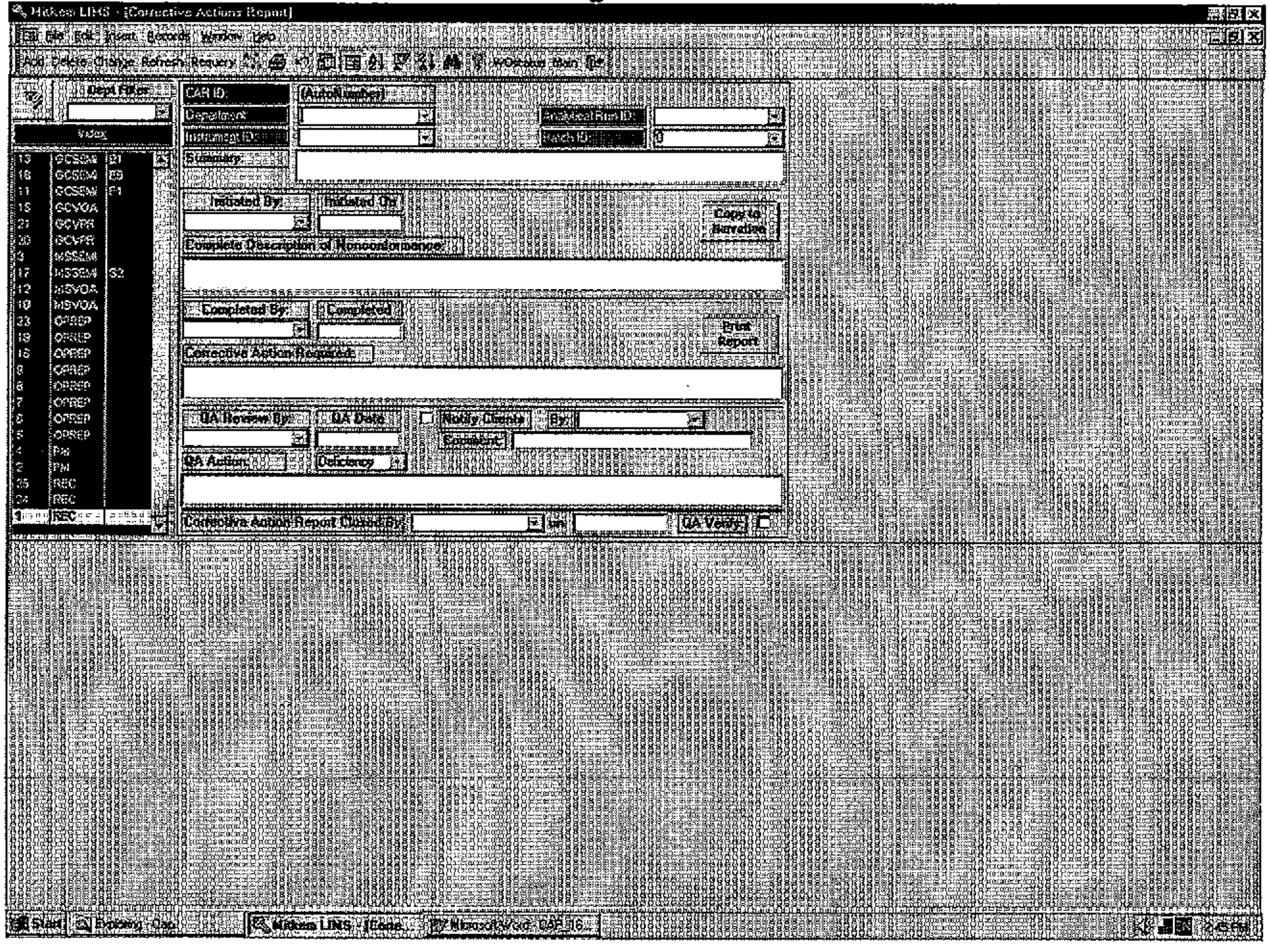
Any breech of standard protocols is a nonconformance item that is documented on the Corrective Action Request Form and management informed immediately. The following are nonconformance items:

1. Sample holding time exceeded.
2. Hoods, Class "S" weights, NIST Thermometers, balances, automatic pipettes, being used but not certified.
3. Expired standards being used.
4. Manual integration being misrepresented.

16.1 Client Complaints:

Mitkem Corporation ensures client complaints are dealt with quickly and completely. The policies are stated in the laboratory Client Complaint Standard Operating procedure (SOP No. 80.0002).

Figure 16-1



13	GCSSM	B1
16	GCSSM	E9
11	GCSSM	F1
15	GCVOA	
21	GCVPR	
20	GCVPR	
3	MSSSM	
17	MSSSM	S2
12	MSVOA	
10	MSVOA	
23	OPREP	
19	OPREP	
15	OPREP	
8	OPREP	
6	OPREP	
7	OPREP	
8	OPREP	
5	OPREP	
4	PM	
2	PM	
25	REC	
24	REC	
1	REC	

Quality Assurance Corrective Action Request Form

17.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The MITKEM Quality Assurance Director submits a QA report annually to the Operations Manager and the President of the Laboratory. The report should be completed and submitted no later than the 15th of July in any calendar year.

The report contains detailed laboratory information and QA activities during the previous twelve months. Items to include are the status of internal and external audits, client complaints, quality control activities, resources and staffing. See the following pages for the report format.

Management will review the QA report and respond to outstanding issues. Management will add a review of the suitability of policies and procedures, and any other relevent issues. The response report is due within 30 days of the QA Report receipt.

A copy of the report is kept on file in the QA department.

In case of a severe problem or difficulty, a special report is prepared by the QA Director and submitted immediately to management.

MITKEM CORPORATION
Annual Quality Assurance Report to Management

1. Status of Internal Audits.

2. Status of External Audits

3. Identification of Quality Control issues in the laboratory.

4. Discussion of corrective action issues.

5. Proficiency Testing.

6. Changes in volume and type of work undertaken.

7. Client Feedback.

8. Reports from management and supervisory personnel.

18.0 SAFETY

MITKEM maintains safety program managed by the Health and Safety Officer and the Safety Committee. Responsibilities include many aspects that comply with the Right-to-Know Laws. Training includes:

- Training seminars with information on OSHA safety instruction for new employees.
- Introductory training to include location of fire extinguishers, first aid supplies, etc.
- Chemical Hygiene Plan/Health and Safety manual review when hired initially and then annually thereafter.
- Monthly Safety Committee meetings.
- Centralized MSDS information.
- Maps with safety equipment and all exits noted.
- Posted safety rules.

If a chemical spill occurs, proper actions are described in Mitkem's Contingency Plan. Each department at Mitkem has its own copy of the Contingency Plan. Additionally, the local fire department (Warwick) and hospital (Kent County) also have a copy in case a need arises. All employees are required to review the plan when hired.

Emergency equipment, such as spill control kits, fire extinguishers and fire blankets are located throughout the laboratory areas. The Contingency Plan has instructions for evacuation, notification of emergency authorities and regulatory personnel in the event of a chemical accident.

19.0 WASTE MANAGEMENT

19.1 Pollution Prevention

The waste management option of choice is to prevent pollution by minimizing the amount or types of chemical wastes that are generated. Mitkem's ability to minimize waste generation is limited by the chemical analysis techniques that are required by the EPA or other authors of test methods. As new test methods are utilized in the laboratory, the type and volume of chemical waste generated by the new test is considered. Analysts and Supervisors are encouraged to look for ways to reduce the amount of chemical waste, or the type of chemical waste generated during the testing process; HOWEVER, no method is allowed to be modified without discussion among the Supervisor, Technical Director, QA Director and other management personnel to determine the affect of the change on the resulting data.

19.2. Waste Management

Mitkem has identifies and routinely disposes of chemical wastes in several hazardous waste streams. In general these are acids, caustics, solvent wastes and various laboratory waste solids. No laboratory chemical waste is disposed in the trash or dumped down the drain. All remaining sample volume following testing, and after contract-required disposal date has past, are disposed in one of these waste streams. These wastes are fully described in Mitkem's Waste Management Plan and in Mitkem's Profile Log that has been prepared by Univar, Mitkem's waste hauler. Other hazardous wastes are identified and properly disposed according to these documents.

Continued compliance is monitored monthly by an outside consultant to ensure all RI DEM regulations are met.

20.0 DEFINITIONS, ACRONYMS, ABBREVIATIONS:

ACCURACY:	The closeness of agreement between an observed value and An accepted reference value.
BATCH:	A group of samples of the same matrix that are processed as a unit. Unless defined differently by a specific analytical method (such as Oil & Grease by Method 1664), the maximum batch size is 20 samples.
BIAS:	The deviation due to analytical or matrix effects of the measured value from a known spiked amount.
BLANK:	A "clean" matrix analysis. Such as: Equipment Blank, Method Blank, Trip Blank.
CAS:	Chemical Abstracts Service, a registry where chemicals are assigned identification numbers.
CCB:	Continuing Calibration Blank
CCV:	Continuing Calibration Verification standard.
CLP:	Contract Laboratory Program. A contract used by EPA to purchase analytical services. Also refers to the test protocols described in that contract. The CLP analyses can be used for EPA or for other clients. CLP-format data reports are arranged as described in the EPA CLP contract, including specified data report pages and all raw data. The CLP analysis scheme includes OLM (Organic Low/Medium-soil and water), OLC (organic low concentration-waters only) and ILM (Inorganic Low/Medium-soil and water) analyses.
CONTROL SAMPLE	A QC sample introduced into a process to monitor the performance of the system.
DL:	Dilution, not used when the initial analysis is performed at dilution, but is used for a secondary dilution.
DUPLICATE:	see Matrix Duplicate, Field Duplicate, and Matrix Spike Duplicate.
EQUIPMENT BLANK	A sample of analyte-free water that has been used during sample collection to measure any contamination introduced during sample collection.
ICB:	Initial Calibration Blank

ICV:	Initial Calibration Verification standard
IDL:	Instrument Detection Limit. Statistical value similar to MDL, but with analyses performed on standards that have not been through the sample preparation process.
FIELD DUPLICATES	Independent samples that are collected as close as possible to the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently. These duplicates are useful in documenting the precision of the sampling process.
LAB CONTROL SAMPLE(LCS)	A blank spiked with compound(s) representative of the target analytes. This is used to document laboratory performance in a "clean" matrix.
MATRIX:	The component or substrate (e.g., water, soil, air, and oil) which contains the analyte of interest.
MATRIX DUPE (DUP)	A sample split by the laboratory that is used to document the precision of a method in a given sample matrix.
MATRIX SPIKE (MS)	An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.
MATRIX SPIKE DUPE (MSD)	Laboratory split samples spiked with identical concentrations of target analyte(s). The spiking occurs prior to sample preparation and analysis. They are used to document the precision and bias of a method in a given Sample matrix.
METHOD BLANK (MB)	An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process.
METHOD DETECTION LIMIT (MDL)	The minimum concentration of a substance 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 type containing the analyte. For operational purposes, when it is necessary to determine the MDL in the matrix, the

MDL should be determined by multiplying the appropriate one-sided 99% t-statistic by the standard deviation obtained from a minimum of seven analyses of a matrix spike containing the analyte of interest at a concentration estimated to be three to five times the MDL, where the t-statistic is obtained from standard references.

MSA: Method of Standard Additions

ND: Not Detected. Used in conjunction with the reporting limit.

ORGANIC-FREE REAGENT WATER: For volatiles, all references to water in the methods refer to water in which an interferent is not observed at the reporting limit of the compounds of interest. Organic-free reagent water can be generated by passing tap water through a carbon filter bed containing about 1 pound of activated carbon. A water purification system may be used to generate organic-free deionized water.
For semivolatiles and nonvolatiles, all references to water in the methods refer to water in which an Interferent is not observed at the reporting limit of the compounds of interest. Organic-free reagent water can be generated by passing tap water through a carbon filter bed containing about 1 pound of activated carbon. A water purification system may be used to generate organic-free deionized water.

PPB: Parts Per Billion, ug/L, ug/Kg

PPM: Parts Per Million, mg/L, mg/Kg

PQL: Practical Quantitation Limit. Is equivalent to Reporting Limit.

PRECISION: The agreement among a set of replicate analyses.

PS: Post Spike. Spike added at the analysis level (as opposed to at the beginning of sample preparation) to determine interferences.

REPORTING LIMIT: The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The RL is generally 5 to 10 times the MDL. However, it may be nominally chosen other than these guidelines to simplify data reporting. For many analytes the RL concentration is selected as the lowest non-zero standard in the calibration curve. Sample RLs are matrix-dependent, and are adjusted by the amount of sample analyzed, dilution, percent moisture.

RE: Reextraction or Reanalysis

RPD: Relative Percent Difference, used to determine precision.

RRF: Relative Response Factor. Used for quantification with the internal standard procedure.

RT: Retention Time for a chromatographic peak, as calculated from the time of injection.

SD: Serial Dilution

STANDARD ADDITION: The practice of adding a known amount of an analyte to a sample immediately prior to analysis. It is typically used to evaluate interferences.

STANDARD CURVE: A plot of concentrations of known analyte standards versus the instrument response to the analyte. Calibration standards are prepared by successively diluting a standard solution to produce working standards which cover the working range of the instrument. Standards should be prepared at the frequency specified in the appropriate method. The calibration standards should be prepared using the same type of acid or solvent and at the same concentration as will result in the samples following sample preparation. This is applicable to organic and inorganic chemical analyses.

SURROGATE: An organic compound that is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples.

TRIP BLANK: A sample of analyte-free media taken from the laboratory to the sampling site and returned to the laboratory unopened. A trip blank is used to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organics samples.

From EPA SW-846, Revision 4, and other sources.

MITKEM CORPORATION

INSTRUMENTATION and EQUIPMENT LIST

APPENDIX A

Weight Set Identification:

1. **WT1-Organic Prep Weight Set**
2. **WT2-Organic Prep 100g**
3. **WT3-Organic Prep 300g**
4. **WT4-Organic Prep 1kg**
5. **WT5-Inorganics Weight Set**
6. **WT6-VOA Weight Set**

12/20/2006

Mitkem Corporation
Balance List

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition New/Used	Equipment ID	Location
TOP-LOADING Balance	OHAUS	1121230069	2000	2000	New	TL10	Organic
Analytical Balance	Denver	0077138	1995	1995	New	AB-1	Inorganic
TOP-LOADING Balance	OHAUS Voyager	F2921120391055	2001	2001	New	TL9	Inorganic
TOP-LOADING Balance	Denver	0079896	2000	2000	New	TL1	Metals
TOP-LOADING Balance	OHAUS Precision Std.	C22427176	2002	NA	New	TL6	Backup
TOP-LOADING Balance	OHAUS Navigator	1121122373	2002	2002	New	TL11	Unit 3
TOP-LOADING Balance	OHAUS	CD8910	2000	2000	New	TL4	VOA
TOP-LOADING Balance	OHAUS Navigator	1122173423	2003	NA	New	TL12	Inorganic

12/20/2006

Mitkem Corporation
Equipment List

Department: Receiving

Equipment	**Manufacturer**	**Serial #**	**Date Received**	**Date In Service**	**Condition New/Used**	**Equipment ID**	**Location**
% Solid Oven	Thelco Lab Oven	600011006			used		Unit 3
Walk in Cooler		Not Applicable			used		Receiving
Freeze Dryer	Dura-Stop MP, Dura-Dry MP	TD-12-90-133 Model: TD-00008-A			New		Unit 3

12/20/2006

Mitkem Corporation
Equipment List

Department: Organic Prep

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition New/Used	Equipment ID	Location
Vortex Concentrator	Labconco	000493001C	Jul-98	Jul-98	New	RV I	O Prep
Vortex Concentrator	Labconco	010595103E	Apr-99	Apr-99	New	RV II	O Prep
Vortex Concentrator	Labconco	011196291E	Jun-01	Jun-01	New	RV III	O Prep
Vortex Concentrator	Labconco	246368	Dec-05	Jan-06	Used	RV IV	O Prep
Vortex Concentrator	Labconco	266438	Dec-05	Jan-06	Used	RV V	O Prep
Vortex Concentrator	Labconco	246505	Dec-05	Jan-06	Used	RV VI	O Prep
Vortex Concentrator	Labconco	266818	Dec-05	Jan-06	Used	RV VII	O Prep
Nitrogen Concentrator Bath	Organomations	17033	Jun-97	Jun-97	New	NZ1	O Prep
Deionized Water Generator	Barnstead Thermodyne	582941018789	Jun-95	Jun-95	New	DI1	O Prep
Pressurized Fluid Extractor	Dionex	98070129	Jun-00	Jun-00	New	PFE1	O Prep
Gel Permeation Chromatograph	J2/AccuPrep	P26D031	Jun-05	Jul-05	New	GPC3	O Prep
Gel Permeation Chromatograph	J2/AccuPrep	06D-1196-4.1	Jul-07	Aug-06	New	GPC4	O Prep
Misonex Ultrasonic Disruptor	Sonicator/Heat systems	Unable to view			New	OPH1	O Prep
Misonex Ultrasonic Disruptor	Sonic Dismembrator Fisher Model 550	Unable to view			New	OPH2	O Prep

Misonex Ultrasonic Disruptor	Sonic Dismembrator Fisher Model 500	Unable to view			New	OPH3	O Prep
Misonex Ultrasonic Disruptor	Sonic Dismembrator Fisher Model 500	Unable to view			New	OPH4	O Prep

12/20/2006

Mitkem Corporation
Equipment List

Department: Inorganics : Metals& Wet Chemistry

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition New/Used	Equipment ID	Location
Optima 4300DV	Perkin Elmer	077N3102302	Nov-03	Nov-03	New	Optima3	Metals
Optima 3100XL	Perkin Elmer	069N8060801	Nov-98	Nov-98	New	Optima2	Metals
FIMS 100	Perkin Elmer	1131	Mar-00	Mar-00	Used	FIMS	Metals
GPR Centrifuge	Beckman Instruments	7M149	Apr-02	Apr-02	Used	Centrifuge	Unit 3
Apollo 9000	Tekmar/Dohrmann	US03035002	Apr-03	Apr-03	Demo	TOC1	Unit 3
Quick Chem 8000	Lachat Instruments	A83000-1020	Apr-96	Apr-96	New	Lachat	Unit 3
IC	Dionex	95030498E980802	May-03	May-03	New	IC1	Unit 3
Genesys 20	Thermospectronic	3SGD332010	Apr-02	Apr-02	New	Spec 2	Wetchem
Dessicator	Sanplatec Corp	none	June-06	June-06	New	DryKeeper	Unit 3

12/20/2006

Mitkem Corporation
Equipment List

Department: Pest/PCB

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition New/Used	Equipment ID	Location
GC/ECD	Hewlett Packard	3336A55650	Oct-94	Oct-94	New	E1	Pest/PCB
GC/ECD	Hewlett Packard	3336A59890	Oct-94	Oct-94	New	E2	Pest/PCB
GC/ECD	Hewlett Packard	3235A45554				E3	Pest/PCB
GC/ECD	Hewlett Packard	US00032017				E4	Pest/PCB
GC/ECD	Agilent	US00037060				E5	Pest/PCB
GC/FID	Hewlett Packard	US00001898				F1	Pest/PCB

12/20/2006

Mitkem Corporation
Equipment List

Department: VOA

Equipment	Manufacturer	Serial #	Date Received	Date In Service	Condition New/Used	Equipment ID	Location
GC/MS	Hewlett Packard	3336A55963				V1	VOA
GC/MS	Hewlett Packard	3336A58222				V2	VOA
GC	Hewlett Packard	3336A56504				V3	VOA
GC	Hewlett Packard	2843A21041				V4	VOA
GC/MS	Hewlett Packard	US00007055				V5	VOA
GC/MS	Hewlett Packard	US00031343				V6	VOA
GC	Hewlett Packard	3140A37463				V7	VOA

12/20/2006

Mitkem Corporation
Equipment List **Department: VOA**

Equipment	Manufacturer	Serial #	current Instrument	MITKEM ID Number	Equipment TYPE	Location
A/S Model 4552	OI Analytical			**A/S-22**	Autosampler	VOA LAB
A/S Model 4560	OI Analytical	N111460838		**A/S-23**	Sample concentrator	VOA LAB
A/S Model 4552	OI Analytical			**A/S-24**	TRAY	VOA LAB
A/S Model 4560	OI Analytical	H340460074		**A/S-25**	Sample concentrator	VOA LAB
A/S Model 4551-A	OI Analytical			**A/S-26**	TRAY	VOA LAB
A/S Model 4560	OI Analytical	M943460129		**A/S-27**	Sample concentrator	VOA LAB
A/S Model 4552	OI Analytical			**A/S-28**	TOWER	VOA LAB
A/S Model 4560	OI Analytical	J430460188		**A/S-29**	Sample concentrator	VOA LAB
LSC 2000 ALS 2016	Tekmar	**OUT OF SERVICE**		**A/S-30**		VOA LAB
A/S Model 4560	OI Analytical	J651460769		**A/S-31**	Sample concentrator	VOA LAB
DPM-16 Discrete Purging Multisampler	OI Analytical	D730416521	V4	**A/S-32A**	DPM	VOA LAB
MHC-16 Multiple Heat Controller	OI Analytical	F445464080	V4	**A/S-32B**	MHC	VOA LAB
A/S Model 7000	Tekmar	US01170015	V4	**A/S-33**	Headspace autosampler	VOA LAB

12/20/2006

Mitkem Corporation
Equipment List

Department: SVOA

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition New/Used	Equipment ID	Location
GC/MS	Agilent	3435A01848	Oct-94	Oct-94	New	S1	SVOA
GC/MS	Agilent	3449A02133	Oct-94	Oct-94	New	S2	SVOA
GC/MS	Agilent	US72821130	Nov-99	Nov-99	Used	S3	SVOA
GC/MS	Agilent	CN10315002	May-03	May-03	New	S4	SVOA

Mitkem Corporation
Equipment List

Department: GC AND GC/MS

Equipment	Manufacturer	Serial #	current Instrument	MITKEM ID Number	Equipment TYPE	Location
AUTOSAMPLER	HEWLETT-PACKARD	US12111699 G2614A		**A/S-1**	TRAY	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	US12109082 G2613A		**A/S-2**	TOWER	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	CN31623836 G2614A		**A/S-3**	TRAY	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	CN31630412 G2613A		**A/S-4**	TOWER	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	US14207448 18596C		**A/S-5**	TRAY	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	CN13720586 G1513A		**A/S-6**	TOWER	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	US94706562 G2614A		**A/S-7**	TRAY	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	US11618592 G2613A		**A/S-8**	TOWER	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	3522A38799 18596M		**A/S-9**	TRAY	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	CN13920644 G1513A		**A/S-10**	TOWER	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	US14307475 18596C		**A/S-11**	TRAY	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	CN143220863 G1513A		**A/S-12**	TOWER	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	US514307466 18596C		**A/S-13**	TRAY	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	CN15121474 G1513A		**A/S-14**	TOWER	SVOA LAB

AUTOSAMPLER	HEWLETT-PACKARD	US14207449 18596C		**A/S-15**	TRAY	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	US00001909 G1513A		**A/S-16**	TOWER	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	US92505547 G2614A		**A/S-17**	TRAY	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	US94710320 G2613A		**A/S-18**	TOWER	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	3216A28361 18596B		**A/S-19**	TRAY	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	COULDN'T SEE		**A/S-20**	TOWER 1	SVOA LAB
AUTOSAMPLER	HEWLETT-PACKARD	COULDN'T SEE		**A/S-21**	TOWER 2	SVOA LAB

Laboratory Information System Equipment

1. **Data Collection**:
    1.1. 12 - HP chem station software for collecting GC-ECD and GC-MS data
        1.1.1. 5 GC-ECD
        1.1.2. 4 GC-MS (SVOA)
        1.1.3. 4 GC-MS (VOA)
    1.2. Hardware varies but is x86 compatible
    1.3. OS is Windows, Various Versions (9x, NT, 2000)

2. **Data Storage**:
    2.1. Dell Poweredge servers
        2.1.1. Dual P IV Xeon processors
        2.1.2. 2 GB RAM
        2.1.3. 105 GB Storage expandable to 750 GB internally
        2.1.4. OS is Windows, Various Versions (NT and 2003)
    2.2. LTO tape drive - daily backup, long term archiving and data restoration
    2.3. Tape software is Backup Exec (10.x)

3. **Compound Identification**:
    3.1. 12 - Target 4.14 chromatographic software
    3.2. Hardware is Intel based (3GHZ, 512MB RAM) for Target 4.14
    3.3. OS is Windows Xp

4. **Forms Generation**:
    4.1. In house forms generation LIMS modules for SW-846, ILM4 and ILM5 metals
    4.2. In house forms generation LIMS modules for SW-846, OLC03 and SOM01 organics
    4.3. Target-based forms generation for OLM04 and SW-846 organics
    4.4. Hardware varies but is x86 compatible
    4.5. OS is Windows, Various Versions (2000 and Xp)

MITKEM CORPORATION

CONFIDENTIALITY, ETHICS, and DATA INTEGRITY AGREEMENT

APPENDIX B

CONFIDENTIALITY, ETHICS, AND DATA INTEGRITY

The confidentiality, ethics, and data integrity agreement attached must be signed and dated by all new personnel associated with the data generated by Mitkem Corporation. All said personnel will complete a training course and understand the information stated in the agreement. The course must include the ethical and legal responsibilities including the potential punishments and penalties for improper, unethical, or illegal actions. All personnel must fully understand this information before signing the agreement.

Data Integrity training will be done on an annual basis. If changes to the enclosed integrity agreement are made, then all employees will be required to review and sign. All documents are stored in the employee's personnel file located in the QA Department.

MITKEM CORPORATION

CONFIDENTIALITY, ETHICS AND DATA INTEGRITY AGREEMENT

I. I, ______________________________ *(Name)*, state that I understand the standards of integrity required of me with regard to the duties I perform and the data I report in connection with my employment at Mitkem Corporation.

II. I agree that in the performance of my duties at Mitkem Corporation:

A. I shall not improperly use manual integrations to meet calibration or method QC criteria, such as peak shaving or peak enhancement.

B. I shall not intentionally misrepresent the date or time of analysis by resetting computer or instrument date/time.

C. I shall not falsify analytical results.

D. I shall not report analytical results without proper analysis documentation to support the results; dry-labbing.

E. I shall not selectively exclude data to meet QC criteria, such as calibration points, without technical or statistical justification.

F. I shall not misrepresent laboratory performance by presenting calibration data or QC limits within data reports that are not linked to the data set reported.

G. I shall not represent matrix interference as basis for exceeding acceptance criteria in interference-free matrices, such as method blanks and Laboratory Control Standards (LCS).

H. I shall not manipulate computer software for improper background subtraction or chromatographic baseline manipulations.

I. I shall not alter analytical conditions such as EM voltage, GC temperature program, etc. from standards analysis to sample analysis.

J. I shall not misrepresent QC samples such as adding surrogates after sample extraction, omitting sample preparation steps, or over-spiking/under-spiking.

K. I shall not report analytical results from the analysis of one sample for those of another.

L. I shall not intentionally represent another individual's work as my own.

III. I agree to report immediately any accidental or intentional reporting of non-authentic data either I or another employee may have committed. Such report must be made to any member of Mitkem Corporation's Management (Kin Chiu, Reinier Courant, Edward Lawler, Yihai Ding) or the Quality Assurance Director, either orally or in writing. Every incident will be investigated by senior management. A written corrective action is required of any findings from the investigation.

IV. Any incidents that violate the standards of data integrity can result in immediate termination of the employee as well as civil or criminal charges.

V. Questions pertaining to confidentiality, ethics, and integrity may be posed to any of the above individuals.

VI. I agree not to divulge any pertinent information including but not limited to data and any other information about a project to outside sources without the prior consent from the client.

I understand that failure to comply with the above ethics and data integrity agreement can result in my immediate dismissal from Mitkem Corporation.

______________________________ ____________________

(Signature) *(Date)*

____

(Print Name)

MITKEM CORPORATION

SUBCONTRACTORS

CONFIDENTIALITY, ETHICS AND DATA INTEGRITY AGREEMENT

I. I, ______________________________ *(Name)*, authorized representative of

______________________________(Subcontractor) state that I understand the standards of integrity required of me and the Subcontractor with regard to the duties performed and the data reported in connection with the analysis/analyses contracted by Mitkem Corporation.

II. Subcontractor agrees that in the performance of analysis for Mitkem Corporation:

A. Subcontractor shall not intentionally report data values or results that are not the actual values measured or observed;

B. Subcontractor shall not modify data values unless the modification can be technically justified through a measurable analytical process;

C. Subcontractor shall not intentionally report the dates and times of data analyses that are not the true and actual dates and times of analyses; and

D. Subcontractor shall not intentionally represent another's work as its own.

III. Subcontractor agrees to report immediately any accidental or intentional reporting of non-authentic data to Mitkem.

IV. Subcontractor agrees not to divulge any pertinent information including but not limited to data and information about any Mitkem projects to outside sources without the prior consent from Mitkem or its clients.

I understand that failure to comply with the above ethics and data integrity agreement can result in immediate termination of the subcontract relationship with Mitkem Corporation.

____ ________________________

(Signature) *(Date)*

____

(Name)

____

(Title)

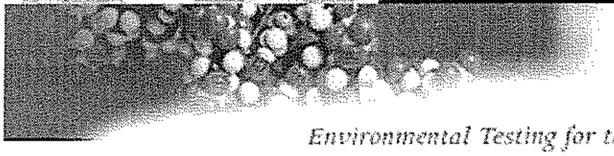
ATTACHMENT 2

Mitkem Table 2

(Recommended Container, Preservation Techniques, and Holding Times for CLP/ASP Analyses)

The Mitkem Difference Capabilities QA/QC Certifications Client List Analytical Guide

MITKEM CORPORATION



Home Contact Us

Environmental Testing for the New Millenium

Analytical Guide

Table 1 | **Table 2** | Table 3

Table 2

Recommended Container, Preservation Techniques and Holding Times For CLP/ASP Analyses

Analytes	Method	Containers	Required* Volume	Preservation	Holding Times
Volatile Organics					
Solid	CLP/ASP	Amber glass jar with Teflon lining	Minimal head-space in jar	4°C	10 days from VTSR
Aqueous	CLP/ASP	40mL VOA vials with Teflon septum	40mL	4°C HCl, pH<2	10 days from VTSR
	CLP Low	40mL VOA vials with Teflon septum	40mL	4°C HCl, pH<2	10 days from VTSR
Semivolatile Organics					
Solid	CLP/ASP	Amber glass jar with Teflon lining	30gram	4°C	10 days from VTSR Analysis within 40 days
Aqueous	CLP/ASP	Amber glass bottle with Teflon lining	1L	4°C	5 days from VTSR Analysis within 40 days
	CLP Low	Amber glass bottle with Teflon lining	1L	4°C	5 days from VTSR Analysis within 40 days
Organochlorine Pesticide/PCB					
Solid	CLP/ASP	Amber glass jar with Teflon lining	30gram	4°C	10 days from VTSR Analysis with 40 days
Aqueous	CLP/ASP	Amber glass bottle with Teflon lining	1L	4°C	5 days from VTSR Analysis within 40 days
	CLP Low	Amber glass bottle with Teflon lining	1L	4°C	5 days from VTSR Analysis within 40 days
Cyanide					
Solid	CLP/ASP	Amber glass jar	2gram	4°C	12 days from VTSR
Aqueous	CLP/ASP	Polyethylene bottle	50mL	4°C NaOH, pH>12	12 days from VTSR
Total Metals except Mercury					
Solid	CLP/ASP	Amber glass jar	2gram	4°C	180 days from VTSR
Aqueous	CLP/ASP	Polyethylene bottle	100mL	HNO_3, pH<2	180 days from VTSR
Mercury					
Solid	CLP/ASP	Amber glass jar	10gram	4°C	26 days from VTSR
Aqueous	CLP/ASP	Polyethylene bottle	100mL	4°C HNO_3, pH<2	26 days from VTSR

* These represent minimum required volume. Additional sample volumes should be collected to minimize headspace loss for volatile analysis. Additional sample aliquot are also required to perform QA/QC functions (e.g. spikes, duplicates), % moisture for solid samples and sample re-analysis (if needed).

[a] For Massachusetts analyses, the volatile soil samples are to be preserved in methanol in the field.

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Webmaster@mitkem.com

Last updated: November 14, 2005

ATTACHMENT 3

Table 1

(Analytical Laboratory Testing Program)

Table 1

Analytical Laboratory Testing Program

Remedial Work Plan
185 Mt. Hope Avenue
Rochester, New York
(NYSDEC Site ID C828124)

Task	Sample Matrix	Parameter	Field Samples	Trip Blanks	MS/MSD	Field Blanks	Analytical Methods	Reporting Levels	Corresponding SCGs
Post-Excavation Samples (3 Bottom, Up to 8 Sidewall)	Soil	TCL VOCs	11	0	1	0	ASP Method OLM04.3	ASP-B	Part 375 Soil Cleanup Objectives
	Soil	TCL SVOCs	11	0	1	0	ASP Method OLM04.3	ASP-B	Part 375 Soil Cleanup Objectives
Contingency In-Situ Remediation Performance Monitoring as part of Site Management Plan (if Warranted)	Soil	TCL VOCs	up to 6	0	1	1	ASP Method OLM04.3	ASP-B	Part 375 Soil Cleanup Objectives
	Soil	TCL SVOCs	up to 6	0	1	1	ASP Method OLM04.3	ASP-B	Part 375 Soil Cleanup Objectives
Long-Term Groundwater Monitoring	Water	TCL VOCs	up to 49 (up to 7 rounds, up to 7 samples/round)	7 (1/round)	7 (1/round)	7 (1/round)	ASP Method OLM04.3	ASP-B	TOGS 1.1.1 Groundwater Standards and Guidance Values
	Water	TCL SVOCs	up to 49 (up to 7 rounds, up to 7 samples/round)	7 (1/round)	7 (1/round)	7 (1/round)	ASP Method OLM04.3	ASP-B	TOGS 1.1.1 Groundwater Standards and Guidance Values

ATTACHMENT 4

Resume of Ms. Hope Kilmer

HOPE L. KILMER, CHMM

EXPERIENCE

Day Environmental, Inc.: March 2006 to present
Years with Other Firms: Over 14 years

AREAS OF SPECIALIZATION

- Environmental Compliance
- Quality Assurance Officer and DUSR reporting
- Industrial Hygiene Sampling & Analysis Techniques
- Inorganic and Organic Methods & Analysis
- Radiation Safety & Analysis

EDUCATION

State University of New York at Fredonia; B.S. Chemistry 1989
Additional Chemistry and Industrial Hygiene curricula graduate course work

REGISTRATIONS/AFFILIATIONS

- Certified Hazardous Materials Manager (CHMM), ID# 14070
- 24 hour HAZWOPER Emergency Response Training
- 8 Hour OSHA Hazardous Waste Site Worker Refresher Training

RESPONSIBILITIES AND PROJECT EXPERIENCE

Ms. Kilmer has more than 15 years of experience providing sampling information, calibrated equipment, and report data. Ms Kilmer's experience includes working within environmental laboratories performing multiple analysis techniques on various media including: personnel samples, soil, sludge, air, and water; addressing environmental, health, and safety issues within a manufacturing facility, waste characterization, waste management, annual OSHA, RCRA, and Radiation Safety training.

Regulatory Compliance:

Air Permit Data Management and Compliance Reporting, Industrial Facility, Albion, New York: Maintain Access database containing air permit information including materials used and their VOC and HAP emissions, receive monthly material usage reports from the facility and prepare monthly emissions report as per Title V requirement. Identified opportunities for improved data collection, management of database functions, and evaluation of status of compliance against permit conditions. Submitted semi-annual and annual Title V compliance monitoring reports on timely basis.

Clean Water and Oil Pollution Prevention Regulatory Compliance, Industrial Facilities, New York: Performed storm water permitting assessment. Assisted in the preparation of Storm Water Pollution Prevention Plans (SWPPP) and Spill Control and Countermeasures (SPCC) Plans for facilities.

Investigation of ambient air quality, Manufacturing Facility, Rochester, New York: Performed health and safety monitoring including volatile organic compound sampling and particulate monitoring using various sampler types. Evaluated data, prepared and provided a report.

Investigation of ambient air quality, Manufacturing Facility, Arcade, New York: Conducted noise exposure monitoring and an indoor air quality survey in a manufacturing facility. Five individuals were monitored to determine noise exposure and air samples for three different materials were collected at four locations in the building. Evaluated data, prepared, and provided a report.

Polychlorinated Biphenyl (PCB) Annual Log, Metro North Railroad Yards, New York and Connecticut: Prepared the PCB Annual Log for multiple facilities.

RCRA Hazardous Waste Compliance, Industrial Facility, Rochester, New York: Project activities included waste characterization and disposal, preparation of hazardous waste profiles, manifests, the Special Assessment forms for NYS Tax Department, and the Hazardous Waste Report.

RCRA Hazardous Waste Compliance, Multiple Industrial Facilities, Rochester, New York: Preparation of Hazardous Waste Reports.

RCRA Hazardous Waste Compliance, Manufacturing Facility, Rochester, New York: Performed RCRA 40CFR part 265 subpart BB/CC monitoring for a large manufacturing facility.

SARA/EPCRA Regulatory Compliance, Multiple Industrial Facilities, New York: Tasks included preparation of, Toxic Release Inventory and Tier II reports for several facilities**.**

Site Assessments/Investigations, Rochester, New York: Conducted and prepared associated reports for Phase I site assessment.

Environmental Remediation Activities - Former Manufacturing Facilities, Rochester, New York: Current activities include the evaluation of laboratory data and the preparation of Data Usability Summary Report (DUSR) documentation for submittal to the New York State Department of Environmental Conservation (NYSDEC).

Chemical Technician, Eastman Kodak Company, New York:

Worked within four separate laboratories, Industrial Hygiene Analysis, Inorganic Analysis, Metals Analysis, and Environmental Process Monitoring. Consulted with internal clients to determine needs and provide necessary sampling equipment and media. Assisted in field sampling activities for worker and environment exposure projects. Performed instrument maintenance and calibration.

Lab Analysis: Performed analysis of samples utilizing OSHA, NIOSH, ELAP, and ASTM methods. Samples included Industrial Hygiene personnel dosimeters, silica gel tubes; groundwater, soils, sludge, filters, aqueous solutions, and unknown solid materials. Develop and document methods of analysis for multiple laboratory techniques including Gas, Ion, and HP-Liquid Chromatography techniques; alpha/beta analysis, Segmented flow analysis, Total Organic Carbon, Inorganic Carbon, ICP-Atomic Absorption, FIAS-MHS (Flow Injection Atomic Spectroscopy- Mercury Hydride System) and AA. Developed digestion methods for various materials (waters, solids, sludges, gelatin, bone).

Data Analysis: Designed and wrote reports for various types of sampling, reviewed reports of others for accuracy and data evaluation and validation. Performed analyses using ELAP protocols; stringent quality control programs were followed as determined by state and federal agencies; participated in ELAP proficiency testing.

***Project examples*:**

Cyanide in Air: Determined a method of sampling for cyanide compounds possibly being generated over a development process. The process consisted of several tanks of solutions over which a conveyor system for film operated. The sampling chain was made up of bubblers containing 0.025 M sodium hydroxide solution and calibrated pumps. The air was sampled for 15 and 30 minutes while the process was in operation. The samples were collected into sealed glass vials, analyzed, and results reported to the IH.

Formaldehyde in air: The concern was that formaldehyde was in use in a new manufacturing process. The monitoring was to determine if formaldehyde was being exhausted through a building ventilation system on the roof. Sep-Paks and calibrated pumps were set up at the stacks exits. The exhausts temperatures and velocities were measured and formaldehyde sampled for 5, 15, and 30 minute intervals. Samples were sent to an outside lab for analysis. Upon receipt, the results were checked for data validation and a report generated for the IH.

Methylene Chloride Exposure: An area consisted of several large open vats of methylene chloride and the concern was regarding personnel in the area being exposed to large quantities of the chemical in air. The people were monitored using passive charcoal badges to collect the chemical. The badges were collected after 30 minute and 4 hour intervals and sealed for analysis. The analysis was performed in-house and a report submitted to the IH.

APPENDIX C

Proposed Brownfield Cleanup Program Sign
And NYSDEC Instructions

DEPARTMENT OF ENVIRONMENTAL CONSERVATION • NEW YORK STATE •

Brownfield Cleanup Program

185 Mt. Hope Avenue Site
C828124
Conifer Hamilton, LLC

Eliot Spitzer, Governor
Peter Grannis, Commissioner
Robert J. Duffy, Mayor

Transform the Past…. Build for the Future

SITE SIGNS FOR REMEDIAL PROGRAMS

Instructions

Signs are required at sites where remedial actions are being performed under one of the following remedial programs: State Superfund, Voluntary Cleanup Program (VCP), Brownfield Cleanup Program (BCP), and Environmental Restoration Program (ERP). They will not be required during the investigation and design phases. The cost of the sign will be borne by the parties performing the remedial action based on the legal document the activities are being performed under (i.e. volunteers/participants would pay 100% of the cost under the BCP; municipalities would pay 100% and then would be reimbursed for the cost under the ERP).

Sign Requirements

Size: Horizontal format - 96" wide by 48" high

Construction Materials: Aluminum or wood blank sign boards with vinyl sheeting.

Inserts: "Site Name", "Site Number", "Name of Party Performing Remedial Activities" and "Municipal Executive".
Indicate position, size and topography for specific inserts.

Color Scheme: Copy surrounding DEC logo - "NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION" - PMS 355

DEC logo: PMS 301 Blue
PMS 355 Green

Text:

Program (choose one):	PMS 301
Brownfield Cleanup Program	
Voluntary Cleanup Program	
State Superfund Program	
1996 Clean Water/Clean Air Bond Act - Environmental Restoration Program	
Site Name, Site Number, Party Performing Remedial Activities	PMS 355
Names of Governor, Commissioner, Municipal Executive	PMS 301
Transform the Past.......Build for the Future	PMS 355

Type Specifications: All type is Caslon 540, with the exception of the logotype.
Format is: center each line of copy with small caps and initial caps.

Production Notes: 96" wide x 48" high aluminum blanks will be covered with vinyl sheeting to achieve background color. Copy and logo will be silk screened on this surface.

See attached format

APPENDIX D

RegenOx^{TM} In-Situ Chemical Oxidation Application Instructions

REGENESIS

RegenOx™

CHEMICAL OXIDATION REDEFINED

RegenOx™ *In Situ* Chemical Oxidation Application Instructions

Using Direct-Push Injection (Step-by-Step Procedures)

RegenOx™ is the new generation of chemical oxidation. RegenOx™ is a proprietary (patent-applied-for) *in situ* chemical oxidation process using a solid oxidant complex (sodium percarbonate/catalytic formulation) and an activator complex (a composition of ferrous salt embedded in a micro-scale catalyst gel). RegenOx™ with its catalytic system has very high activity, capable of treating a very broad range of soil and groundwater contaminants including both petroleum hydrocarbons and chlorinated solvents.

Instructions

1) Prior to the installation of RegenOx™, any surface or overhead impediments should be identified as well as the location of all underground structures. Underground structures include but are not limited to utility lines; tanks; distribution piping; sewers; drains; and landscape irrigation systems. The planned installation locations should be adjusted to account for all impediments and obstacles. These considerations should be part of the SSHP or HASP.

2) Pre-mark the installation locations, noting any points that may have different vertical application requirements or total depth.

3) Set up the direct push unit over each point and follow the manufacturer standard operating procedures (SOP) for the direct push equipment. Care should be taken to assure that probe holes remain in the vertical.

4) For most applications, Regenesis suggests using 1.5-inch O.D./0.625-inch I.D drive rods. However, some applications may require the use of 2.125-inch O.D./1.5-inch I.D. or larger drive rods.

5) Advance drive rods through the surface pavement, as necessary, following SOP.

6) Push the drive rod assembly with an expendable tip to the desired maximum depth. Regenesis suggests pre-counting the number of drive rods needed to reach depth prior to starting injection activities.

7) After the drive rods have been pushed to the desired depth, the rod assembly should be withdrawn three to six inches. Then the expendable tip can be dropped from the drive rods, following SOP. If an injection tool was used instead of an expendable tip, the application of material can take place without any preliminary withdrawal of the rods.

8) In some cases, introduction of a large column of air prior to RegenOx™ application may be problematic because the air can block water flow to the treatment area. This is particularly the case in deep injections (>50 ft) with large diameter rods (>1.5-inch O.D.). To prevent the injection of air into the aquifer during RegenOx™ application, as well as to prevent problems associated with heaving sands, fill the drive rods with water, or the RegenOx™ mixture prior dropping the expendable tip or exposing the injection tool.

9) The RegenOx™ percent of the oxidizer in solution should range between 3% to 5%. Although solutions up to 8% may be used, this will likely increase the difficulty of injection due to reactivity.   Solutions with greater than 8% oxidizer in solution will result in excess reaction and flocculation prior to injection and are not typically recommended

Measure the appropriate quantity of RegenOx™ Oxidizer for one to four vertical foot of injection into a 55 gallon drum or mixing tank. The volume of water per injection location can be calculated from the following formula:

$$\frac{\text{RegenOx Oxidizer lbs/foot}}{(8.34\text{ lbs/gal water})(\%\ \text{R}egenOx\_Oxidizer\text{ solids})}\left[1-(\%\,\text{R}egenOx\_Oxidizer\text{ solids})\right]$$

Tighter formations (clays and silts), and even some fine sand formations will likely require higher oxidant percentages since less volume can be injected per location. The following are guides to various RegenOx™ mixing ratios based on the above equation.

- to make a roughly 3% oxidant solution for every 10 lbs of oxidant and 10 lbs of activator (20 lbs total RegenOx™), use 38 gallons of water.
- to make a roughly 4% oxidant solution for every 10 lbs of oxidant and 10 lbs of activator (20 lbs total RegenOx™), use 28 gallons of water.
- to make a roughly 5% oxidant solution for every 10 lbs of oxidant and 10 lbs of activator (20 lbs total RegenOx™), use 22 gallons of water.

10) Pour the pre-measured quantity of RegenOx™ Oxidizer into the pre-measured volume of water to make the desired target % oxidant in solution. NOTE: always pour the Oxidizer into water, do not pour water into the Oxidizer. Mix the water and oxidant with a power drill and paint stirrer or other mechanical mixing device to ensure that the Oxidizer has dissolved in the water.

11) Pour the applicable quantity of the pre-mixed RegenOx™ Activator into the oxidant:water solution. Mix the Oxidant and Activator using a power drill paint stirrer or other mechanical mixing device for at least 5 minutes until a homogenous mixture is formed. After mixing the RegenOx™ mixture should be injected into the subsurface as soon as possible.

12) Do not mix more RegenOx™ material than will be used over roughly 1 to 4 feet of injection so as to minimize potential above ground reaction/flocculation prior to injection.

    Transfer the contents of the mixing tank to the pump using gravity feed or appropriate transfer pump. (See Section 9.2: Pump Selection) For some types of pumps, it may be desirable to perform a volume check prior to injecting RegenOx™

13) Connect the delivery hose to the pump outlet and the delivery sub-assembly. Circulate RegenOx™ though the hose and the delivery sub-assembly to displace air in the hose. NOTE: an appropriately sized pressure gauge should be placed between the pump outlet and the delivery sub-assembly in order to monitor application pump pressure and detect changes in aquifer backpressures during application.

14) Connect the sub-assembly to the drive rod. After confirming that all of the connections are secure, pump the RegenOx™ through the delivery system to displace the water/fluid in the rods.

15) Slowly withdraw the drive rods. Commonly RegenOx™ injection progress at 1-foot intervals. However, continuous injection while slowly withdrawing single lengths of drive rod (3 or 4 feet) is an acceptable option. The pre-determined volume of RegenOx™ should be pumped into the aquifer across the desired treatment interval.

16) Remove one section of the drive rod. The drive rod may contain some residual RegenOx™. Place the RegenOx™-filled rod in a clean, empty bucket and allow the RegenOx to drain. Eventually, the RegenOx™ should be returned to the RegenOx™ pump hopper for reuse.

17) Monitor for any indications of aquifer refusal. This is typically indicated by a spike in pressure as indicated or (in the case of shallow applications) RegenOx™ “surfacing” around the injection rods or previously installed injection points. At times backpressure caused by reaction off-gassing will impede the pumps delivery volume. This can be corrected by bleeding the pressure off using a pressure relief/bypass valve (placed inline between the pump discharge and the delivery sub-assembly) and then resume pumping. If aquifer acceptance appears to be low, as indicated by high back pressure, allow sufficient time for the aquifer to equilibrate prior to removing the drive rod.

18) Repeat steps 13 through 23 until treatment of the entire contaminated vertical zone has been achieved. It is recommended that the procedure extend to the top of the capillary fringe/smear zone, or to the top of the targeted treatment interval.

19) Install an appropriate seal, such as bentonite, above the RegenOx™ material through the entire vadose zone. Prior to emplacing the borehole seal, we recommend placing clean sand in the hole to the top of the RegenOx™ treatment zone (especially important in holes that stay open). Bentonite chips or granular bentonite should be placed immediately above the treatment zone, followed by a cement/bentonite grout to roughly 0.5 feet below ground surface. Quick-set concrete should then be used as a surface seal.

20) Remove and clean the drive rods as necessary.

21) Finish the borehole at the surface as appropriate (concrete or asphalt cap, as needed). We recommend a quick set concrete to provide a good surface seal with minimal set up time.

22) A proper borehole and surface seal assures that the RegenOx™ remains properly placed and prevents contaminant migration from the subsurface. Each borehole should be sealed immediately following RegenOx™ application to minimize RegenOx™ surfacing during the injection process. If RegenOx™ continues to “surface” up the direct push borehole, an appropriately sized (oversized) disposable drive tip or wood plug/stake can be used to plug the hole until the aquifer pressures equilibrates and the RegenOx™ stops surfacing. If wells are used for RegenOx™ injection the RegenOx™ injection wells and all nearby groundwater monitoring wells should be tightly capped to reduce potential for surfacing through nearby wells.

23) Periodically compare the pre- and post-injection volumes of RegenOx™ in the holding tank or pump hopper using the pre-marked volume levels. Volume level may not be present on all tanks or pump hoppers. In this case, volume level markings can be temporarily added using known amounts of water and a carpenter’s grease pencil (Kiel crayon).

24) Move to the next probe point, repeating steps 8 through 29. We recommend that the next RegenOx™ injection point be as far a distance as possible within the treatment zone from the previous RegenOx™ injection point. This will further minimize RegenOx™ surfacing and short circuiting up an adjacent borehole. When possible, due to the high volumes of liquid being injected, working from the outside of the injection area towards the center will limit expansion of the plume.

Pump Selection

Regenesis has evaluated a number of pumps and many are capable of delivering RegenOx™ to the subsurface at a sufficient pressure and volumetric rate. However, even though a number of the evaluated pumps may be capable of delivering the RegenOx™ to the subsurface based on adequate pressures and delivery rates, each pump has its own set of practical issues that may make it more or less difficult to manage in a field setting.

In general, Regenesis strongly recommends using a pump with a pressure rating of 200 pounds per square inch (psi) in sandy soil settings, and 800 psi in silt, clay or weathered bedrock settings. Any pump under consideration should have a minimum delivery rate of 5 gallons per minute (gpm). A lower gpm rated pump may be used; however, they are not recommended due to the amount of time required to inject the volume of liquids typically associated with a RegenOx™ injection (i.e. 1,000 lbs of RegenOx™ [500 lbs Oxidant/500 lbs Activator] require roughly 1,100 gallons of water to make a 5% Oxidant solution).

Quite often diaphragm pumps are used for the delivery of chemical oxidants. Generally, these pumps operate pressures from 50-150 psi. Some of these pumps do not have the pressure head necessary to overcome the back pressure encountered in silt and clay lenses. In these cases the chemical oxidant thus ends up being delivered to the surrounding sands (the path of least resistance) and is not delivered to soil with residual adsorbed contamination. The use of a positive displacement pump such as a piston pump or a progressing cavity pump is may be superior because these pumps have the pressure necessary to overcome the resistance of low permeability soils. NOTE: be aware that application at pressures that are too high may over-consolidate the soil and minimize the direct contact of the oxidant. The key is to inject at a rate and pressure that maximizes the radius of influence without causing preferential flow. This can be achieved by injecting at the minimum pressure necessary to overcome the particular pressures associated with your site soil conditions.

Whether direct injection or wells are used, it is best to start by injecting RegenOx™ outside the contaminated area and spiral laterally inwards toward the source. Similarly, RegenOx™ should be applied starting vertically at the bottom elevation of contamination, through the layer of contamination, and a couple of feet above the layer of contamination. The reagents can be pushed out from the well bore with some water.

Pump Cleaning

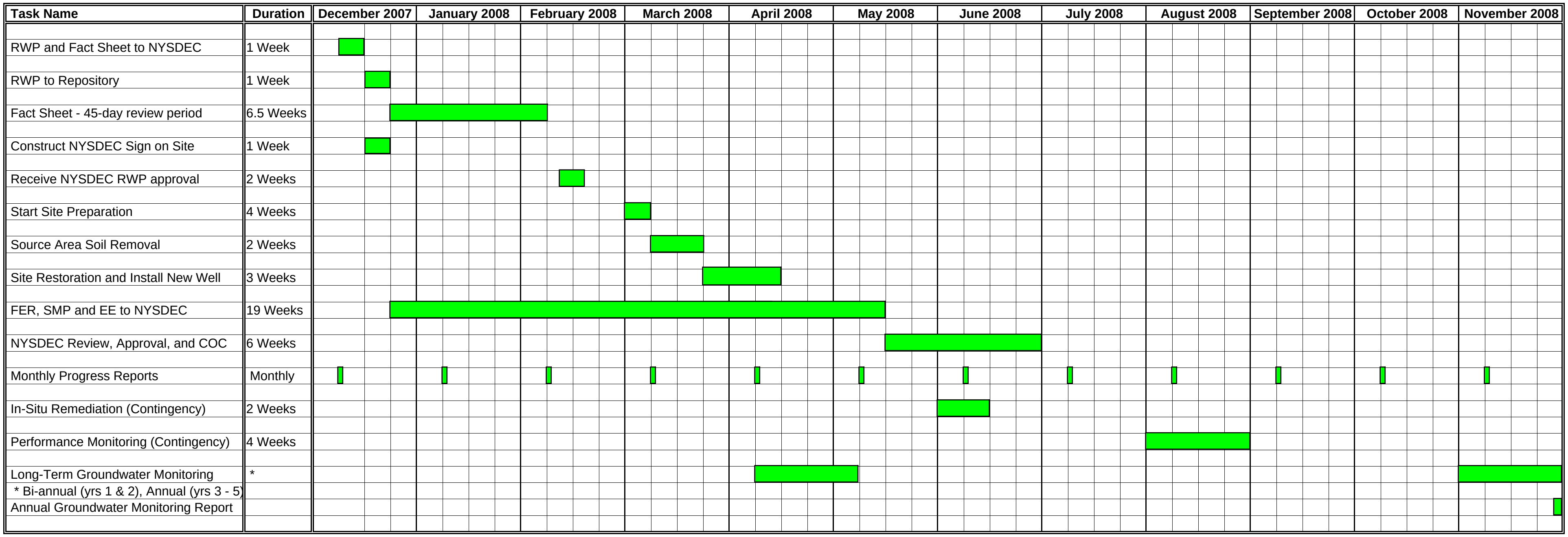
For best results, flush all moving parts and hoses with clean water at the end of the day; flush the injection system with a mixture of water and biodegradable cleaner such as Simple Green.

For more information or technical assistance please call Regenesis at 949-366-8000

APPENDIX E

Project Schedule

Tentative Remediation Schedule
(First Year)
185 Mount Hope Avenue
Rochester, New York
(NYSDEC Site ID C828124)



Task Name	Duration	December 2007	January 2008	February 2008	March 2008	April 2008	May 2008	June 2008	July 2008	August 2008	September 2008	October 2008	November 2008
RWP and Fact Sheet to NYSDEC	1 Week	🟩											
RWP to Repository	1 Week	🟩											
Fact Sheet - 45-day review period	6.5 Weeks	🟩	🟩	🟩									
Construct NYSDEC Sign on Site	1 Week	🟩											
Receive NYSDEC RWP approval	2 Weeks			🟩									
Start Site Preparation	4 Weeks				🟩								
Source Area Soil Removal	2 Weeks				🟩								
Site Restoration and Install New Well	3 Weeks				🟩	🟩							
FER, SMP and EE to NYSDEC	19 Weeks	🟩	🟩	🟩	🟩	🟩	🟩						
NYSDEC Review, Approval, and COC	6 Weeks						🟩	🟩					
Monthly Progress Reports	Monthly	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
In-Situ Remediation (Contingency)	2 Weeks							🟩					
Performance Monitoring (Contingency)	4 Weeks									🟩			
Long-Term Groundwater Monitoring	*					🟩	🟩						🟩
* Bi-annual (yrs 1 & 2), Annual (yrs 3 - 5)													
Annual Groundwater Monitoring Report													🟩

APPENDIX F

Alternative #5 Opinion of Probable Cost

Source Area Soil Removal Alternative
with Contingency In-Situ Remediation Beyond Excavation
(Present Worth of Project Costs)

185 Mt. Hope Avenue
Rochester, New York

Opinion of Probable Cost

The scope of this alternative is based on the outcome of the November 26, 2007 meeting with the NYSDEC, and the costs associated with implementing this alternative are considered preliminary.

Capital/Initial Costs

Design, Work Plans, HASP	$ 20,012.00
Institutional Controls	$ 10,014.00
Install + Develop One New Well	$ 3,902.00
Source Area Soil Removal with ORC-A Placed in Excavation	$ 104,143.90
Costs Associated with Dewatering Excavation (Contingency)	$ 5,000.00
Limited In-Situ Remediation (Contingency)	$ 60,324.00
Post In-Situ Remediation Performance Soil Monitoring (Contingency)	$ 6,300.80
Project Derived Wastes (drill cuttings, decon water, well water)	$ 2,500.00
FER and 12 MPRs	$ 20,009.00
20% Contingency	$ 46,441.14
Total	**$ 278,646.83**

Operation/Maintenance/Annual Costs

Years 1-2 Groundwater Monitoring ($14,093 X 2 yrs)	$ 28,186.00
Years 3-5 Groundwater Monitoring ($7,582.50 X 3 yrs)	$ 22,747.50
20% Contingency	$ 10,186.70
Total Operation/Maintenance/Annual Costs	**$ 61,120.20**

Present Worth Cost

Capital/Initial Costs	$ 278,646.83
Years 1-2 Groundwater Monitoring Present Worth (F=1.8594)	$ 31,445.43
Years 3-5 Groundwater Monitoring Present Worth (F=4.3295-1.8594)	$ 22,475.44
Total Present Worth Cost	**$ 332,567.70**

Assumptions

- 5 years at 5% discount factor
- Develop detailed remedial work plan for Site
- Develop and implement institutional controls
- F = Discount Factor of 5% at the nth year of the project
- Conduct long-term groundwater monitoring for 5 years (biannually for 7 wells for yrs 1-2, annually for 7 wells for yrs 3-5)
- Develop and submit necessary reports to document work completed
- Only one excavation event (I.e., initial confirmatory sample results are less than SCGs, and additional excavation is not necessary)
- NYSDEC approves approach and size of the excavation (i.e., ~1,441ft^2 x 19 ft deep)
- Quotes provided by contractors, etc. to develop the cost estimate will be accurate at the time the work is conducted
- The lowest of three contractor quotes for soil removal, backfilling and restoration services was used
- The costs provided are for comparative purposes only, and actual costs will vary