GEI Consultants

December 23, 2004
Project 042310

Geotechnical
Environmental and
Water Resources
Engineering

DEC 29 2004

Mr. John Helmeset
Environmental Engineer 2
MGP Remediation Division
New York State Department Environmental Conservation
625 Broadway
Albany, NY 12233

Dear John:

RE: **Site-Specific Air Monitoring Plan**
Phase II 93B Maple Avenue Interim Remedial Measure
99, 103, and 104 Maple Avenue
Haverstraw, New York

This submittal is an addendum to the Final Interim Remedial Measure Work Plan dated December 20, 2004 for the above-referenced project.

Attached please find:

- The draft Perimeter Air Monitoring Plan, prepared by AirLogics, which describes the procedures that will be used to monitor volatile organic compounds (VOCs) and dust during remedial activities.

- The draft Odor Monitoring Plan, prepared by GEI, which describes the procedures that will be used to monitor potential odors during remedial activities.

Although provided as separate plans, GEI and AirLogics will perform the procedures described as an integrated activity in the field.

Taken collectively, the plans meet or exceed the requirements of the New York State Department of Health's (NYSDOH) generic Community Air Monitoring Plan (CAMP).

Please call me or Kevin McAleer at 781.721.4000 if you have any questions.

Very truly yours,

GEI CONSULTANTS, INC.

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ATTACHMENT 1

PERIMETER AIR MONITORING WORK PLAN

DRAFT PERIMETER AIR MONITORING WORKPLAN
ORANGE & ROCKLAND UTILITIES, INC.
PHASE II INTERIM REMEDIAL MEASURE
99, 103 and 104 MAPLE AVENUE
HAVERSTRAW, NEW YORK

PREPARED FOR:
Orange & Rockland Utilities, Inc.
Spring Valley, New York

PREPARED BY:
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December 7, 2004
File No. 16642.52

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1.0 INTRODUCTION

The site investigations that were performed at 99, 103, and 104 Maple have indicated the presence of contamination associated with the operations at the nearby former 93B Maple Avenue and Clove and Maple Avenue manufactured gas plant (MGP) sites. The site investigations that were performed at the sites have indicated the presence of elevated levels of compounds typically associated with MGP sites including semi-volatile organic compounds, particularly polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs). Based on the assumed prevalence of PAHs and VOCs on MGP sites, and the general toxicity of these classes of compounds, PAHs and VOCs have been selected as the target analytes to be included in the perimeter ambient air quality monitoring program.

Real-time perimeter air quality monitoring, in conjunction with confirmatory air sampling, is to be performed at the 99, 103 and 104 Maple Avenue sites during remedial activities in which sub-surface soils affected by MGP residuals are disturbed. The goal of real-time air monitoring and the aggressive response to exceedance of short-term levels (e.g. 15 minute averages), is to ensure that the longer-term exposures at the fence line are below acceptable risk levels. The purpose of the real-time air monitoring system is to act as an early warning system to prevent elevated off-site exposures and to document conditions occurring on the site during excavation activities. The warning or action levels are based on toxicity-based short-term action levels for the selected target compounds. If the action levels are exceeded, immediate and aggressive actions will be taken to limit further exposures, e.g. dust and/or vapor suppression or alteration of certain work activities. The air monitoring system is designed to provide real-time information on fence line concentrations of the target volatile organic compounds (VOCs) and dust levels.

2.0 PROJECT OBJECTIVES

2.1 The overall IRM project objectives are to:

- Protect human health and the environment from exposure to unacceptable risk levels of contaminants resulting from former MGP process residuals;

- Minimize risk of exposure to contaminants resulting from remediation work performed at the former MGP sites;

- Develop and implement an overall air monitoring strategy.

2.2 PERIMETER AIR MONITORING OBJECTIVES

Perimeter air quality monitoring will be performed at upwind and downwind locations around the perimeter of the site before and during remedial activities in which impacted subsurface soils are disturbed. The perimeter air monitoring system is designed to accomplish the objectives presented in Section 2.1 as well as the following:

- Establish background levels of target compounds in ambient air prior to initiation of remedial activities;

- Monitor and document perimeter ambient air levels of target compounds during remedial activities;

- Provide an early warning system to prevent elevated off-site exposures by responding aggressively to exceedances of short-term action levels, to ensure that longer-term exposures at the perimeter are below acceptable risk levels;

- Evaluate ongoing effectiveness of, and need for additional vapor and/or dust suppression controls and/or alteration of work activities, to reduce airborne compounds to below acceptable risk levels;

- Use real-time perimeter monitoring results in conjunction with confirmatory air sampling and the air monitoring program contained within the health and safety plans.

2.3 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQO) have been established to define the quality of the data gathered in relation to the methods used to collect the data and the data's anticipated end use.

Both real-time screening level and confirmatory data will be collected to evaluate contaminant levels in ambient air. The number of samples collected for field screening or laboratory analysis depends on the level of data quality that can be expected from the testing method employed. Below is a discussion regarding Data Quality Objectives (DQOs) and the relative quality of the samples needed for types of data to be collected, either real-time or confirmatory.

The following DQO levels will be utilized during the performance of remedial actions:

- Real-time screening data: This screening data applies to all field screening using portable equipment, such as a field gas chromatograph, and ambient dust monitor. The data collected generally does not include QA/QC information with the exception of the field GC which includes standard analytical QA/QC information. The real-time data will be used to document conditions occurring on the sites during excavation activities and determine the need for more aggressive dust and/or vapor suppression activities or alteration of work activities. In addition, the real-time data will be used to show compliance with the health-protective action levels.

- Confirmatory data: This level applies to analyses performed off-site at an analytical laboratory. The analyses will be conducted in accordance with the appropriate US EPA air sampling methods at a state certified laboratory. The data will include the QA/QC elements specified by the appropriate US EPA method. In general, the confirmatory samples will be collected on a baseline and routine basis and analyzed using the US EPA methods.

3.0 AIR MONITORING STRATEGY

The environmental monitoring required for the project will be conducted using the real-time perimeter air monitoring system and via confirmatory air monitoring using US EPA approved sampling and analytical methods. The perimeter air monitoring system is intended to be protective of public health in the vicinity of the site. The real-time perimeter air monitoring system is designed to provide an immediate means to evaluate appropriate measures of control of short-term exposure levels for selected VOCs and PAHs, so that acceptable risks for acute and subchronic exposures are not exceeded. The data provided by the real-time perimeter air monitoring system may also be used to determine the appropriate control actions.

The AirLogics system will operate 24 hours/day – 7 days/week. Utilization of this system will provide data on a continuous basis for the duration of the project. Conventional air monitoring systems typically provide data for the periods of time that work is being conducted. In addition to providing data during work activities, this system will provide data continuously including evenings, weekends and holidays when no work is being conducted.

4.0 REAL-TIME PERIMETER AIR MONITORING

The perimeter air monitoring system is designed to be protective of public health, in the vicinity of the site, against off-site unacceptable acute and subchronic exposures. The real-time perimeter air monitoring system is automated and includes the instrumentation of six separate sampling locations. Since multiple sampling locations will be used, the system has inherent equipment redundancy that should prevent interruption of excavation activities.

4.1 VOLATILE ORGANIC COMPOUND (VOC) PERIMETER AIR MONITORING

The automated, real-time perimeter air monitoring system will be installed at the sites to monitor VOC concentrations associated with the remedial activities. During remedial activities, the system's portable field gas chromatographs provide continuous air quality measurements from four separate sampling locations around the site perimeter and compare the measurements to action levels established for target contaminants. The real-time VOC perimeter air monitoring system is set to protect against both short-term exposure to unacceptable levels of volatile organic compounds emitted during the site remedial activities, as well as longer term exposure over the length of the remediation project. If a specific short-term action level is exceeded, a visual alarm is illuminated. In the event of an alarm condition, the site manager will identify the source and initiate the controls to mitigate the emissions within 30 minutes.

4.2 POLYCYCLIC AROMATIC HYDROCARBONS (PAH) PERIMETER AIR MONITORING

Real-time monitors for PAHs do not exist. Therefore, real-time monitoring for PAHs will involve the measurement of respirable dust as a surrogate for ambient PAH levels. Respirable dust levels will be measured on a real-time basis at upwind and downwind locations during excavation activities to evaluate site related particulate concentrations. The measured levels will then be compared to a conservative action level for respirable dust. The dust monitors will be housed in the same enclosures as the portable field GCs. The data from the dust monitors will also be relayed to the central computer located in the on-site construction office.

4.3 AIR MONITORING SYSTEM DESIGN

The air monitoring system is designed to measure site-related contaminants, namely volatile organic compounds (VOCs), and respirable particulate matter as a surrogate for polycyclic aromatic hydrocarbons (PAHs), and metals. The analytical components of the air monitoring system are field gas chromatographs for VOCs and continuous respirable particle monitors. Real-time methods for monitoring particle bound PAHs and metals do not exist, thus particle levels will be used as a surrogate for PAHs and metals.

The automated perimeter air monitoring system consists of the following five basic components: (1) portable field gas chromatographs, (2) meteorological system, (3) computer control system, (4) alarm system, and (5) dust monitors. Each of these system components is described in the following sections.

4.3.1 Gas Chromatographs

Volatile organic substance concentrations will be measured utilizing Photovac Voyager portable field gas chromatographs (GC), or equivalent. The GCs will be housed in weather tight enclosures located at the pre-determined perimeter locations. The placement of the shelters will provide proper upwind/ downwind locations relative to excavation activities. Each GC unit collects and analyzes air continuously in a "total VOC" screening mode. If an action level is exceeded during the total VOC screening mode, a preliminary "yellow" alarm is issued and the computer control system automatically instructs the GCs to begin analyzing air samples for specific target VOCs. The analytical cycling time will be based on the target list of VOCs, but is anticipated to be within a 15-minute time frame. While the GCs are analyzing air samples for specific target VOCs, total VOCs are not measured by the instruments. Given the approximate 15-minute cycling time, compound-specific VOC data will be produced every 15 minutes.

4.3.2 Meteorological System

An on-site meteorological tower will be utilized to differentiate between upwind and downwind sample locations. The meteorological system consists of a wind speed and direction, temperature, and relative humidity sensors mounted on a portable meteorological tower. The wind meteorological data is continuously recorded on a PC data logging system.

Each sampling port location has a corresponding range of wind direction that identifies when winds are blowing from the site activities towards that sampling location.

4.3.3 Computer Control System

At the end of the GC analysis cycle, the resulting target substance concentrations are output to the central computer via a radio telemetry system. The central computer continuously polls each remote perimeter station to obtain the analytical data. When a new data value is reported, the data are stored in the PC database file along with the meteorological data and other operations status information.

When an action level is first exceeded in the "total VOC mode" the system is in a "yellow" alarm condition and the appropriate visual alarm is displayed. If the results of the compound-specific GC analysis indicate that an exceedance of an action level is sustained, then a "red" alarm condition is issued and the appropriate actions taken.

If the action level is exceeded, visual alarms are illuminated in the construction office and at an outside location visible to the site workers. In the event of an alarm condition, the site manager on duty or designated representative will identify the source and initiate mitigating the emission within 30 minutes, if the source is associated with on-site activities.

When the downwind concentrations drop below the action level, the system will turn the visual alarms off automatically.

4.3.4 Dust Monitors

Direct-reading, real-time MIE DataRam meters, or equivalent, will be used to monitor for dust in the upwind and downwind locations. The measurement of dust levels is accomplished using infrared electromagnetic radiation to sense airborne particles. The dust meter will be configured to respond to dust particles < 10 micron in diameter (PM10). Readings from the upwind location and the downwind location will be compared to the Action Level. The same computer control and alarm systems will be utilized for the interpretation of the real-time dust monitoring results.

4.3.5 Alarm System

A two-tier warning system has been developed. The first tier is based on monitoring total VOCs. If the first warning level is exceeded based on total VOCs, the instruments are automatically activated to monitor target compounds. Remediation activities are altered if any of the target compounds exceed their action level.

The system is equipped with a pager module that calls the technician operating the system if an actionable level is triggered overnight or off hours.

4.3.6 Monitoring System Operation

System operation requires a full-time technician for the routine inspection and testing of the system according to the system quality assurance program. The technician is responsible for inspection of the equipment, operation, replacement of expendable supplies, and testing the system performance.

Routine operation requires the following functions:

- Change-out of compressed gas cylinders utilized for the GC Unit operation and calibration.
- Inspection of the sampling systems for damage, loss of flow, dirt or moisture buildup and replacement of inlet filters.
- Inspection of the operational parameter set-points on the GCs and review of the gas chromatograms for proper equipment operation.
- Inspection of the meteorological system for proper operation.
- Daily testing of the alarm system.

The system calibration is tested through routine calibration checks. The system is designed to provide for daily equipment calibrations to test the calibration drift. Meteorological system maintenance and calibrations are conducted annually.

5.0 CONFIRMATORY AIR SAMPLING

Confirmatory air monitoring will be conducted at the perimeter fence-line at upwind and downwind locations in order to document ambient levels of target contaminants using US EPA approved sampling and analytical methods. Analyses will be by a state certified analytical laboratory demonstrating proficiency for the specific methods stated in this section.

5.1 VOLATILE ORGANIC COMPOUNDS

2 DOWN
1 UP

At a minimum, one 10-hour VOC sample will be collected on a rotating weekly schedule (one every six days) during intrusive site work. The sampling location will be chosen from the six perimeter locations and will be based on actual and predicted wind conditions for the sampling day. Sample dates will be selected based on the projected construction activities with the intent of sampling during the period of greatest activity, and therefore the greatest potential for volatilization, for the workweek. VOC samples will be collected using SUMMA stainless steel canisters in conjunction with US EPA Method T0-15 GC/MS Full Scan, as presented in "The Compendium of Methods for the Determination of Toxic Organic Compounds in the Ambient Air," EPA Document No. EPA/600/4-89/017. The VOC samples will be analyzed for the standard TO-15 analyte list, which consists of 61 volatile organic compounds, by an off-site certified laboratory. The SUMMA canister method consists of the collection of a whole air sample into an evacuated stainless steel canister. The sample is collected via a sampling cane from a height of approximately four (4) feet that is designed to approximate the typical breathing zone. The canister is passively filled with sample air via a mass flow controller that allows for uniform filling of the canister over the desired sampling period.

While the VOC samples are being collected for laboratory analysis, the AirLogics monitoring system will be in full operation. Therefore, the system will typically be running in total VOC mode, unless an action level triggers monitoring of target compounds.

5.2 SEMIVOLATILE ORGANIC COMPOUNDS

At a minimum one SVOC sample will be collected on a rotating weekly schedule (one every six days) during intrusive work. The sample collection date, location, and, duration will be the same as the VOC sample described above. SVOC samples will be collected using high-volume polyurethane foam (PUF) samplers. The sample will be analyzed in accordance with US EPA Method TO-13 for semivolatile organic compounds. The samples will be submitted to a state certified laboratory for the requested analytical list.

6.0 SELECTION OF VOC TARGET COMPOUNDS

To identify potential target compounds which may be associated with remediation activities, GZA/AirLogics reviewed extensive air sampling data (over four hundred samples) which were previously collected using US EPA methods during sub-surface activities at two former manufactured gas sites. The selection of target compounds was based on the detected concentrations of individual compounds and published inhalation toxicity information presented in the literature. The target compounds were selected from a list of the most frequently detected compounds at these sites.

A toxicological literature review was performed to identify available information on the potential adverse health effects of the potential target compounds. The review included USEPA Health Effects Summary Tables (HEAST) and USEPA Integrated Risk Information System (IRIS). Based on the toxicological review, the frequencies of detection, and measured concentrations, benzene, toluene, m,p-xylenes, o-xylene, and 1,2,4-trimethylbenzene were selected as target compounds.

These target compounds also are typically associated with impacted soil at manufactured gas plant sites. Our experience at other manufactured gas sites is that these VOC's are most frequently found when excavation activities are occurring and are a good indicator group for the other VOC's found at lower concentrations.

6.1 ACTION LEVELS

The action levels have been developed to protect off-site receptors from adverse health impacts from VOC's and PAH's for both short-term acute exposures and long-term chronic exposures. Action levels were derived so as not to exceed acute or subchronic exposure levels that are associated with known health effects.

Fifteen-minute action levels and daily action levels (based on 10 hours of activity per day) have been defined. These will have the purpose of alerting site management to control emissions or curtail operations to maintain off-site exposures at levels below the human health risk-based criteria.

The action level values have been derived using human health based criteria for different averaging times. The action levels were set using a commonly used rule of thumb which relates to peak concentrations observed over one averaging time to the peak concentrations which might be expected for a different averaging time, It is based on empirical observations of concentrations observed in the vicinity of an emission source subjected to normal variations in atmospheric dispersion.

Action level calculations are presented in Section 6.2.4.

6.2 GENERAL METHODOLOGY FOR DEVELOPING BENCHMARK CONCENTRATIONS AND ANNUAL CONCENTRATIONS

The general methodology for developing both acute and subchronic reference concentrations (RfCs) and cancer risk-based annual concentrations is consistent with guidance provided in Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part C, Risk Evaluation of Remedial Alternatives) (OSWER Directive 9285.7-01C). Technical support staff at the Superfund Health Risk Technical Support Center at the Environmental Criteria and Assessment Office (ECAO) were consulted on the availability of short-term toxicity values and the application of these values to evaluating risks during remediation activities. Guidance was obtained from US EPA draft ECAO toxicity values and pre-release versions of new Final Toxicological Profiles developed by the Agency for Toxic Substances and Disease Registry (ATSDR) for selected chemicals.

Short-term toxicity values were available for several chemicals of concern, however, in some cases, modifications to the ECAO values or alternatives to these values were deemed appropriate. Modifications to ECAO values included adjustments to reflect a different exposure duration. Alternative values included acute and subchronic minimum risk levels (MRLs) developed by ATSDR and presented in the Toxicological Profile for an individual chemical or values derived from a review of the toxicological literature presented in the toxicological profile and other sources.

The following methodology was employed in the development of reference concentrations and annual concentrations:

Consistent with standard risk assessment principles, air concentrations were developed to be protective of both carcinogenic and non-carcinogenic effects.

A three-tiered approach was used which included an acute and subchronic reference concentration and a longer term concentration which is more appropriate for assessing risks over the length of the project.

Carcinogenic effects are addressed over the length of the project. This is consistent with US EPA guidance to consider cumulative dose averaged over a lifetime.

For carcinogens, the annual concentration is based on the following exposure duration: 12 hrs./day, 5 days/week, for 1 year. Inhalation unit risk values, derived on the basis of continuous lifetime exposure, will be adjusted accordingly. The annual concentration will be based on 1E-06 cancer risk. This assumed exposure duration is more than twice the expected project duration.

Subchronic RfCs are based on the following toxicity values in order of preference:

- Subchronic RfC developed by ECAO
- Intermediate Minimum Risk Level (MRL) developed by ATSDR.

When appropriate, the acute benchmark concentration is based on the following toxicity values in order of preference:

One to two days acute inhalation criteria (AIC) developed by ECAO adjusted to reflect the appropriate exposure duration;

- The acute MRL adjusted to reflect the appropriate exposure duration; and
- No Observed Adverse Effects Levels (NOAELs) or Lowest Observed Adverse Effects Levels (LOAELs) from the toxicological summaries presented in the Toxicological Profiles and from other sources together with standard uncertainty and modifying factors.

The following discussion describes how the benchmark concentrations for the individual compounds were derived.

6.2.1 Derivation of Acute Reference Concentrations

Benzene

Both the 1-2 day and the 30-day provisional acute AICs for benzene of 3E-2 mg/m^3 and 6E-2 mg/m^3, respectively are based on hematopoietic effects in mice. However, due, in part, to the application of an Uncertainty Factor of 3 for extrapolation from a minimal LOAEL in the derivation of the 30-day value versus the use of an Uncertainty Factor of 10 for extrapolation from a LOAEL in the derivation of the 1-2 day value, the 1-2 day AIC is lower (more conservative) than the 30-day AIC, by a factor of two. The values are inconsistent since benchmark concentrations for shorter duration exposures are typically higher than for longer exposures. The result is that the first two days of an acceptable 3-day exposure would not be in compliance with the 1-2 day AIC. Both values are based on the same toxicological endpoint in the same species (mice). Furthermore, the Acute MRL derived by the ATSDR for exposures lasting up to 14 days, is also based on hematopoietic effects in mice. The study upon which the MRL of 0.002 ppm (6E-3 mg/m^3) is based on one of the co-studies used by US EPA in deriving the 1-2 day of AIC of 3E-2 mg/m^3 (8.33E-3 ppm). However, ATSDR applied an Uncertainty Factor of 1,000 as opposed to EPA's Uncertainty Factor of 300. Thus, the Acute MRL intended for exposures of up to 14 days is lower than both the 1-2 day and 30-day AICs as well as the subchronic RfC (which is equal to the 30-day AIC).

After reviewing the above toxicological data, it was concluded that as long as the 24-hour average is within acceptable limits intended to prevent hematopoietic effects (i.e., the subchronic RfC), the acute benchmark concentration could be based on another more acute effect. The following table from Patty's Industrial Hygiene and Toxicology (Clayton and Clayton, 1981) presents acute toxicity data obtained using human subjects. These data were also presented in ATSDR's 1989 Toxicological Profile for Benzene.

Table A - Acute Inhalation Exposure Criteria for Benzene

Route	Concentration	Results, Signs, or Symptoms
Inhalation	1.5 ppm (5 mg/m^3)	Olfactory threshold
	25 ppm (0.08 mg/liter)/480 min.	No effect, detectable in blood
	50-150 ppm (0.15-0.48 mg/liter)/300 min.	Headache, lassitude, weariness
	500 ppm (1.6 mg/liter)/60 min.	Headache
	1,500 ppm (4.8 mg/liter)/60 min.	Symptoms of illness
	3,000 ppm (9.5 mg/liter)/30 min.	May be tolerated for 0.5 - 1 hr.
	7,500 ppm (24.0 mg/liter)/60 min.	Signs of toxicity in 0.5 - 1 hr.
	3,100 - 5,000ppm (10-16 mg/liter)	Subtle signs of intoxication, absorbed 79.8 - 84.8 percent
	19,000 - 20,000 ppm (61-64 mg/liter)/5-10 min.	May be fatal in 5 to 10 min.

These data support the use of the 25 ppm (0.08 mg/liter), 480-minute exposure as a NOAEL for acute CNS effects. Although neither Patty's nor ATSDR presented details of the study methodology (e.g. number of subjects, exposure conditions, etc.), the data are from human subjects and the subjects were exposed over a wide range of concentrations and exposure duration. Thus, it was deemed appropriate for derivation of an acute benchmark concentration, keeping in mind that the 24-hour value will be protective of potential hematopoietic effects.

To derive the acute benchmark, the NOAEL of 25 ppm was divided by an Uncertainty Factor of 10 for intraspecies variability (to be protective of sensitive human subpopulations) and a Modifying Factor of 5 for uncertainty regarding study methods. The resulting acute reference concentration is 0.5 ppm.

Due to the shorter duration benchmarks being lower than longer-term values, and the redundancy of having multiple benchmark values being based on the same toxic endpoint, the acute benchmark of 0.5 ppm, derived above, is recommended.

Toluene

The US EPA (1992) derived a 1-2 day AIC for toluene of 1 mg/m^3 (0.267ppm) based on a study by Anderson et. al. (1983) wherein human subjects were exposed via inhalation to

toluene for a single 6-hour exposure period. A LOAEL of 100 ppm was reported for headache and dizziness. The NOAEL was 40 ppm. EPA adjusted the NOAEL to be based on continuous 24-hour per day exposure and applied an Uncertainty Factor of 30 which included a factor of 10 for human variability and 3 for database deficiencies. The deficiencies in developmental studies were the basis of the additional factor of 3. In deriving an acute 1 hour RfC, EPA's adjustment for continuous (24-hour per day) exposure from this AIC was removed to obtain a concentration of 5 mg/m^3 (1.33 ppm).
The 1994 ATSDR Toxicological Profile for toluene reports an Acute MRL of 3 ppm which was derived from a LOAEL of 100 ppm. This LOAEL was obtained from a 6.5-hour human inhalation exposure in a study by Baelum et. al. (1985) wherein exposed subjects experienced decreased manual dexterity and visual perception. This study did not report a NOAEL. An Uncertainty Factor of 30 was applied to the LOAEL to account for intraspecies variability (10) and for the use of a minimally adverse LOAEL (3).

The adjusted 1-2 day AIC was chosen instead of the Acute MRL because it was calculated from an EPA-derived AIC. This adjusted value is lower than the Acute MRL of 3 ppm.

1,2,4-Trimethylbenzene

There is not enough information to derive an acute human health-based inhalation standard for 1,2,4-trimethylbenzene.

Xylenes

The Toxicological Profile for Xylenes (ATSDR, 1997) reported an acute MRL of 1 ppm for mixed xylenes which was derived from a LOAEL of 100 ppm. This LOAEL was obtained from a study by Dudek, et. al. (1990) wherein human subjects were exposed to mixed xylenes for a 4-hour duration via inhalation. The subjects experienced neurological effects. More specifically, subjects displayed an increased (longer) reaction time. This study did not report a NOAEL. The number of subjects that participated in the study was not presented. Also, there was no mention of a control group. An uncertainty factor of 100 was applied to the LOAEL to account for intraspecies variability (10) and for the use of a minimally adverse LOAEL (10).

6.2.2 Derivation of Subchronic Reference Concentrations

Potential exposures to emissions associated with remediation activities are representative of a subchronic exposure duration. Subchronic reference concentrations were identified to support the development of daily action and weekly action levels.

The following sections discuss the availability of subchronic toxicity values and the recommended value selected to form the basis of the action levels.

Benzene

The ECAO has published a subchronic RfC for benzene of 6E-2 mg/m^3 . The subchronic RfC was derived from a study involving mice exposed to benzene for 6 hours per day, 5 days per week for 24 weeks. The toxicological endpoint was damage to hematopoietic progenitor cells; the LOAEL is 10 ppm (32 mg/m^3).

The LOAEL was adjusted from intermittent to continuous exposure. The Human Equivalent Concentration (HEC) was derived and an uncertainty factor of 100 was applied to account for interspecies variability (3), intraspecies variability (10), and extrapolation from a minimal LOAEL (3). A provisional subchronic RfC of 60 µg/m^3 (18 ppb) was derived. This value was adopted as the subchronic "criteria to maintain" for the site.

Toluene

ECAO has published a provisional subchronic RfC for toluene of 1 mg/m^3 (0.267 ppm). The subchronic RfC was derived from a study involving male rats exposed to 0, 500, or 1,500 ppm toluene for 6 hours per day, 5 days per week for 6 months, followed by a 2-month recovery period prior to neurobehavioral testing (Ladefoged, 1991). There were no effects on motor activity and performance following toluene exposure. Morphometric measurements indicated a significant increase in mean nuclear volume and mean perikaryonal volume in rats exposed to 500 ppm. There was a concentration-related decrease in hippocampus weight, significant at the high-concentration group only. A LOAEL of 500 ppm was determined for neurochemical and morphometric changes in the brains of rats.

The LOAEL was adjusted from intermittent to continuous exposure. The HEC was derived and an uncertainty factor of 300 was applied to account for interspecies variability (3), intraspecies variability (10), and use of a LOAEL for the derivation of a subchronic RfC (10). A provisional subchronic RfC of 1 mg/m^3 (0.267 ppm) was derived. This value was adopted as the subchronic RfC for the site.

1,2,4-Trimethylbenzene

No acute or subchronic human health-based standards have been derived for 1,2,4-trimethylbenzene by US EPA because of the lack of a sufficient database. US EPA Office of Pollution Prevention and Toxics presents the most relevant study in a chemical fact sheet prepared on 1,2,4-trimethylbenzenes in August 1994. In response to a TSCA Section 4 test rule, a developmental toxicity study on the C9 fraction was conducted by the International Research and Development Corporation for the American Petroleum Institute. 1,2,4-Trimethylbenzene comprises only about 40 percent of the C9 fraction. EPA feels that adverse effects caused by C9 are similar to what would be caused by the individual chemicals, however, the dose-response may differ.

A LOAEL of 100 ppm (the lowest dose level) was established from this developmental inhalation study on CD-1 mice in which pregnant mice were exposed to the C9 fraction for 6 hours per day during days 6 through 155 of gestation. EPA has concluded that there was evidence of developmental toxicity at all dose levels. Indicators of adverse developmental effects include increased frequency of whole litter resorptions. Reduced pup viability, and malformations (cleft palate, unossified sternebrae, and reduced skull ossification) although it was unspecified as to which effect occurred at which dose level. The highest dose produced maternal toxicity (neurotoxicity). It is unclear as to whether or not there were other toxic effects to the mothers at lower dose levels. A No Observable Effect Level (NOEL) was not established. GZA applied an uncertainty factor of 3,000 to the LOEL to account for intraspecies variability (10), for extrapolation from animals to humans (10) and for the use of a LOEL (10). An additional modifying factor of (3) was applied to the LOEL because of the lack of a sufficient data base (i.e. the lack of acute and subchronic inhalation information). The resulting human health-based acute toxicity value is 0.033 ppm.

Xylenes

The Toxicological Profile for Xylenes (ATSDR, 1997) reported an intermediate minimum risk level of 0.7 ppm for mixed xylenes which was derived from a LOAEL of 200 ppm. The intermediate MRL corresponds to a subchronic exposure period. The LOAEL was obtained from a developmental exposure study by Haas and Jakobsen (1993). One and 2-day old pups of mother rats exposed during gestation days 4-through 20 for 6 hours per day displayed a decrease in rotorod performance. No maternal toxicity was reported in this study, and it is not clear if the effect on rotorod performance was a permanent deficity or a result of xylenes still present in the offspring. This study did not report a NOAEL. An uncertainty factor of 300 was applied to the LOAEL to account for intraspecies variability (3), for the use of a minimally adverse LOAEL (10), and for extrapolation from animals to humans.

6.2.3 Derivation of Annual Average Concentration for Benzene

Benzene is the only carcinogenic target compound. The carcinogenic Unit Risk factor for benzene is based on a continuous lifetime exposure. In order to calculate acceptable risk based concentrations associated with the expected time interval of the remediation work, a standard scaling approach was used. The acceptable air concentration based on a target cancer risk level of 1E-06 was calculated by multiplying the Unit risk value by factors of 12/24 (conservatively assuming 12 hours per day of site activity), 5/7 (assuming an average of 5 of 7 days of intrusive operation per week), 1/70 (conservatively assuming a one year project duration during a 70 year lifetime span). The following calculations are presented to illustrate how to derive the risk-based benchmark for 1 year exposure to benzene.

3×10^{-6} risk per 1 $\mu g/m^3$ (benzene) * 12 hrs/24hrs *5 days/7 days * 1 year/70 years = 4.23 $\times 10^{-8}$ risk per 1 $\mu g/m^3$ (as benzene) for exposures less than lifetime therefore:

4.23×10^{-8} risk per 1 $\mu g/m^3 = 1 \times 10^{-6}$ risk per 23.6 $\mu g/m^3$ (7.4 ppb annual average)

6.2.4 Calculation of VOC Action Levels

The acute and subchronic criteria for the target compounds presented are based on various acute study durations, and weekly subchronic values as discussed in the previous section. In order to calculate acceptable risk based concentrations associated with the appropriate time interval for real-time monitoring, namely a 15 minute average, a standard scaling approach was used. This scaling approach is based on a commonly used rule of thumb which relates concentrations observed over one averaging time to the concentrations which might be expected over a different averaging time. It is based on empirical observations of concentrations observed in the vicinity of an emission source subjected to normal variations in atmospheric dispersion. Mathematically, the rule of thumb is:

$$C_1/C_2 = (T_2/T_1)^{0.4}$$

Where C_1 and C_2 are the concentrations corresponding to averaging times T_1 and T_2 . This relationship is based on the assumption that the source of the emissions is constant over the two time intervals, T_1 and T_2 . If emissions only occur during a portion of either time interval, then the non-exposure periods need to be factored into the equation. This is the case with the calculation of 15 minute action levels using the subchronic criteria, since the subchronic criteria are based on a weekly exposure in which there are non-exposure periods. The action level based on the subchronic criteria is calculated using a two-step process.

In the first step, a daily (i.e. 10 hour) average concentration is scaled from the weekly subchronic criteria, taking into account the diurnal nature of the remediation period, namely, 10 hours per day for 5 days per week. Mathematically, this relationship is:

$$C_{\text{daily}} = C_{\text{weekly}} \text{ x [exposure period/remediation period] x } [T_{\text{weekly}} / T_{\text{daily}}]^{0.4}$$

where:

C_{weekly} = subchronic "criteria to maintain", (ppm)
Exposure period = 24 hors per day for 7 days (hrs)
Remediation period = 10 hours per day for 5 days per week (hrs)
T_{weekly} = 10 hours per day for 5 days (hrs), and
T_{daily} = 10 hrs

The second step simply scales the daily (10 hour) average concentration to the appropriate time interval for the action level, namely 15 minutes. Mathematically this is:

$$C_{\text{action level}} = C_{\text{daily}} \text{ x } [T_{\text{daily}} / T_{\text{action level}}]^{0.4}$$

where:

$C_{\text{action level}}$ = 15 minute action level (ppm)
$T_{\text{action level}}$ = 15 minutes (0.25 hrs)

As presented in Table B, fifteen minute average Action Levels were calculated based on both the acute and subchronic (weekly) criteria. The lowest value of the two was then selected as the overall Action Level for each compound. Table B presents the values used in calculating the action levels based on the acute and subchronic criteria.

Table B – Short-Term Toxicity Values and Action Levels VOCs

Compound	Criteria to Maintain			Action Levels	
	Acute (ppm)	Subchronic Weekly Average (ppm)	Annual Average (ppm)	15-Minute Based on Acute (ppm)	15-Minute Based on Subchronic (ppm)
Benzene	0.5 (1)	0.018 (3)	0.007 (5)	2	**0.50**
Toluene	1.3 (2)	0.27 (3)	--	**4.63**	7.55
1,2,4-Trimethylbenzene	- -	0.033 (4)	--	--	**0.92**
Xylenes	1 (1)	0.7 (1)	--	**3.03**	20

Notes:
1. Value obtained from ATSDR, 1993 (benzene), 1997 (xylenes).
2. Value obtained from USEPA, 1992.
3. Value obtained from ECAO/USEPA, 1994 (benzene), 1992 (toluene).
4. Value derived by GZA using USEPA sources.
5. Value derived by GZA using USEPA sources (IRIS).
6. Boldface denotes lowest 15-minute value and selected Action Level.

The following table summarizes the selected 15-minute Action levels to be used for the real-time monitoring system.

Table C – VOC Action Levels

Compound	Action Level (ppm)
Benzene	0.5
Toluene	4.6
1,2,4-Trimethylbenzene	0.9
Xylenes	3.0

Since the lowest compound-specific Action Level is 0.5 ppm (benzene), A total VOC Action Level of 0.5 ppm will be used to trigger the compound-specific analysis.

7.0 RESPIRABLE PARTICULATE ACTION LEVEL

The National Ambient Air Quality Standard (NAAQS) for PM10 particulate (150 micrograms per cubic meter) was conservatively selected as the Action Level for dust on this project. This Action level is protective of inhalation exposures associated with typical MGP contaminant concentrations encountered during remediation activities.

8.0 SAMPLING PLAN

As presented in previous sections, sampling for VOCs and respirable dust (as a surrogate for PAHs) will occur on a real-time basis during site excavation activities. Confirmatory air sampling for VOCs will occur on a less frequent basis as follows:

8.1 BASELINE (PRE-REMEDIAL) MONITORING

Prior to the initiation of excavation activities, baseline monitoring will be performed to quantify "background" levels of site-specific contaminants using the automated system. Background sampling will be performed during the week preceding the planned remediation activities startup.

8.2 ROUTINE MONITORING

During on-going excavation activities, confirmatory air sampling will be performed to quantify airborne levels of VOCs. Following the start-up period, one set of confirmatory air samples per week (i.e. one every sixth day, excluding weekend days) will be collected from one upwind and two downwind locations. The six-day schedule allows for samples to be collected on a rotating basis encompassing each working day of the week. Additional details regarding the confirmatory sampling are included in Section 5.0. The sampling times will be the same as previously described for the baseline up sampling. The samples will be submitted to the laboratory on a weekly basis for VOC analyses.

8.3 SAMPLE ANALYSES

VOC sampling will be completed using EPA Method TO-15, which uses SUMMA evacuated canisters, and flow controllers to collect ambient air samples. The collected air samples will be analyzed using GC/MS analysis for the project target compounds consistent with the requirements of EPA Method TO-15.

SVOC sampling will be completed using EPA Method TO-13, which uses PUF samplers to collect air samples over the desired duration. The collected samples will be analyzed for the target compounds consistent with the requirements of EPA TO-13.

In general, confirmatory air sample analysis will be completed within three (3) weeks of the laboratory's receipt of the sample, depending on the appropriate holding times specified in the analytical methods. Analysis of air samples collected during the pre-remedial and start-up phases of the work will be completed on an expedited schedule with the goal to receive data in approximately one week. In the event of potential releases (if high levels are detected using real-time analysis methods), the sample collection frequency and turnaround time for sample analysis may be completed on an expedited basis to assess the potential contribution of site-related contaminants to the local environment. Analysis of field blanks will be completed within three weeks of the laboratory's receipt of the samples.

Sample number, collection, holding times, calibration procedures and handling will be performed in accordance with "the Compendium of Methods for the Determination of Toxic Organic Compounds in the Ambient Air," EPA Document No. EPA/600/4-89/017 and the requirements of the appropriate Method.

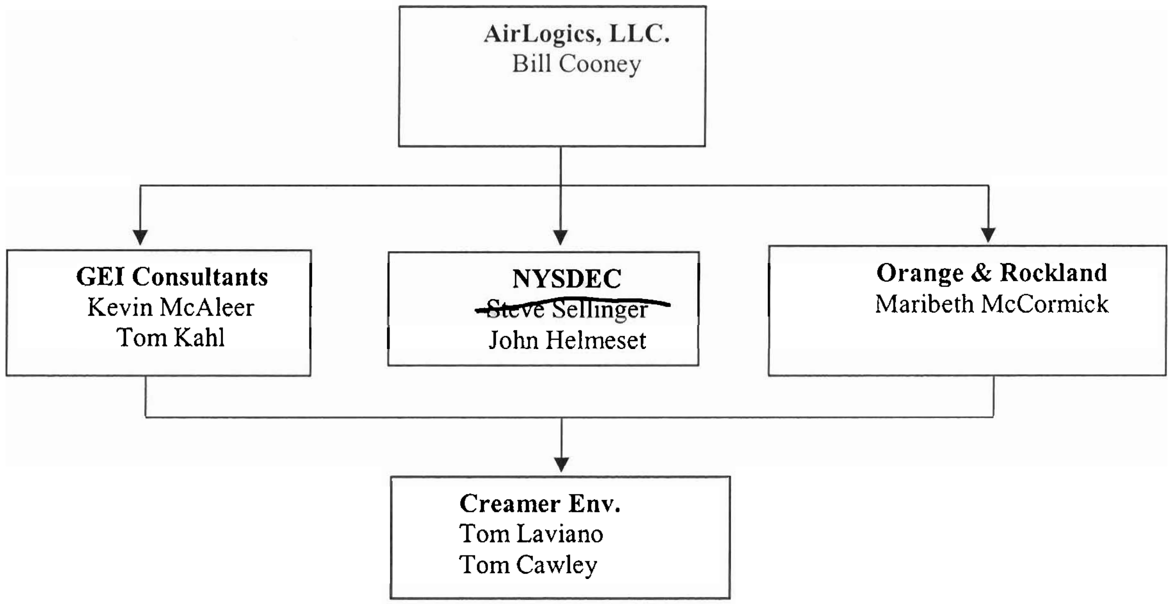
8.4 EQUIPMENT CALIBRATION

Equipment calibration will be performed in accordance with the manufacturers instructions. Field checks using the appropriate reference standards must be made on-site at the minimum frequency of twice per shift (pre and post sampling). The DataRam will be zero checked once per shift (pre-sampling) and calibration will be performed daily according to the operation manual. A daily log of all instrument readings, as well as all field reference checks and calibration information will be maintained.

Additional spare monitoring instrumentation and sampling equipment will be maintained on the site and available for use as needed. If monitoring or sampling equipment is determined not to be in proper working order, it will be removed from service, replaced with other equipment and sent to the appropriate manufacturer or supplier for service and calibration.

9.0 COMMUNICATIONS

The following flow chart depicts the communications chain for responding to an actionable level.



If an action level is exceeded (Total VOCs, benzene, and/or particulates), triggering a yellow or red alert, the AirLogics system operator will notify the first individuals for each company/agency listed above. If the primary contact is not available then, the AirLogics operator will contact the second contacts for each company/agency as appropriate. If mitigative actions are required to correct the red alert condition, then the GEI and O&R field representatives are responsible for notifying the on-site construction supervisor for Creamer Environmental. GEI and O&R will be responsible for directing the mitigative actions to be implemented by Creamer Environmental.

A summary of specific responses to the project-specific action levels is presented in the following section.

10.0 SUMMARY OF ACTION LEVELS AND RESPONSES

The following table presents the appropriate action levels and responses for the site-specific air monitoring plan.

Alert Level	Action Level	Response Action
Green	Total VOCs < 0.5 ppm PM10 particulates < 150 $\mu g/m^3$	None – continue monitoring
Yellow	Total VOCs > 0.5 ppm	1. Confirm VOC source is from site emissions – if not, continue total VOC monitoring (green alert) 2. If VOCs are from site emissions, notify contact list per Section 9.0 of this plan 3. Initiate compound-specific monitoring 4. Evaluate construction activities and determine if work zone indicates potential elevated emissions 5. Evaluate performance of air emission controls (temporary enclosure and air handling system); rectify any deficiencies in the air emission controls 6. Monitor exhaust from air emission controls 7. If compound specific action levels are not exceeded, continue monitoring 8. If total VOC levels drop below 0.5 ppm, return to total VOC monitoring mode (Green alert) 9. If VOC levels and compound specific levels do not decrease, then take the following actions as appropriate ▪ Temporarily relocate work to an excavation area with potentially lower emission levels ▪ Cover non-working areas of exposed impacted soils or open stockpiles of impacted soils with tarpaulins, vapor suppressing foam, or equivalent ▪ Slow the pace of the IRM activities ▪ Change the removal process or equipment to alternatives that minimize air emissions
Yellow	PM10 particulates > 150 $\mu g/m^3$	1. Confirm particulate exceedance is downwind of work area and is from site activities 2. If particulates are attributable to site activities take following actions as appropriate: ▪ Use water or other material to mist exposed soil surface and/or roadways to suppress windblown dust ▪ Cover non-working areas of exposed impacted soils or open stockpiles of impacted soils with tarpaulins, vapor suppressing foam, or equivalent ▪ Slow the pace of the IRM activities Change the removal process or equipment to alternatives that minimize air emissions
Red	Benzene > 0.5 ppm Toluene > 4.6 ppm 1,2,4-Trimethylbenzene>0.9 ppm Xylenes > 3.0 ppm	1. Apply yellow alert controls 2. Cease IRM activities if action level exceedance not resolved 3. Re-evaluate air control systems & monitoring system 4. Re-initiate IRM activities after reaching concurrence between O&R, GEI, NYSDEC, AirLogics personnel

ATTACHMENT 2

ODOR MONITORING PLAN

Draft

Odor Monitoring Plan

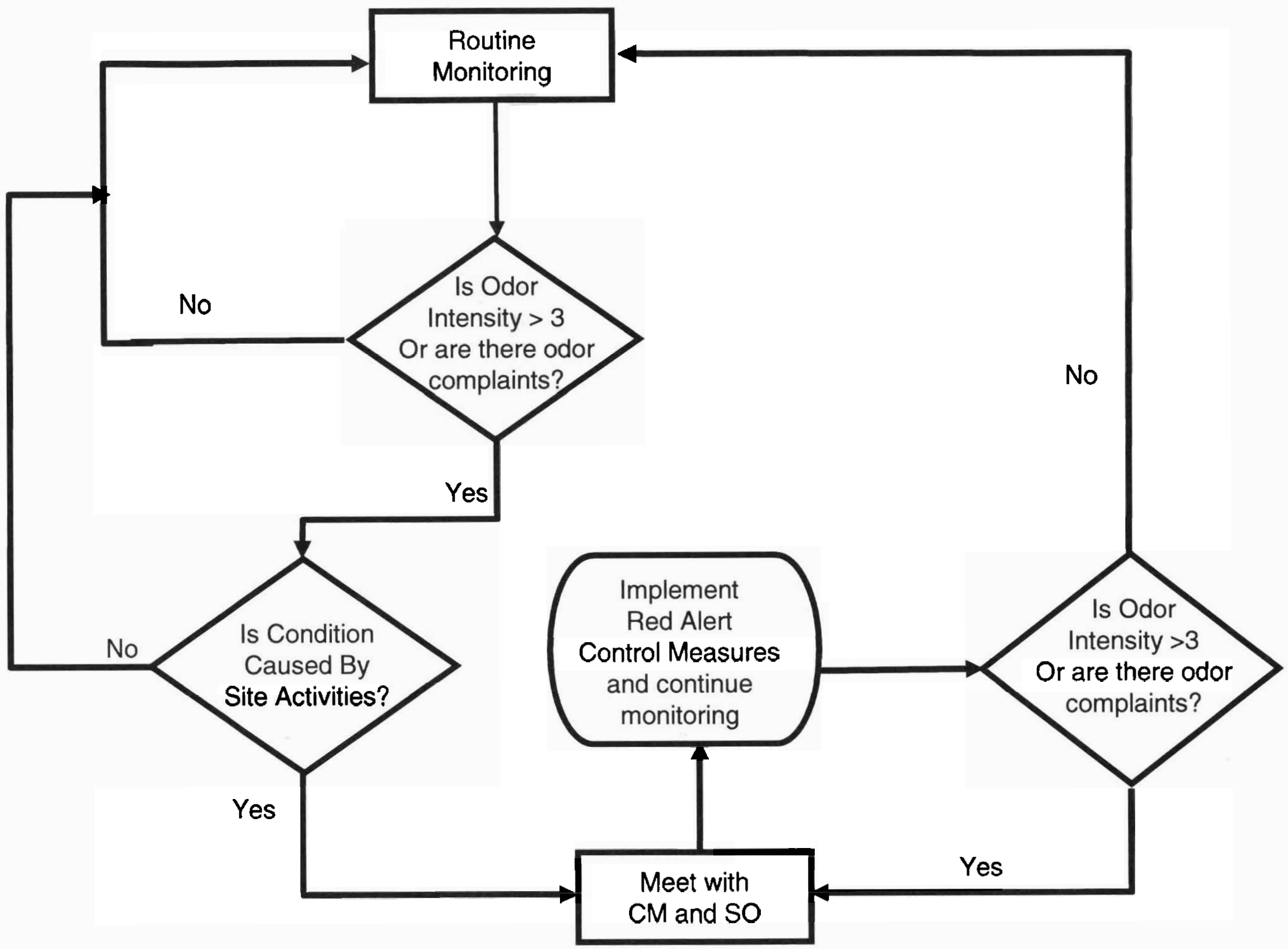
December 2004

Odor intensity levels will be monitored and recorded during walk-around perimeter and work zone monitoring. Intensity levels will be based on the n-butanol scale as adapted from ASTM E544-99.

Figure 1 illustrates the odor decision diagram. Green alert conditions will remain in effect if the odor intensity, based on the 8-point n-butanol scale, is less than 3. Red alert conditions will go into effect if odor intensities are greater than 3, based on the 8-point n-butanol scale or if there are odor complaints from the public. Odor intensities at upwind and downwind locations relative to active construction areas will be evaluated. Odor complaints will be investigated by evaluating odor intensities at upwind and downwind locations.

Upwind and downwind odor intensities will be compared to determine if the alert is due to site conditions. If the downwind odor intensity is greater than the upwind odor intensity, then it will be assumed that the alert condition is due to site activities. If an alert condition, due to odor, is verified, then a meeting attended by the air quality consultant, site owner, the NYSDEC or NYSDOH representatives and construction manager will be held within 60 minutes of the alert condition to determine appropriate response actions. Possible alert response actions are listed in Table 1.

Table 1 Alert Levels and Response Actions	
Alert Level	**Response Action**
Yellow	• Establish trend of data and determine if evaluation/wait period is warranted • Temporarily stop work • Temporarily relocate work to an area with potentially lower emission levels • Apply water to area of activity or haul roads to minimize dust levels • Reschedule work activities • Cover all or part of the excavation area • Apply VOC emission suppressant foam over open excavation areas • Slow the pace of construction activities • Change construction process or equipment that minimize air emissions
Red	• Apply yellow alert controls • Cease construction activities • Re-evaluate air monitoring work plan
Notes: The bulleted response actions specified under each alert can be implemented in any order that is most appropriate under the existing site conditions.	



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PROJECT 042310

ODOR DECISION DIAGRAM

DECEMBER 2004

FIGURE 1