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Air_Monitoring

GEI Consultants

Geotechnical
Environmental and
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Engineering

Air Monitoring Work Plan

Greenpoint Energy Center

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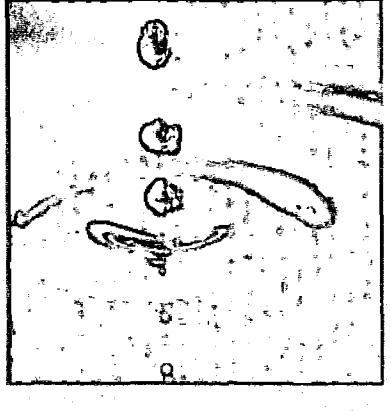

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Table of Contents

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Executive Summary

This Community Air Monitoring Program (CAMP) has been developed to protect neighbors of the Greenpoint Energy Center site (GPE) from the release of potentially harmful airborne contaminants during activities at the proposed remedial area. Because of the care taken in designing and implementing this state-of-the-art CAMP, it is unlikely that neighboring residents or commercial workers will be significantly exposed to GPE contaminants during upcoming remedial activities. GPE activities related to the removal of soil contaminants from the remedial activity area will begin in March 2005. The CAMP will be implemented following guidance provided by the New York State Department of Health (NYSDOH) and is designed to (1) provide monitoring, Action Levels and contingency procedures to prevent exposure of residents, nearby commercial workers, or GPE employees to volatile contaminants and dust, (2) provide a contingency plan that prevents significant contaminant release from the GPE, and (3) reduce community concerns and general environmental anxiety concerning perceived potential health effects due to these remedial activities. (An Action Level is a contaminant concentration or odor intensity that triggers contingent measures. It is important to note these Action Levels do not suggest the existence of a health hazard, but serve instead as a screening tool to trigger contingent measures to ensure that significant levels of contaminants and odors are not transported off site during remedial activities.)

During times of remediation, work zone and fenceline perimeter air monitoring will be conducted using a combination of real-time (continuous and almost instantaneous) air monitoring at fixed locations (24 hours a day/7 days a week) and walk-around perimeter and work zone monitoring using hand-held instruments. Relevant volatile compounds detected during the remedial investigation and dust will be monitored. Odor will be monitored to ensure no off-site impacts to nearby residents. Although total cyanide has not been detected in the soil or groundwater, there will be monitoring for the presence of hydrogen cyanide to ensure complete protection of the community. **A Contingency Plan—with defined, specific response actions—will be implemented if 75 percent of the Action Level for any contaminant is exceeded.** The presence of contaminants below Action Levels has been determined by the NYSDOH to be protective of human health and below the level of harm. The response actions, including work stoppage, will prevent or significantly reduce any potential worker and resident exposure from GPE contaminants.

1. Introduction

The New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP) requires that during excavation at contaminated sites, real-time monitoring for total volatile organic compounds (TVOCs) and particulates (i.e., dust) be conducted at the downwind perimeter of each designated work area. As such, this work plan describes the proposed air monitoring means and methods that will be implemented during activities at the remedial area at the Greenpoint Energy Center site (GPE).

Air monitoring at the GPE will be conducted in accordance with the NYSDOH CAMP. The purpose of the air monitoring program is to ensure that the community and general public are not exposed to hazardous constituents at levels above accepted regulatory limits and guidelines provided in the NYSDOH CAMP. For the remediation and Interim Remedial Action (IRA) activities proposed for the GPE, the worker protection and community air monitoring will be conducted using a combination of real-time air monitoring at fixed locations and walk-around perimeter and work zone monitoring using hand-held instruments.

The objectives of the Plan are as follows:

- Provide an early warning system to alert the site owners if concentrations of TVOCs, naphthalene, odors, or dust in ambient air are approaching Action Levels due to site conditions.
- Provide details for a site contingency plan that is designed to reduce the off-site migration of contaminants/odors if established Action Levels are approached/exceeded.
- Determine whether remedial controls are effective in reducing ambient air concentrations to below Action Levels, and make appropriate and necessary adjustments.
- Develop a permanent record that includes a database of perimeter air monitoring results and meteorological conditions, equipment maintenance, calibration records, and other pertinent information.

1.1 General Approach

The general approach to meet the objectives of the Plan is two-fold:

1. *Utilize a real-time system to monitor target compounds.* Real-time monitoring data will be used as an early warning system so that GEI, acting as the site owner's air quality consultant, can alert the site owner or its representative and remediation manager that concentrations of target compounds are approaching Action Levels. Under this scenario, the site owner, remediation manager, and air quality consultant can then begin to evaluate and implement appropriate site controls to maintain acceptable ambient air concentrations.

2. *Develop comprehensive data management and analysis procedures.* Data will be generated from a variety of sources, including real-time fixed station analytical monitoring, background sampling, and meteorological monitoring. These data must be reduced, evaluated, verified, and presented to the site owner and remediation manager in a timely manner, so that decisions regarding site conditions can be made.

2. Sampling and Analytical Procedures

This section of the Plan presents a detailed description of the sampling and analytical procedures, including data management that will be used during the IRA activities. This section expands upon the sampling and analytical procedures provided in the remedial Work Plan.

In general, real-time sampling methods will be utilized to determine ambient air concentrations during the project. Real-time continuous monitoring for total volatile organic compounds (TVOC) and respirable particulate matter (RPM_{10}) will occur at four fixed locations. Meteorological conditions including wind speed and direction, temperature, and relative humidity will be monitored in real time. Walk-around perimeter and work zone monitoring for TVOC, RPM_{10}, and odor will occur along the perimeter of the GPE. Walk-around perimeter monitoring of naphthalene will also be performed.

2.1 Action Levels

The project Action Levels, real-time monitoring, background sampling, walk-around perimeter and work zone monitoring, and data management procedures are discussed below. An Action Level is a contaminant concentration or odor intensity that triggers contingent measures. For example, if odors are detected onsite, the Odor Action Levels may require odor suppression using foam or may require temporary work stoppage.

The following target compounds and corresponding Action Levels were developed in accordance with the NYSDOH Generic CAMP and are for contaminant concentrations and odor intensities detected at the perimeter.

Target Compounds	Action Levels
TVOCs (15-minute average concentration)	5.0 ppm
TVOCs (maximum allowable concentration)	25 ppm
Respirable Particulate Matter (RPM_{10})	150 $\mu g/m^3$
Odor (n-butanol scale)	3
Odor (naphthalene)	440 $\mu g/m^3$
Hydrogen cyanide	1 mg/m^3

In addition, if odors are detected at or as close as possible to the property line as at a 15-minute sustained level of "3" on an eight-point butanol scale, naphthalene is detected at a concentration greater than 440 $\mu g/m^3$, or an odor complaint is made by someone in the community, then a contingency action plan for odor control will be implemented.

2.2 Real-Time Fixed Station Monitoring

Real-time air monitoring for TVOCs and suspended particulates will be conducted upwind and downwind of the work area along the GPE perimeter. The intent of the real-time monitoring program is to prevent and/or mitigate potential short-term emissions and off-site migration of GPE-related TVOCs and dust by early detection in the field. Real-time monitoring will occur 24 hours per day during active remediation periods using the patented Airlogics, LLC Perimeter Air Monitoring System. The perimeter air monitoring system consists of four Air Monitoring Stations (AMS), one meteorological tower, and one central computer system. The central computer system will be located in the project trailer located on the GPE.

Real-time monitoring will be conducted at four fixed air monitoring stations (AMS-1 through AMS-4). These monitoring stations will be located at each directional boundary of the GPE (north, south, east, west). The rationale for the placement of each fixed station is summarized below.

The Site borders commercial facilities. The real-time fixed air monitoring stations will be positioned between the work zone and potential receptors in each direction, i.e. the commercial properties surrounding the Site and the surrounding Energy Center facilities. Therefore, the placement of the fixed air monitoring stations is based on the need to document all potential off-site migration on the perimeter, but also recognizes the potential off-site receptors and the location of the proposed remedial activities. The following are the approximate location of the fixed air monitoring stations:

- **AMS-1** will be located on the northern property line within the fence bordering Lombardy Street.
- **AMS-2** will be located on the eastern property line between the Site and Newtown Creek.
- **AMS-3** will be located on the southern boundary of the work area.
- **AMS-4** will be located on the western boundary of the work area.

The final locations of each of the fixed air monitoring stations are variable and will depend on the practicality of setting up each station with respect to potential boundary

impediments (the fenceline at Lombardy Street, the Newtown Creek bulkhead along the eastern boundary) while maintaining the utmost effective monitoring at each station. Each real-time air monitoring station contains the following:

1. Station enclosure
2. PhotoVac Voyager gas chromatograph (GC)
3. GC carrier gas
4. GC sample inlet
5. GC sample inlet tubing
6. MIE DataRAM 2000 portable real-time aerosol monitor
7. DataRAM sample inlet with PM-10 impactor
8. DataRAM sample tubing with in-line heater
9. Data communications device
10. Heat exchanger
11. Heater element

Each monitoring station is housed in a weather-tight NEMA-4 type enclosure. The internal components of an air monitoring station are illustrated in Figure 1.

Each monitoring station will continuously measure and record TVOCs and RPM_{10}. Each GC will operate in the TVOC mode to determine the TVOC concentration in ambient air. In TVOC mode, the GCs will collect and analyze samples at a rate of one sample per minute. If the TVOC concentration measured at any station reaches 75 percent of the Action Level for TVOC (3.7 ppm), then each GC will begin to continuously sample and measure in the compound-specific mode. In the compound-specific mode, quantitative concentrations of benzene, toluene, m,p-xylene/ethylbenzene, and o-xylene in ambient air will be determined. During compound-specific operation of the GCs, TVOC concentration will be monitored using a hand-held organic vapor meter (OVM) at the downwind monitoring station. Each GC will operate in compound-specific mode until the downwind TVOC concentration drops below 3.7 ppm.

Each MIE DataRAM portable particulate meter will be equipped with a PM-10 impactor to monitor RPM less than 10 microns (RPM_{10}). An in-line heater will be used to accurately measure particulate during high moisture conditions. Particulate meters will be set to perform a standard one minute averaging concentration. The walk-around meters will be set for a five minute time weighted average.

In addition to the four monitoring stations, a Campbell Scientific, Inc. Met Data1 meteorological monitoring system will be established on site. The meteorological system will be set at a height of 3 meters (approximately 10 feet) above ground and located along

the boundary of the GPE in an area that is clear of buildings, trees, or other obstructions. The meteorological system will continuously monitor temperature, relative humidity, wind speed, and wind direction. Fifteen-minute average values for each meteorological parameter will be stored in the central computer database.

All TVOC, individual VOC constituents, RPM_{10}, and meteorological data will be stored in dataloggers located within each monitoring station. Stored analytical data along with system performance data from each station will be sent in real-time, via radio telemetry, to the central computer system located in the project office or trailer for monitoring and analysis.

Equipment calibration will be performed according to manufacturer's instructions. Each GC will be calibrated once daily using a certified standard isobutylene gas for TVOC mode and a certified standard gas mixture for specific compounds. DataRAMs for RPM_{10} will be zeroed and span-checked daily. Hand-held portable equipment will be calibrated before each use, and a minimum of once per week when not in use.

In the event of an alert for TVOC or RPM_{10}, the air monitoring consultant will be notified during working hours via a white light visual alarm. The air monitoring consultant will be alerted at every instance where measured concentrations are greater than Action Levels during working hours only.

2.3 Perimeter Walk-around and Work Zone Monitoring

Walk-around perimeter and work zone monitoring for TVOC, RPM_{10}, and odor will occur along the perimeter of the project site on a regular and as-needed basis. Specific site conditions that will trigger walk-around perimeter or work zone monitoring include:

- Visible dust
- Odor complaints
- Detection of TVOCs and/or RPM_{10} at an AMS at levels approaching or exceeding Action Levels
- Direction by the site oversight consultant

Perimeter air monitoring and work zone monitoring, in the absence of any specific triggering criteria, will be conducted on a twice daily basis during the normal workday.

At the time when a triggering condition is observed, the walk-around perimeter and work zone monitoring will occur continuously until the conditions that triggered the

monitoring have subsided. Additional temporary monitoring points may be established due to changing site or meteorological conditions.

TVOC concentrations will be monitored and recorded using a Rae Systems MiniRAE 2000 Portable Ionization Detector (PID) or equivalent twice during the workday, once in the morning and once in the afteroon. RPM_{10} will be measured and recorded using a MIE personal DataRAM 1200 (pdR-1200) portable real-time aerosol monitor equipped with a PM-10 impactor and Gilian personal air sampling pump. Odors will be noted based on the n-butanol scale, as adapted from ASTM E544-99.

At each monitoring point, the 5-minute average value of TVOC and RPM_{10}, sample time, and sample location will be collected and recorded. The odor intensity based on the n-butanol scale will be monitored over a 15-minute period and recorded. At each location, air temperature, wind direction, and wind speed will be monitored and recorded using a hand-held wind meter.

Odors as a function of naphthalene concentration will be monitored over a 15-minute period and recorded. To measure naphthalene concentrations, the zNose™ Model 4200 system will be used. The zNose™ is an ultra-fast GC that is capable of analyzing airborne concentrations of VOCs and SVOCs in less than one minute. The zNose™ uses a surface acoustic wave (SAW) detector that changes in vibration frequency as compounds elute from the column and condense onto the surface of the detector.

The zNose™ is a portable instrument and will be positioned downwind of the remedial activities. Two samples, each collected over five minutes and within a 15-minute period, will be used to calculate a 15-minute average naphthalene concentration. The calibration will be checked at the start of the day, at mid-day, and at the end of the day. An air blank will be run at least every two hours. A blank will also be run if a reading exceeds the calibration range of the instrument.

The zNose™ also has the capability of generating fingerprint images of the chemical constituents in the vapor called VaporPrints™. A VaporPrint™ of an air sample can be collected through a headspace analysis. This VaporPrint™ can be compared to others generated at the perimeter and off-site to see if remedial operations are the source of the odors. VaporPrints™ can allow for identification of odors that may not be affiliated with remedial operations.

To monitor cyanide (as hydrogen cyanide gas), a real-time hand-held meter in conjunction with the Dräger Chip Measuring System (CMS) will be used. Types of continuously monitoring equipment include the V-RAE by Rae Systems and the Mini-

Warn by Dräger Safety Systems and are available from rental equipment suppliers. Due to potential interference from sulfur compounds, hydrogen sulfide gas (H_2S) will also be monitored for comparison to the hydrogen cyanide gas levels detected. Hydrogen cyanide gas detections will also be confirmed with CMS Dräger tubes due to this interference. The Dräger CMS can quantify other gases that could potentially provide false positives for hydrogen cyanide gas (including sulfur dioxide, hydrogen sulfide, phosphine gas, chlorine, and nitrogen dioxide) detected by the real-time meter.

At each location, air temperature, wind direction, and wind speed will be monitored and recorded using a hand-held wind meter.

2.4 Background Sampling

Background sampling will be completed to establish baseline ambient air concentrations prior to the start of remediation activities. Baseline conditions will be developed for TVOCs and RPM_{10} in ambient air using real-time fixed station sampling methods. In addition, a baseline odor survey will be completed during background sampling activities. Sample collection and analysis methods will follow those described in subsection 2.2 (Real-Time Fixed Station Monitoring).

Background real-time sampling will take place at the four fixed station monitoring locations to determine TVOC and RPM_{10} baseline conditions. TVOC data will be monitored and recorded 24 hours per day for a minimum of three days.

Background odors will also be established prior to remediation activities. On-site and off-site odor surveys will be conducted using two methods of measurement: the 8-point n-butanol scale and the zNose™. The on-site odor surveys will be conducted along the perimeter of the GPE. The off-site odor surveys will be conducted throughout adjacent neighborhoods.

Preliminary GPE activities (i.e. subsurface utility clearance) are slated to begin the first week that the fixed monitoring stations are scheduled to be installed. In order to extend the site background air sampling collecting period, upwind and downwind recording PIDs and dust monitors will be established a few days prior to start of the preliminary activities.

2.5 Data Management Procedures

This section of the Plan discusses the data management procedures that will be used during the IRA. Data will be generated from a variety of sources, including real-time fixed station analytical monitoring, walk-around monitoring, background sampling, and

meteorological monitoring. These data must be reduced, evaluated, verified, and presented to the site owner and remediation manager in a timely manner, so that decisions regarding site conditions can be made. The data management process for each source of data is discussed below.

Analytical data generated at each fixed-station monitoring location are sent to the central computer system via radio telemetry. Proprietary software translates the data into Microsoft Excel format for data analysis, interpretation, and reporting. The fixed station monitoring data will be downloaded to the project database on a daily basis. The fixed station baseline monitoring data will also be downloaded to the project database for data evaluation. Data from the hand-held instruments and the zNose™ will be manually downloaded and stored in the on-site computer. At a minimum, the following daily charts or tables will be prepared.

- 24-hour TVOC concentration compared to the TVOC Action Level
- 24-hour RPM_{10} concentration compared to Action Level
- Hourly average wind speed, wind direction, and air temperature
- Daily extent of Action Level 1, Action Level 2, and Action Level 3 site conditions (as explained below)
- A summary of the 15-mimute average naphthalene concentrations

3. Contingency Plan

This section of the CAMP presents the air monitoring contingency plan. The purpose of the contingency plan is to identify potential site control measures that may be implemented in response to elevated levels of target compounds or odor. In general, a tiered warning Action Level and response action will be implemented during the air monitoring program. Tiered warning Action Levels are defined as follows.

- **Action Level 1.** Normal or ambient air conditions where all target concentrations are less than 75 percent of the Action Level.
- **Action Level 2.** Concentration of at least one target is equal to or greater than 75 percent of the Action Level but less than the Action Level.
- **Action Level 3.** Concentration of at least one target is greater than the Action Level.

The contingency plan will rely on real-time data generated from the fixed-station monitoring and meteorological monitoring. These data sources will be evaluated together in order to make appropriate decisions concerning site conditions and potential control measures.

An explanation of the notification system, specific Conditions, and response actions for VOCs, RPM_{10}, and odor are presented below.

3.1 VOCs

TVOC concentrations in air will be measured and recorded by the fixed-station monitors. Figure 2 presents the TVOC decision diagram that will be used to determine the appropriate Action Level based on site conditions. Action Level 1 site conditions will be in effect when the TVOC concentration is less than 75 percent of the TVOC Action Level of 5.0 ppm. Specifically, Action Level 1 site conditions will apply when the TVOC concentration measured at each fixed station is less than 3.7 ppm.

Under Action Level 1 site conditions, each GC located at the fixed monitoring stations will operate in the TVOC mode and will collect and analyze a TVOC sample at a frequency of one sample per minute.

A preliminary Action Level 2 will occur if the TVOC concentration measured at any fixed station is greater than or equal to 3.7 ppm. Under a preliminary Action Level 2, the GC at each fixed-station monitoring location will begin analyzing in the compound-specific mode. In the compound-specific mode, the concentration of each target VOC (benzene, toluene, m,p-xylene/ethylbenzene, and o-xylene) will be determined. At this time, TVOC concentrations at the downwind monitoring station will be determined using a hand-held OVM.

At this time, upwind and downwind concentrations will be compared to determine if the Action Level 2 is due to site activities. If downwind individual VOC or TVOC concentrations are greater than upwind concentrations, then it will be assumed that the preliminary site condition is due to site activities.

If a preliminary Action Level 2 is due to site activities, then the following question will be used to verify an Action Level 2.

- Is the TVOC concentration (based on hand-held OVM readings) averaged over a 15-minute period, greater than 3.7 ppm?

If the above condition is true, then an Action Level 2 will be verified. Under a verified Action Level 2, a contingency meeting attended by the air monitoring consultant, site owner, and the remediation manager will be held to determine appropriate response actions. This meeting will be held within 60 minutes of the Action Level 2 verification. Possible Action Level 2 response actions are listed in Table 1.

During a verified Action Level 2, target VOC concentrations will be monitored at the fixed stations, while TVOC concentrations will be monitored at the downwind fixed station using hand-held OVMs. The site will remain in Action Level 2 as long as the TVOC concentration is between 3.7 ppm and 5.0 ppm, based on 15-minute averages.

If average TVOC concentrations increase to greater than 5.0 ppm, then the site will enter into an Action Level 3. Action Level 3 will remain in effect if the following condition is true.

- The average TVOC concentration, measured over a 15-minute period, is greater than or equal to 5.0 ppm.

Under an Action Level 3, all remedial activities will be halted. A meeting attended by the air monitoring consultant, site owner, and remediation manager will be held within 60 minutes of the Action Level 3 to determine appropriate response actions.

In accordance with the CAMP, the following procedures will be followed if total organic vapor levels at the downwind perimeter persist at levels in excess of 5 ppm above background but less than 25 ppm. If the TVOC concentration remains above 5 ppm for 45 minutes (three measurement cycles), work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. Possible Action Level 3 corrective measures actions are listed in Table 1. After these steps, work activities will resume provided that the total organic vapor level at the site perimeter is below 5 ppm above background for the 15-minute average. Due to the small size of the site, the perimeter fence line is the most conservative downwind point.

If the total organic vapor level is above 25 ppm for 45 minutes (three measurement cycles) at the downwind perimeter, activities will be shutdown.

If average TVOC concentrations fall below the Action Level, then the site will be upgraded to an Action Level 2, at which time work activities may resume. The Action Level 2 will remain in effect as long as the following condition is true.

- The 15-minute average concentration for TVOCs is greater than 3.7 ppm and less than 5.0 ppm.

The site will return to Action Level 1 if the following condition is true.

- TVOC concentrations at each of the fixed monitoring stations are less than 3.7 ppm.

Under Action Level 1, the GCs in each of the fixed stations will return to the TVOC mode of sampling. The site will remain under Action Level 1 if the following are true.

- The TVOC concentration measured at each fixed monitoring stations by the field GC is less than 3.7 ppm.

Specific VOC target concentrations for Action Level 1, Action Level 2, and Action Level 3 site conditions are summarized in Table 2.

3.2 Respirable Particulate Matter (RPM_{10})

RPM_{10} concentration in air will be measured and recorded by the fixed-station monitors.

Figure 3 presents the RPM_{10} decision diagram. Action Level 1 will be in effect when the RPM_{10} concentration is less 113 $\mu g/m^3$. The value of 113 $\mu g/m^3$ represents 75 percent of the Action Level for RPM_{10} (150 $\mu g/m^3$). A preliminary Action Level 2 will occur if the RPM_{10} concentration at any fixed station is greater than 113 $\mu g/m^3$. Under a preliminary Action Level 2, upwind and downwind RPM_{10} concentrations will be compared to determine if the preliminary Action Level 2 is due to site activities. If downwind RPM_{10} concentrations are greater than upwind concentrations, then it will be assumed that the preliminary Action Level 2 is due to site activities.

If elevated RPM_{10} concentrations are found to be related to site activities, then three measurements of RPM_{10} will be collected over a 15-minute period and averaged. If the average RPM_{10} concentration is equal to or greater than 113 $\mu g/m^3$, then the Action Level 2 will be verified. The Action Level 2 will remain in effect as long as the average RPM_{10} concentration is greater than or equal to 113 $\mu g/m^3$ and less than or equal to 150 $\mu g/m^3$.

If during an Action Level 2, the average RPM_{10} concentrations are increasing and approaching the Action Level of 150 $\mu g/m^3$, then a contingency meeting attended by the air monitoring consultant, site owner, and remediation manager will be held within 60 minutes of the verified Action Level 2. Possible Action Level 2 response actions for RPM_{10} control are listed in Table 1.

An Action Level 3 will go into effect if the average RPM_{10} concentration exceeds 150 $\mu g/m^3$. Under an Action Level 3, a meeting attended by the air monitoring consultant, site owner, and remediation manager will be held within 60 minutes of the Action Level 3 to determine appropriate response actions. Possible Action Level 3 response actions for RPM_{10} are listed in Table 1.

Specific RPM_{10} target concentrations for Action Level 1, Action Level 2, and Action Level 3 site conditions are summarized in Table 2.

3.3 Visible Dust

In addition to measured RPM_{10} levels, the CAMP requires monitoring of visible dust conditions. If visible 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 RPM_{10} 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.

3.4 Odor

Odors at sites similar to the GPE would generally be negligible due to surface soil cover of contaminated materials; however, excavation work may expose these materials and odors may become detectable. This may cause concern among the nearby community, visitors to the GPE, and on-site workers regarding potential health risks. Health risks or the potential for health risks do not rely strictly on detectable odors. It is important to note that a lack of detectable odor does not indicate a lack of health risks; however, controlling odor emissions from a site can allay public fears about health risks and provide additional means of controlling nuisance emissions during remediation activities.

A characteristic odor during remediation of subsurface contamination with PAHs may be attributed primarily to naphthalene and indene, although additional compounds may contribute to the overall odor. (Pure naphthalene has the characteristic odor of mothballs). EPA provides a threshold for the initial presentation of naphthalene odors at 440 $\mu g/m^3$. There is no reported odor threshold for indene. Odors emanating from the GPE will be monitored for naphthalene at its odor threshold and for general odor intensity, as described below.

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. The zNose™ will typically be stationed downwind of the remedial activities; however, the instrument can be relocated to measure naphthalene concentrations at locations where significant odors are detected.

Figure 4 illustrates the odor decision diagram. Action Level 1 will remain in effect if the odor intensity, based on the 8-point n-butanol scale, is less than 3 and the naphthalene concentration is less than 440 $\mu g/m^3$. Action Level 3 will go into effect when (1) odor intensities are greater than 3, based on the 8-point n-butanol scale or (2) naphthalene concentrations are greater than 440 $\mu g/m^3$ or (3) there are odor complaints from the public. Naphthalene concentrations at upwind and downwind locations relative to active remedial areas will be measured. The overall nature of the odors can be evaluated by comparing VaporPrints™ from waste samples to samples collected either at the site perimeter or off-site to evaluate if the remedial operations are the source of the odors. Odor complaints will be investigated by evaluating naphthalene concentrations and by evaluating VaporPrints™ at upwind and downwind locations. KeySpan will inform the nearby potential receptors (neighboring commercial property occupants and others) of the

IRA activities being scheduled and at the same time provide them with a call-in phone number and contact person in the event they experience a nuisance condition from the site.

Upwind and downwind VaporPrints™ and naphthalene concentrations will be compared to determine if the Action Level is due to site conditions. If the downwind naphthalene concentration is greater than the upwind naphthalene concentration, and if the VaporPrint™ at the downwind location is similar to that from the waste sample, then it will be assumed that the Action Level is due to site activities. If an Action Level, due to odor, is verified, then a meeting attended by the air monitoring consultant, site owner, and remediation manager will be held within 60 minutes of the Action Level to determine appropriate response actions. Possible Action Level responses are listed in Table 1.

3.5 Hydrogen Cyanide

Cyanide will be monitored around the perimeter of the work zone and on the perimeter of the site on a regular basis. Continuous monitoring will be completed every fifteen minutes if sulfur odor or suspected purifier material is encountered. Measurements will be monitored around the perimeter of site, especially downwind, and will be recorded into the field notebook. In the event that hydrogen cyanide is detected, the following procedures will be implemented:

Hydrogen Cyanide Gas Air Monitoring Plan

Response Level	Actions
>1 ppm for 15-minute average using real-time meter (Action Level 2)	Run CMS Dräger tube Continue monitoring with real-time meter Continue work if CMS (Chip Measurement System) Dräger tube for hydrogen cyanide reads <0.5 ppm
>0.5 ppm on CMS Dräger tube (Action Level 3)	Stop work and move (with continuous monitoring meter) at least 25 feet up-wind from excavation or until continuous monitoring meter registers <1 ppm Run CMS Dräger hydrogen cyanide chip and re-evaluate activities Continue monitoring with real-time meter May resume work if Dräger tube for cyanide reads <0.5 ppm
> 1 ppm for 15-minute average using real-time meter and < 0.5 ppm on CMS Dräger tube	Run CMS Dräger using hydrogen cyanide gas chip and confirm <0.5 ppm concentration Continue monitoring with real-time meter Run CMS Dräger tube using sulfur dioxide, hydrogen sulfide phosphine chip to evaluate potential interference Recalibrate the real-time meter and continue to monitor the work zone.
NOTE: NO AIR PURIFYING RESPIRATORY PROTECTION IS AVAILABLE FOR HYDROGEN CYANIDE GAS; The ACGIH Threshold Limit Value (TLV) for Hydrogen Cyanide is 4.7 ppm.	

3.6 Work Zone

The following table will be available for use during field operation as necessary. In addition, all trenches or test pits will be monitored before entry at the beginning of each shift.

REAL TIME AIR MONITORING ACTION AND CONTINGENCY PLANS

Air Monitoring instrument	Monitoring Location	Action Level	Site Action
PID/FID	Breathing Zone	0.5 ppm	Use detector tube for benzene
PID/FID	Breathing Zone	0 - 10 ppm	No respiratory protection is required
		10 - 250 ppm	Stop work, withdraw from work area, Level C
		> 250 ppm	Stop work, withdraw from work area; notify CESM
Oxygen meter	Breathing Zone	< 19.5%	Stop work; withdraw from work area; notify CESM.
		> 22%	Stop work; withdraw from work area; notify CESM.
H2S meter	Breathing Zone	<5 ppm	No respiratory protection is required
		>5 ppm	Stop work, cover excavation, withdraw from work area, notify CESM
HCN meter	Breathing Zone	<0.5 ppm	No respiratory protection is required
		>0.5 ppm	Stop work, cover excavation, withdraw from work area, notify CESM
CGI	Excavation	< 10 % LEL	Investigate possible causes, allow excavation to ventilate; use caution during procedures.
		> 10% LEL	Stop work; allow excavation, borehole to ventilate to < 10% LEL; if ventilation does not result in a decrease to < 10% LEL, withdraw from work area; notify CESM.
Dust Meter	Excavation	> 0.15 mg/m^3	Implement work practices to reduce/minimize airborne dust generation, e.g., spray/misting of soil with water

Tables

Table 1 Action Levels and Response Actions	
Action Level	**Response Action**
Action Level 2	• 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 • Install a perimeter barrier fence
Action Level 3	• Apply Action Level 2 alert controls • Encapsulate construction area and treat air exhaust • Perform work during cold weather • Cease construction activities • Re-evaluate air monitoring work plan
Notes: The bulleted response actions specified under each action level can be implemented in any order that is most appropriate under the existing site conditions.	

Table 2 Target Concentrations for Site Action Levels					
Target	Action Level	Action Level 1	Preliminary Action Level 2	Action Level 2	Action Level 3
Total VOC (GC)-ppm	5.0	[C]<3.7	[C]>=3.7	NM	NM
Total VOC (PID)-ppm	5.0	[C]<3.7	3.7<=[C]<=5.0	3.7<=[C_{avg}]<=5.0	[C_{avg}]>5.0
RPM_{10}-ug/m^3	150	[C]<113	113<=[C]<=150	113<=[C_{avg}]<=150	[C_{avg}]>150
Odor (n-butanol scale)	3	OI<3 and No Odor Complaints	NA	NA	OI>=3 or Odor Complaints
Odor (naphthalene) - ug/m^3	440	[C]<440	N/A	N/A	[C_{avg}]>440
Hydrogen Cyanide - ppm	1	[C]<1	[C]>1	1.0<=[C_{avg}]<=2.0	[C_{avg}]>2.0

Notes:

[C] = Concentration of target collected from a discrete sample.

[C_{avg}] = Average concentration of target measured over three sample cycles.

NM = Target is not measured during this site condition.

OI = Odor Intensity based on the n-butanol scale adapted from ASTM E544-99. Odor measurements made over a 15 minute interval.

NA - Not applicable, odor intensity will be either an Action Level 1 or Action Level 3, there is no Action Level 2 for odor

Figures

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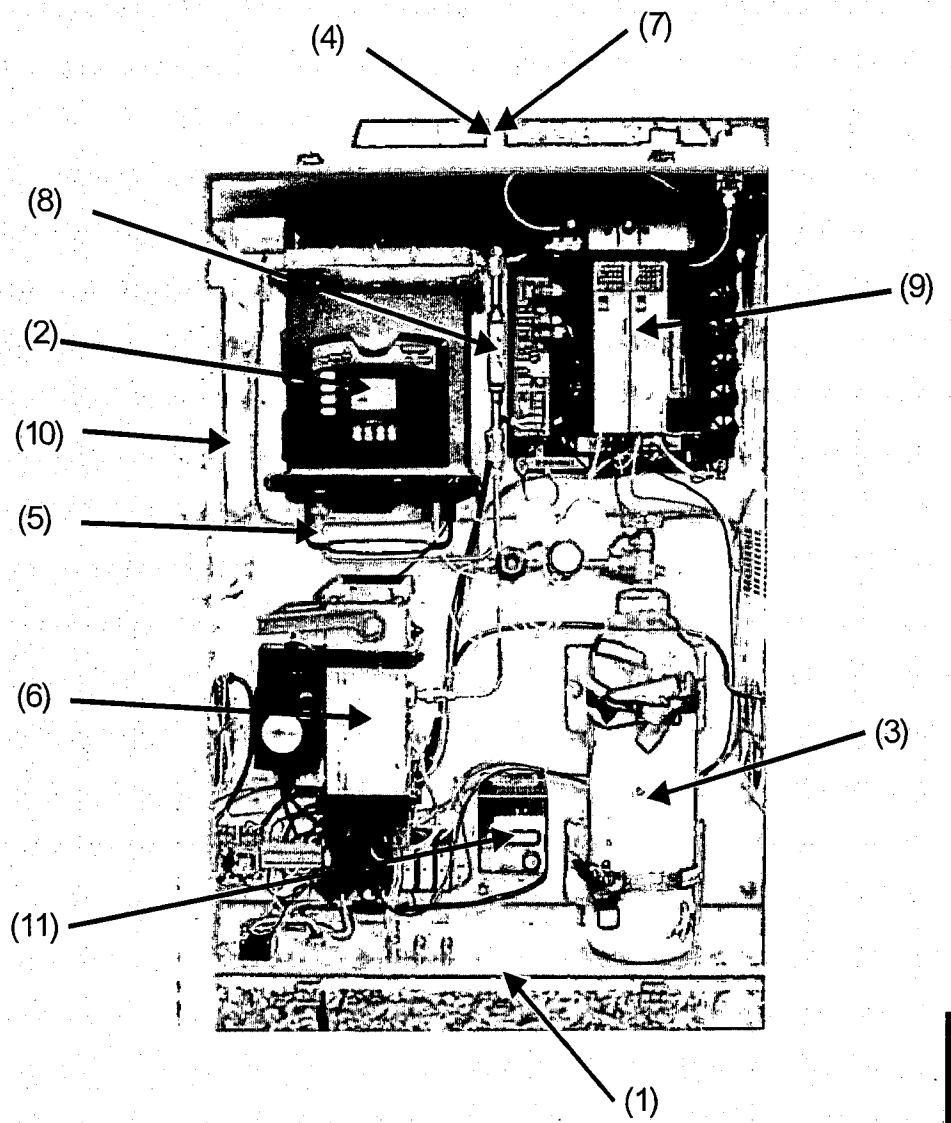

1. Station enclosure
2. PhotoVac Voyager gas chromatograph (GC)
3. GC carrier gas
4. GC sample inlet
5. GC sample inlet tubing
6. MIE DataRAM 2000 portable real-time aerosol monitor
7. DataRAM sample inlet with PM-10 impactor
8. DataRAM sample tubing with in-line heater
9. Data communications device
10. Heat exchanger
11. Heater element

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FIGURE 1
STATION INTERNAL COMPONENTS

NORTHEAST CORNER
AIR MONITORING WORK PLAN
GREENPOINT, NEW YORK

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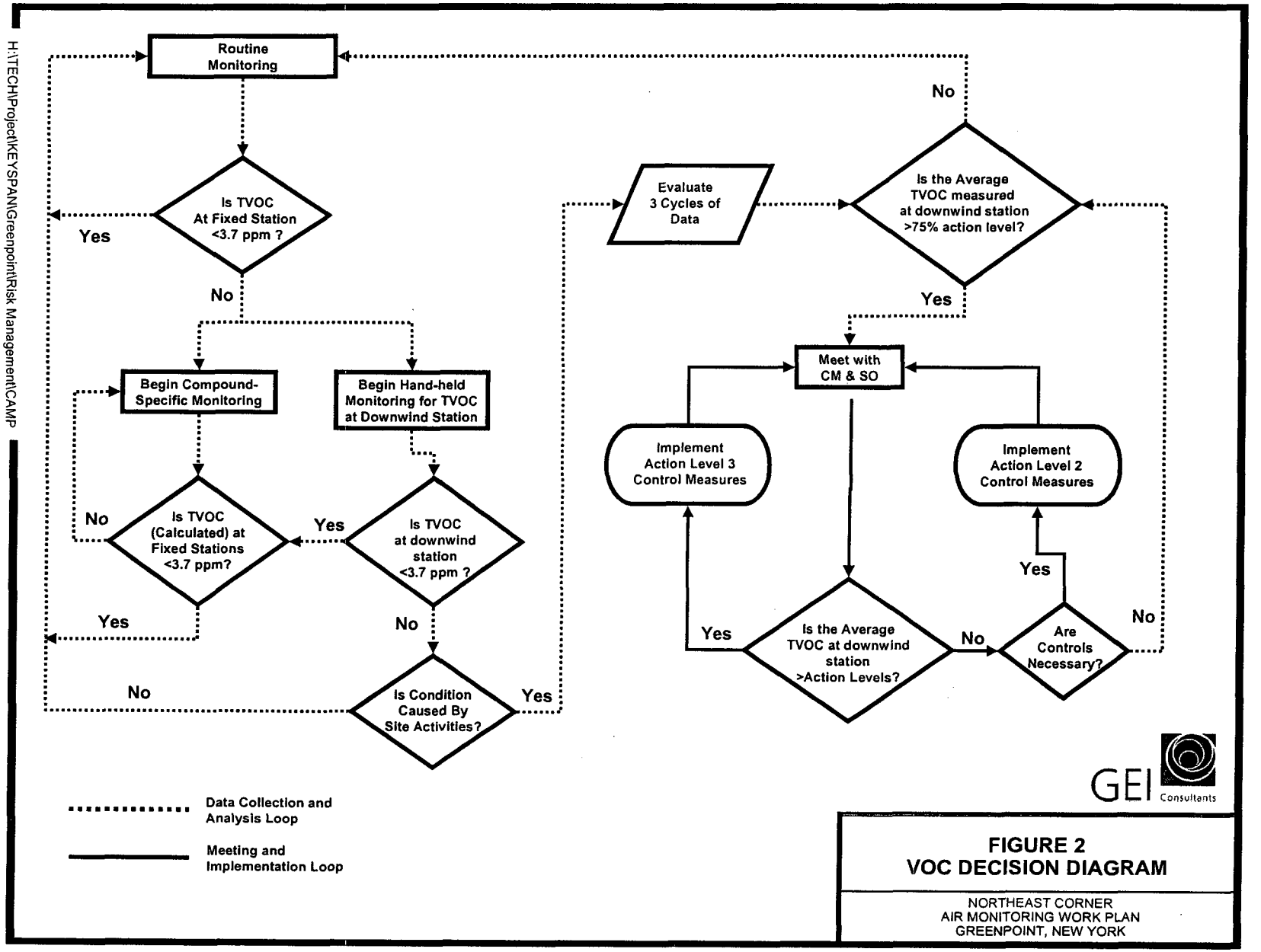

FIGURE 2
VOC DECISION DIAGRAM

NORTHEAST CORNER
AIR MONITORING WORK PLAN
GREENPOINT, NEW YORK

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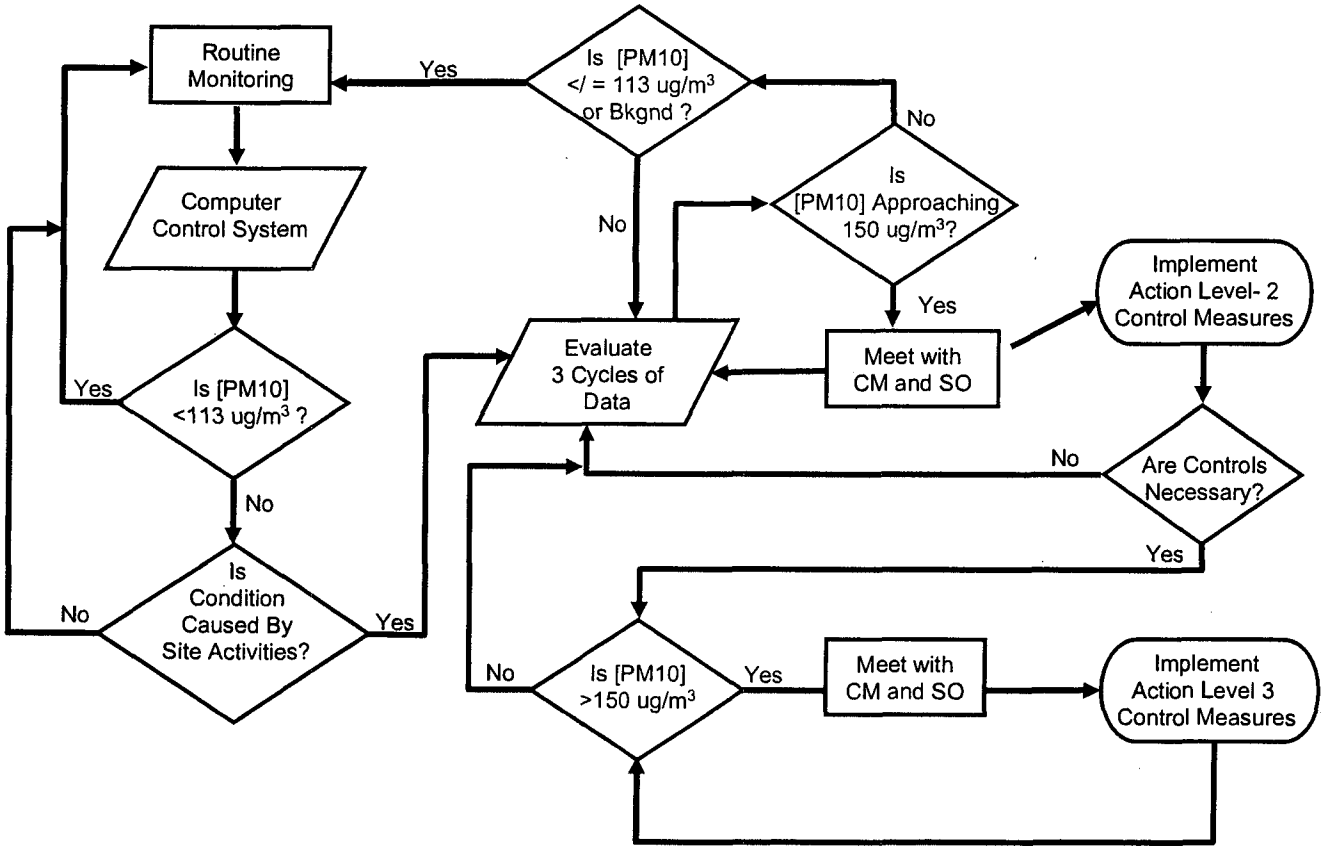

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FIGURE 3
RESPIRABLE PARTICULATE MATTER DECISION DIAGRAM

NORTHEAST CORNER
AIR MONITORING WORK PLAN
GREENPOINT, NEW YORK

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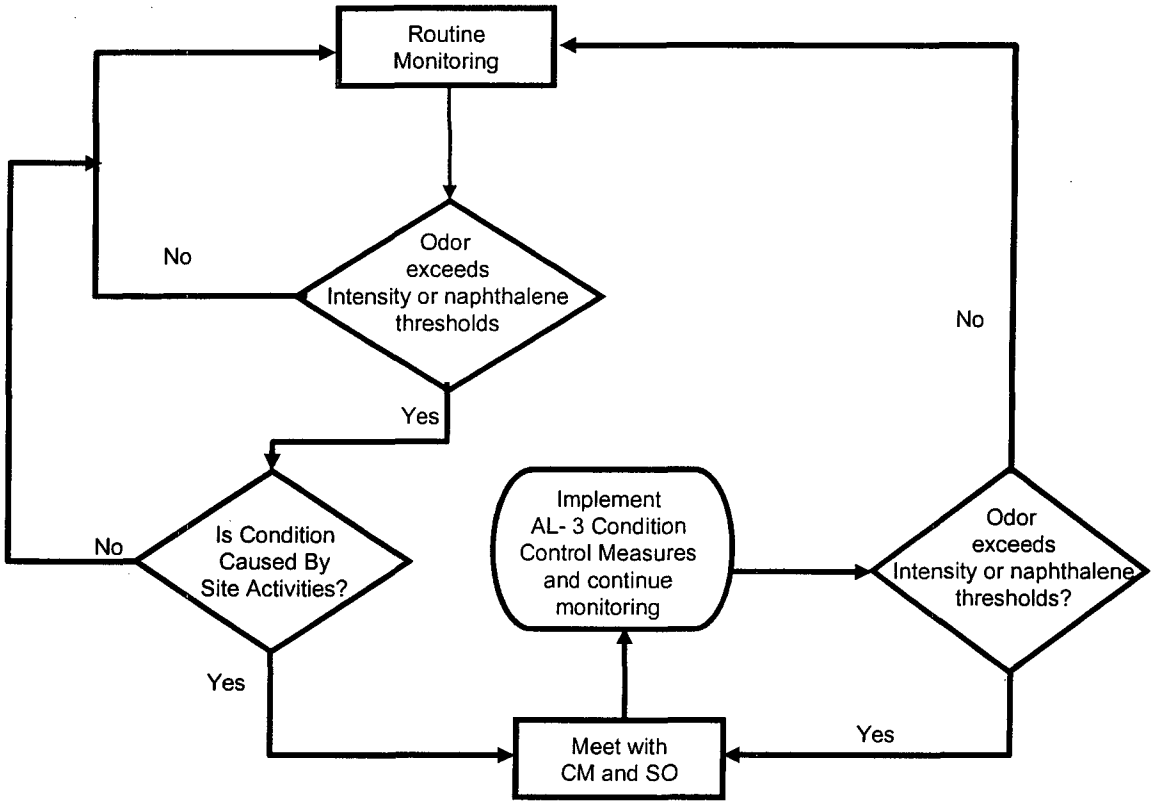

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FIGURE 4
ODOR DECISION DIAGRAM

NORTHEAST CORNER
AIR MONITORING WORK PLAN
GREENPOINT, NEW YORK