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Appendix C

Sampling and Analysis Plan
Operable Unit 3
Soil Gas Interim Remedial Measure

Former Grumman Settling Ponds,
Bethpage, New York
Site # 1-30-003A

February 8, 2008

Imagine the result

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Bethpage, New York
Site # 1-30-003A

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Tables

Attachments

1. Introduction

This Operable Unit 3 (OU3) Soil Gas Interim Remedial Measure (soil gas IRM) Sampling and Analysis Plan (SAP) was prepared by ARCADIS of New York, Inc. (ARCADIS) on behalf of Northrop Grumman Systems Corporation (Northrop Grumman), and is being submitted pursuant to the Order On Consent (Consent Order or CO) Index # W1-0018-04-01 that was executed by the New York State Department of Environmental Conservation (NYSDEC) and Northrop Grumman, effective July 4, 2005 (NYSDEC 2005). The Park, which was termed the "Former Grumman Settling Ponds" and designated as Operable Unit 3 (OU3) by the NYSDEC, and the Former Grumman Plant 24 Access Road are collectively referred to in this Report as the Site.

This SAP, which is Appendix C of the 95% Design Report (ARCADIS 2007a) and will be a component of the Operation, Maintenance and Monitoring (OM&M) Manual to be prepared in accordance with NYSDEC DER-10 guidance (NYSDEC 2002), presents the methodologies to be employed during sampling and analysis activities associated with various soil gas IRM monitoring requirements presented in the OM&M Manual. Specifically, the SAP identifies the procedures to be used to implement operational monitoring and system performance and compliance monitoring, (including startup sampling activities) for the soil gas IRM. The procedures and protocols described herein shall be conducted in accordance with the requirements set forth in the Quality Assurance Project Plan (ARCADIS 2006)(QAPP) along with the December 31, 2007 Addendum, provided as Attachments C-1.1 and C-1.2 to this SAP, and the site-specific Health and Safety Plan (ARCADIS 2005), incorporated herein by reference.

This report is organized into the following sections:

- Section 1 provides an introduction.
- Section 2 provides a description of the sampling and analysis activities.
- Section 3 provides quality assurance procedures.
- Section 4 describes the field decontamination procedures.
- Section 5 provides a description of the waste disposal procedures.
- Section 6 summarizes the reporting activities.

2. Sampling and Analysis Activities

This section identifies the sampling and analysis activities to be used during operation of the soil gas IRM. The analytical data collected during system operation will be utilized to (1) evaluate the effectiveness and efficiency of the soil gas IRM system, (2) evaluate compliance with discharge air and water quality requirements, and (3) evaluate the need for maintenance activities. A description of the sampling and analysis activities is provided below.

2.1 System Startup Sampling Activities

The first 28 days of full-time system operation will be used for system startup performance monitoring. During this time period, system startup performance testing will be conducted at a greater frequency relative to the long-term OM&M requirements of the system. Testing will be used to confirm the proper operation of the system with respect to the performance objectives (i.e., the objectives described in the Soil Gas IRM Work Plan [ARCADIS 2007b]) and compliance requirements (i.e., air discharge limitations [NYSDEC 2003]). Startup performance testing will include the recording of system operating parameters and the collection of vapor and water samples for laboratory and/or field analysis. The System Startup Plan (Attachment C-2) provides a summary of the proposed startup sampling schedule and the field logs that will be completed during system startup. A drawing showing the proposed sampling locations is provided in Drawing 3 of the 95% Design Report (ARCADIS 2007a).

2.2 System Operation, Maintenance, and Monitoring Sampling Activities

The system OM&M phase will begin immediately following the system startup/shakedown period referenced in Section 2 of the System Startup Plan (see Attachment C-2). The goals of system OM&M are:

- Operate and maintain the soil gas IRM in accordance with equipment manufacturer recommendations.
- Inspect and evaluate system data periodically to confirm that the system continues to be effective for protection of human health and the environment.
- Monitor and report performance of the soil gas IRM by:
    - Assessing compliance with the air permit equivalent limits.

  - Assessing achievement of the soil gas IRM design criteria; and,
  - Sampling and analysis of appropriate media.
- Inspect and evaluate site-wide data periodically to determine when operation of the soil gas IRM is no longer required for protection of human health and the environment.

The following subsections of this report identify the procedures to be used to implement performance (Subsection 2.2.1) and compliance (Subsection 2.2.2) monitoring associated with the soil gas IRM System. Performance and compliance monitoring includes air and/or water sampling and analysis activities.

2.2.1 System Performance Monitoring

This section identifies the procedures to be used to implement performance monitoring associated with the soil gas IRM System. Performance monitoring includes air sampling and analysis activities and operating parameter collection. As such, this section specifically summarizes the associated sampling locations and schedule to be used during operation of the soil gas IRM system. Sampling methodology is described in Section 2.3 of this report.

2.2.1.1 Operating Parameters

As referenced previously, the goal of the operational performance monitoring is to demonstrate that the soil gas IRM system is meeting the performance objectives (i.e., the objectives described in the Soil Gas IRM Work Plan [ARCADIS 2007b]) and compliance requirements (i.e., air discharge limitations [NYSDEC 2003]). A total of 47 vacuum monitoring wells (two of which will be used to monitor induced vacuum and perched water levels) and one groundwater monitoring well comprise the baseline well network for monitoring associated with the soil gas IRM system. In addition, the soil gas IRM system is equipped with numerous mechanical and electrical monitoring devices (i.e., vacuum gauges, pressure gauges, flow meters, sample ports, etc.) to allow observation and adjustment of system performance parameters to meet the design objectives in the most efficient manner. Drawing 3 of the 95% Design Report (ARCADIS 2007a) provides a summary of the available monitoring locations and their respective designations. To monitor and record these parameters, several forms have been prepared and provided in Attachment C-3 of this report. Table C-1 presents the schedule of the system long-term performance monitoring and testing.

Specifically, performance monitoring of operating parameters will include the following:

- The collection of induced vacuum readings and depth to water measurements from all applicable monitoring points (Attachment C-3.1).
- The collection of individual wellhead parameters from all monitoring points (Attachment C-3.2).
- The collection of general system operating parameters (Attachment C-3.3).

The frequency for collection and recording of system operating parameters specified in Attachment C-2 will be monthly for approximately three months and if deemed appropriate, a request will be submitted to NYSDEC to reduce the operating parameter collection frequency when the readings stabilize.

2.2.1.2 Vapor Sampling for Field and Laboratory Analysis

The goals of vapor sampling performance monitoring are to:

- Monitor influent vapor concentrations to evaluate if vapor treatment is necessary to reduce concentrations to below applicable discharge standards.
- Monitor influent vapor concentrations to document concentrations and general system operational performance over time.
- Monitor influent vapor concentrations to generate vapor phase carbon adsorption isotherms and estimate carbon usage rates; and,
- Monitor post-treatment vapor concentrations (if necessary) to determine when vapor phase carbon breakthrough occurs so that carbon changeouts can be scheduled accordingly.

The performance monitoring of system vapors will include:

- The collection of vapor performance samples for field analysis using a photoionization detector (PID) from individual depressurization wells (i.e., vapor sample ports VSP-101 through VSP-118), from the total effluent prior to treatment (i.e., VSP-601) and from the total effluent following treatment (i.e., VSP-602). Drawing 3 of the 95% Design Report (ARCADIS 2007a) provides location of the vapor sampling ports. Field analysis vapor performance samples from individual depressurization wells will be collected on a quarterly basis

- In general, vapor sample ports VSP-601 and VSP-602 will be used to monitor the total effluent (prior to treatment) and total effluent (following treatment) vapor streams, respectively. Vapor performance samples will be collected monthly and submitted for laboratory analysis for the first three months, and if deemed appropriate, a request will be submitted to the NYSDEC to reduce the sampling frequency (Table C-1) when concentrations are generally stable to decreasing. Frequency of collection of the total effluent sample prior to treatment may be increased or decreased based on site-specific variables. This will include sampling the total effluent prior to treatment to determine vapor treatment media quality.

- Finally, samples from individual depressurization wells for laboratory analysis may be collected as a contingent activity if troubleshooting of the soil gas IRM system is required.

2.2.2 System Compliance Monitoring

This section identifies the procedures to be used for system compliance monitoring associated with the soil gas IRM system. Compliance monitoring includes vapor and water sampling and analysis activities and operational parameter collection. As such, this section specifically summarizes the associated sampling locations and schedule to be used during operation of the soil gas IRM system.

2.2.2.1 Operating Parameters

The collection of induced vacuum measurements from induced vacuum monitoring wells will be conducted to demonstrate the generation of negative pressure within the entire target zone of the subsurface depressurization system. Table C-1 and Attachment C-3 list the collection frequency and project specific analyte list respectively. Parameter collection will be conducted on a monthly basis for the first three months, and if deemed appropriate, a request will be submitted to the NYSDEC to reduce the sampling frequency.

2.2.2.2 Vapor Sampling

The goal of the vapor sampling compliance monitoring is to monitor the total effluent vapor concentration. Initially, the vapor compliance sample will be collected after emission control unit (ECU), from sampling port VSP-602. Frequency of collection of the total effluent sample following treatment represents the minimum sampling frequency that will be provided when air treatment is provided. Samples will initially be collected on a monthly basis for three months. After the initial three month period, a request will be made to the NYSDEC to reduce the sampling frequency based on steady to decreasing concentrations. Once it has been demonstrated that the ECU is no longer required to reduce emissions to below their respective NYSDEC DAR-1 guidelines (NYSDEC 2003), a request will be made to eliminate the ECU for treatment of soil gas IRM related emissions. Accordingly, the total effluent compliance sample will be collected from sampling port VSP-601. The vapor sample locations associated with the soil gas IRM system are shown on Drawing 3 of the 95% Design Report (ARCADIS 2007a). Tables C-1 and C-2 list the sample collection frequency and project specific analyte list respectively.

2.2.2.3 Condensate Water Sampling

The goal of condensate water quality compliance monitoring is to document and ensure that the waste profile (i.e., concentrations of VOCs) characteristics of the condensate are consistent with prior data (i.e., existing pilot test and system startup analytical data). Water quality will be monitored at WSP-510, the effluent of the collected condensate water storage tank. A condensate water sample will be collected monthly for the first three months and upon review of sample analysis, a long term sampling frequency will be established. Sampling frequency may be increased depending on the laboratory analytical results collected during the system startup period. However, based on existing analytical data, ARCADIS experience at similar sites, the high air to water ratio within the system, and the relatively low vapor concentrations, it is anticipated that the concentration of VOCs will be trace to non-detect. The water sample location associated with the soil gas IRM system is shown on Drawing 3 of the 95% Design Report (ARCADIS, 2007a). Table C-1 and C-3 list the sample collection frequency and project specific analyte list, respectively.

2.3 Sampling Methodology

This section describes the sampling locations and the protocols for collecting vapor and water samples during operation of the soil gas IRM system. Drawing 3 from the

95% Design Report (ARCADIS, 2007a) depicts the sample port locations described below.

2.3.1 Air Sampling Methodology

Vapor sampling locations associated with the soil gas IRM system that will be used for performance and compliance monitoring include the individual depressurization wells with sample ports located on the manifold in Treatment Building 2 (designated as VSP-101 through VSP-118), the ECU influent sampling port (designated VSP-601, and also referred to as vapor phase granular activated carbon (VPGAC) effluent (prior to treatment) in the 95% Design Report), and the ECU effluent sampling port (designated VSP-602).

Before the collection of each round of vapor samples, appropriate pre-cleaned sample containers will be provided by the laboratory in accordance with procedures and requirements described in the QAPP (Attachment C-1.1, Section 4.2 – Preparation and Preservation of Sample Containers), as applicable. The sample containers provided by the laboratory for vapor sampling will either be one-liter Tedlar bags or six-liter Summa canisters. The sample containers will be inventoried and inspected to make sure all the required containers are present and in good condition. Throughout the sample collection and handling process, the sampling technician will wear new disposable surgical gloves for each location sampled.

To collect a vapor sample from the desired sample location, the appropriate container (either one-liter Tedlar bag or one, six-liter Summa canister) will be filled from the sample port. Heavy walled disposable Teflon tubing will be used to connect the sample container, the sampling vacuum pump (as applicable), and the sample port. If a Tedlar bag is used, it will be filled completely based on visual observations. If a Summa canister is used, the laboratory will provide the canister under vacuum. The Summa canister will be filled completely until the canister has a vacuum of 5 inches of mercury.

Depending on the actual location of the individual vapor sample port, as well as the actual sample container used, the sample may be collected using a sampling vacuum pump. Sample collection under negative pressure may require the use of a sampling vacuum pump to provide positive pressure in order draw the vapor sample into the sample container. Logistical considerations (i.e., sample collection time) for stack sampling may warrant the use of a dedicated sampling vacuum pump at the ECU effluent sampling port (VSP-602) if a Tedlar bag is utilized, even though VSP-602 is under atmospheric, or positive, pressure. As mentioned previously, the Summa canister, if used, will be under vacuum. Therefore, a sampling vacuum pump will not be needed to collected vapor samples during short-term and long-term operation from ECU sample ports if Summa canisters are utilized.

All samples (including quality control checks and quality assurance auditing processes (QA/QC) samples specified in the attached QAPP) will be properly labeled and identified, and information on the Field Sampling Log and chain-of-custody form will be completed. The system pressure and temperature at the location and time of sample collection will also be recorded on the Field Sampling Log. The attached QAPP provides additional details regarding Field Records and QA/QC samples, frequency and protocols (Section 4.1 – Field QA/QC), sample labeling (Section 4.2 – Preparation and Preservation of Sample Containers), and sample custody (Section 4.4 – Sample Custody). All sample containers will be checked for proper identification/labeling and compared to the chain-of-custody form for accuracy prior to packaging any sample for shipment. The chain-of-custody form will be placed in a sealed plastic bag and accompany sample containers. The samples may then be wrapped with a cushioning material, as needed, to preclude damage during shipment and placed in a package. The vapor samples will remain at ambient temperature throughout transport until arrival at the laboratory. When the package is ready, it will be sealed with packing tape, and custody seals will be placed in such a manner that any opening of the package prior to arrival at the laboratory can be detected.

Samples will be delivered by overnight carrier to the analytical laboratory following sample custody requirements specified in the attached QAPP. The laboratory will be prepared to receive the samples and perform preliminary extractions or analyses within the analytical method recommended holding times. During the start-up period, compliance vapor samples will be submitted to the laboratory for 24-hour turnaround of analytical results. All vapor samples will be submitted a NYSDOH-approved laboratory for analysis for VOCs (including Freon 113) by USEPA Method TO-15 (modified list including tentatively identified compound, Freon 22), as further described in the QAPP (Attachment C-1.1 and C-1.2). The list of compounds to be analyzed for is included as Table C-2.

2.3.2 Water Sampling Methodology

Before the collection of each condensate water sample, appropriate pre-cleaned sample containers (bottles) will be provided by the laboratory in accordance with procedures and requirements described in the QAPP (Attachment C-1.1). The sample bottles will be inventoried and inspected to make sure all the required bottles are present, unbroken, and have been adequately prepared by the laboratory (i.e., sample preservation requirements, as applicable). Throughout the sample collection and handling process, the sampling technician will wear new disposable surgical gloves.

All condensate water samples will be collected from the storage tank sampling port, WSP-510, into laboratory supplied sample bottles. Special care will be taken in filling and capping the Volatile Organic Analysis (VOA) vials, so that no headspace or air bubbles are present in the condensate water samples collected for VOC analysis. In addition, overflowing bottles will be avoided to prevent the loss of floating substances or preservatives that may have already been added to the bottle. All sample bottle caps will be secured snugly, but not over-tightened.

All samples (including QA/QC samples specified in the QAPP) will be properly labeled and identified. The QAPP provides additional details regarding Field Records and QA/QC samples, frequency and protocols (Section 4.1 – Field QA/QC), sample labeling (Section 4.2 – Preparation and Preservation of Sample Containers), and sample custody (Section 4. System Startup Plan 4 – Sample Custody). All sample containers will be checked for proper identification/labeling and compared to the chain-of-custody form for accuracy prior to packaging any sample for shipment. The chain-of-custody form will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The samples may then be wrapped with a cushioning material, as needed, to preclude breakage during shipment and placed in a cooler. Sufficient amounts of bagged ice or ice packs will be placed in the cooler to keep the samples at 4 degrees Celsius until arrival at the laboratory. When the cooler is ready, it will be sealed with packing tape, and custody seals will be placed in such a manner that any opening of the cooler prior to arrival at the laboratory can be detected.

Samples will be delivered by overnight carrier to the analytical laboratory following sample custody requirements specified in the QAPP. The laboratory will be prepared to receive the samples and perform preliminary extractions or analyses within the analytical method recommended holding times. All condensate water samples (including QA/QC samples) will be analyzed for VOCs, plus Freon 113 (trichlorotrifluoromethane) using USEPA Method 8260 as described in the QAPP Addendum (Attachment C-1.2) and Columbia Analytical Services Inc. Quality Assurance Manual (CAS 2006). The condensate sampling analyte list is presented in Table C-3.

2.3.3 Operating Parameter Collection Methodology

Induced vacuum measurements will be collected from the vapor monitoring well network using the following procedures. Induced vacuum measurements will be collected by measuring the vacuum at each well listed in Attachment C-3.1. The induced vacuum measurements will be made to the nearest hundredth with a digital manometer or Magnehelic type mechanical manometer. Various gauge calibration ranges will be available and the most appropriate manometer range will be used at each individual monitoring point to ensure an accurate reading. All gauges will be calibrated/zeroed prior to use, as appropriate. Induced vacuum measurements and other pertinent information (i.e., Barometric Pressure) will be recorded as outlined in Attachment C-3 System Long-Term Monitoring and Parameter Forms. Ultimately, baseline induced vacuum measurements collected prior to startup will be compared to the induced vacuum measurements to demonstrate that negative pressure is being maintained within the targeted capture zone.

3. Quality Assurance Procedures

Quality assurance procedures will implemented to ensure that data produced as a result of sampling and monitoring include the condensate water and the vapor samples and analytical results is of highest quality. The QAPP, Attachments C-1.1 and C-1.2, provides a summary of the quality assurance procedures and the QA/QC protocols related to field sampling and analysis activities that will be completed during system operation.

4. Field Decontamination Procedures

Proper decontamination of non-dedicated field equipment associated with sampling activities will ensure that the data collected in support of the sampling and analysis activities for the soil gas IRM System will meet the precision, accuracy, representativeness, completeness and comparability (PARCC) requirements, as presented in the QAPP.

5. Waste Disposal

All condensate water generated during system operation will be containerized in drums, carboys, or other suitable containers for eventual disposal. Each container shall be properly labeled and staged in a designated secure area(s) on McKay Field. Containerized water will be disposed of at the predetermined and pre-approved discharge point, on Northrop Grumman Property, which ultimately terminates at the local publicly owned treatment works (POTW). Condensate water will be sampled as described in Section 2.2.2 and its subsections of this SAP to comply with applicable POTW requirements. A copy of the conditional approval for discharge to the local POTW is provided in Attachment C-4.

6. Record Keeping and Reporting

Records documenting the operation and maintenance of the soil gas IRM System will be maintained. Electronic and system inspection and maintenance logs will be retained a minimum of 10 years after data collection and submission of logs.

Interim System operation maintenance and monitoring reports summarizing the system operation and performance and monitoring sampling will be prepared monthly for three months. Similar to the parameter collection and sampling frequency, a request will be submitted to the NYSDEC to reduce the reporting frequency from monthly based on the results of the first three months. In addition, an annual report summarizing data with comments and conclusions will be submitted (NYSDEC 2002).

In addition, for the first three months, a monthly letter report summarizing the condensate water quality and volume will be submitted to the POTW. Reporting frequency may change based on volumes generated, review of first three months of sampling data and POTW requirements.

7. References

ARCADIS of New York, Inc. 2007a. 95% Design Report, Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A. September 7, 2007.

ARCADIS of New York, Inc. 2007b. Operable Unit 3 – Soil Gas Interim Remedial Measure Work Plan, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A February 16, 2007.

ARCADIS G&M, Inc. 2006. Quality Assurance Project Plan, Former Grumman Settling Ponds (Operable Unit 3 -- Bethpage Community Park), Bethpage, New York. NYSDEC Site # 1-30-003A. Revised: March 8, 2006.

ARCADIS G&M, Inc. 2005. Northrop Grumman Systems Corporation, Health and Safety Plan, Bethpage, New York. August 15, 2005.

Columbia Analytical Services Inc. Quality Assurance Manual, Revision Number 15, Revision Date: March 29, 2006.

New York State Department of Environmental Conservation, 2005, Order on Consent Index #WI-0018-04-01, Site # 1-30-003A, July 4, 2005.

New York State Department of Environmental Conservation, AGC/SGC Tables December 2003, Division of Air Resources-1 (DAR-1) Guidelines for the Control of Toxic Ambient Air Contaminants, December 22, 2003.

New York State Department of Environmental Conservation (NYSDEC), December 2002, Draft DER-10 Technical Guidance for Site Investigation and Remediation.

Table C-1. System Long-Term Performance Monitoring and Testing Schedule, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Sample Location/Description	Parameter/Measurement	Frequency
	Parameters for Field Analysis [1]	
Field Parameters		
Induced Vacuum and Water Level Readings	All Parameters Listed on Attachment C-3.1	Monthly
Individual Wellhead Operating Parameters	All Parameters Listed on Attachment C-3.2	Monthly
General System Operating Parameters	All Parameters Listed on Attachment C-3.3	Monthly
Vapor Samples		
Individual Depressurization Wells		
VSP-101 Through VSP-118	Photoionization Detector	Quarterly
Total Effluent Prior to Treatment[3]		
VSP-601	Photoionization Detector	Monthly
Total Effluent Following Treatment[4]		
VSP-602	Photoionization Detector	Monthly
	Samples for Laboratory Analysis	
Vapor Samples		
Total Effluent Prior to Treatment[3]		
VSP-601	VOCs (USEPA Method TO-15+)[5]	Monthly
Total Effluent Following Treatment[4,6]		
VSP-602	VOCs (USEPA Method TO-15+)[5]	Monthly
Condensate Water Samples		
Water Storage Tank Effluent[7]		
WSP-501	VOCs(USEPA Method 8260)	Monthy[8]

Notes on next page.

Table C-1. System Long-Term Performance Monitoring and Testing Schedule, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Notes:

1. All parameters for field analysis will be measured using dedicated system mechanical gauges, handheld portable field gauges, and a portable photoionization detector (PID). All portable field equipment shall be calibrated prior to use.
2. Parameters or samples to be collected monthly for the first 3 months, and if deemed to be appropriate a request will be submitted to the NYSDEC to reduce the sampling frequency.
3. Frequency of total effluent sampling prior to treatment may be increased or decreased based on site-specific variables. Example variables include whether or not vapor treatment is necessary to reduce emissions to below NYSDEC DAR-1 guidance values, reaching asymptotic conditions, and/or a change in system operational parameters or configuration. Any proposed changes will be provided to the NYSDEC for approval prior to implementation.
4. Frequency of total effluent compliance sampling following treatment represents the minimum sampling frequency that will be provided when air treatment is required.
   Additional performance samples will be collected, as necessary, to monitor breakthrough of the vapor phase carbon.
5. All vapor samples to submitted for laboratory analysis using USEPA Method TO-15 with a project modified analyte list plus the top 15 tentatively identified compounds (TICs) including the TIC Freon 22. Complete analyte list is provided in Table C-2 of the Sampling and Analysis Plan.
6. Routine total effluent compliance samples will be submitted to the laboratory with a standard 2-week turnaround time. Performance total effluent samples (e.g., vapor phase carbon breakthrough monitoring) will be submitted with a rush turnaround time, if necessary, to obtain results promptly for decision-making.
7. Condensate water samples will be collected on an annual basis to confirm that the waste profile of the condensate water is consistent with prior data. Complete analyte list is provided in Table C-3 of the Sampling and Analysis Plan. Sampling frequency may be increased depending on the laboratory analytical results collected during the system startup period and/or local treatment work requirements.
8. As required by a letter to Northrop Grumman from Nassau County Department of Public Works, dated October 23, 2007, a condensate water sample will be collected monthly for the first three months and upon review of sample analysis, a long term sampling frequency will be established by the publicly owned treatment works.

Table C-2. System Performance and Compliance Vapor Sampling Analyte List, Northrop Grumman, Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Analyte	CAS No.
Acetone	67-64-1
Benzene	71-43-2
Bromodichloromethane	75-27-4
Bromoform (Tribromomethane)	75-25-2
Bromomethane (Methyl bromide)	74-83-9
1,3-Butadiene	106-99-0
2-Butanone(MEK)	78-93-3
Methyl tert-Butyl Ether	1634-04-4
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chloroethane	75-00-3
Chloroform	67-66-3
Chloromethane (Methyl chloride)	74-87-3
Dichlordifluoromenthane (Freon 12)	75-71-8
Dibromochloromethane (CDBM)	124-48-1
1,1-Dichloroethane	75-34-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethene	75-35-4
trans-1,2-Dichloroethene	156-60-5
cis-1,2-Dichloroethene	156-59-2
1,2-Dichloropropane	78-87-5
cis-1,3-Dichloropropene	10061-01-5
trans-1,3-Dichloropropene	10061-02-6
Ethylbenzene	100-41-4
2-Hexanone (Methyl n-Butyl Ketone)	591-78-6
Methylene chloride (Dichloromethane)	75-09-2
4-Methyl-2-pentanone (MIBK)	108-10-1
Styrene	100-42-5
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethene	127-18-4
Toluene (Methylbenzene)	108-88-3
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethene	79-01-6
Trichlorofluoromethane (Freon 11)	75-69-4
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	76-13-1
Vinyl chloride	75-01-4
o-Xylene	95-47-6
m&p-Xylenes	NA

CAS No. - Chemical Abstracts Service list Number.

Note:

1. Analytical Method TO-15 with Project Modified Analyte List plus top 15 tentatively identified compounds (TICs) including the TIC Freon 22.

Table C-3. System Compliance Condensate Sampling Analyte List, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Analyte	CAS No.
Acetone	67-64-1
Benzene	71-43-2
Bromodichloromethane	75-27-4
Bromoform (Tribromomethane)	75-25-2
Bromomethane (Methyl bromide)	74-83-9
2-Butanone (MEK)	78-93-3
Carbon Disulfide	75-15-0
Carbon Tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chlorodifluoromethane (Freon 22)	75-45-6
Chloroethane	75-00-3
Chloroform	67-66-3
Chloromethane (Methyl chloride)	74-87-3
Dibromochloromethane (CDBM)	124-48-1
Dichlorodifluoromethane (Freon 12)	75-71-8
1,1-Dichloroethane	75-34-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethene	75-35-4
trans-1,2-Dichloroethene	156-60-5
cis-1,2-Dichloroethene	156-59-2
1,2-Dichloropropane	78-87-5
trans-1,3-Dichloropropene	10061-02-6
cis-1,3-Dichloropropene	10061-01-5
Ethylbenzene	100-41-4
2 - Hexanone (Methyl n-Butyl Ketone)	591-78-6
Methylene Chloride (Dichloromethane)	75-09-2
4-Methyl-2-Pentanone (MIBK)	108-10-1
Styrene	100-42-5
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethene	127-18-4
Toluene (Methylbenzene)	108-88-3
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethene	79-01-6
1,1,2-Trichloro-1,2,2-Trifluoroeth (Freon 113)	76-13-1
Vinyl Chloride	75-01-4
o-Xylene	95-47-6
m+p-Xylene	NA

CAS No. - Chemical Abstracts Service list Number.

Note:

1. Analytical Method USEPA 8260

ARCADIS

Attachment C-1.1

Quality Assurance Project Plan

ARCADIS
Infrastructure, environment, facilities

Appendix B

Quality Assurance Project Plan

Former Grumman Settling Ponds (Operable Unit 3 – Bethpage Community Park), Bethpage, New York.
NYSDEC Site # 1-30-003A

Revised: March 8, 2006

Imagine the result

ARCADIS

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Appendix B
Quality Assurance Project Plan, Former Grumman Settling Ponds (Operable Unit 3 – Bethpage Community Park), Bethpage, New York

NYSDEC Site # 1-30-003A.
Revised: March 8, 2006

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8 March 2006

Table of Contents

Tables

Attachments

1. Introduction

This Quality Assurance Project Plan (QAPP) has been prepared by ARCADIS with input from Dvirka & Bartilucci Consulting Engineers (D&B) on behalf of Northrop Grumman Systems Corporation (NGSC), as a component of the Remedial Investigation (RI)/Feasibility Study (FS) Work Plan for the Former Grumman Settling Ponds site (Operable Unit 3 – Bethpage Community Park) in Bethpage, New York (NYSDEC Sites Number 1-30-003A) to address specific quality control (QC) checks and quality assurance (QA) auditing processes.

The overall QAPP objective is to ensure that data produced as a result of the various sampling and monitoring, including soil, groundwater, and soil gas is of the highest quality. This QAPP has been prepared in accordance with the United States Environmental Protection Agency (USEPA) guidance, "Guidance for Quality Assurance Project Plans," (USEPA 2002), The New York State Department of Environmental Conservation (NYSDEC) Draft DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC 2002), and considering requirements of the July 4, 2005 Operable Unit 3 Order on Consent (NYSDEC 2005). This QAPP presents project organization and responsibilities, and QA/QC protocols related to field sampling and analysis activities associated with various sampling and monitoring requirements. The procedures in this QAPP will be implemented to ensure that precision, accuracy, representativeness, completeness, and comparability (PARCC parameters) of the data can be documented, as applicable.

This QAPP is part of the Sampling and Analysis Plan (SAP) which is the umbrella document that consists of Appendices A through D of the RI/FS Work Plan. The SAP includes the following required elements:

- The FSP (Appendix A) defines sampling and data gathering methods consistent with NYSDEC DER-10 and the "Field Methods Compendium," OSWER Directive 9285.2-11 (draft June 1993).
- This QAPP (Appendix B) describes the quality assurance and quality control protocols necessary to achieve the initial data quality objectives.
- The HASP (Appendix C) protects persons at and near the site during performance of the RI/FS (in accordance with 29 CFR 1910).

- The CPP (Appendix D) was developed in accordance with New York Environmental Conservation Law, hazardous waste site regulations (6 NYCRR Part 375) and Citizens Participation in New York's Hazardous Waste Site Remediation Program: A Guidebook (NYSDEC1998).

In addition to the above, the components of the SAP are also consistent with the requirements of NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC 2002). Various cross-references to other portions of the SAP are included, as appropriate in the following Sections.

2. Site Description and Background

The Former Grumman Settling Ponds Site (Operable Unit 3 – Bethpage Community Park) is located on Stewart Avenue in Bethpage, Nassau County, New York and is situated adjacent to the northeastern portion of the NGSC Bethpage Facility site. The Park property was donated by NGSC to the Town of Oyster Bay in 1962. Soon afterwards, the current park structures were constructed by the Town, without Grumman involvement. Former activities are described in the December 2003 report prepared by Dvirka & Bartilucci (Dvirka & Bartilucci, 2003). The Park is approximately 18 acres in size and is currently owned by the Town of Oyster Bay and operated as the Bethpage Community Park (Park). The Park is bordered by the Cherry Avenue Extension and a Robert Plan Company building to the north, Stewart Avenue to the east, the NGSC Plant 24 access road to the south, and another Robert Plan Company building (former NGSC Plant 24) and the McKay Field property (owned by NGSC) to the west. The north campus of the NGSC property and the Naval Weapons Industrial Plant (NWIRP) sites are located west of the Site. The Former Occidental Chemical Corporation (OCC) RUCO Polymer Corporation (RUCO) site is located further west (RI/FS Work Plan Figure 1).

Activities planned for OU3 consist of the RI of groundwater, soil, and soil gas contaminants of potential concern (COPCs), at and near the former Grumman Settling Ponds Site, planning and preparation for evaluation of Interim Remedial Measure (IRM) remedial technologies. The following techniques will be used to collect data to determine the nature and extent of groundwater, soil, and soil gas impacts associated with former site operations, as well as to obtain preliminary information toward design of a potential IRM.

- Soil borings and soil sampling,
- Geophysical surveys,

- Test Pits and soil sampling (if needed),
- Soil gas and ambient air sampling,
- Temporary wells groundwater sampling,
- Hydropunch groundwater sampling,
- Permanent well groundwater sampling, and
- Piezometers perched water sampling.

In addition to the above, cone penetrometer testing (CPT)/membrane interface probe (MIP) methodologies may also be used, depending on field conditions.

3. Project Organization and Responsibilities

The responsibilities of the key project personnel are detailed below.

- The Project Director is responsible for overseeing the implementation of the project tasks. The Project Director will review all documents and other correspondence concerning the activities performed pursuant to the NYSDEC Superfund project (i.e., all activities associated with Operable Unit 3). The Project Director is also responsible for the overall QA including technical adequacy of the project activities and reports and conformance to the scope of work.

- The Project Manager is responsible for the following: overall project coordination; adherence to the project schedules; directing, reviewing, and assessing the adequacy of the performance of the Task Managers assigned to the project; implementing corrective action, if warranted; interacting with the Project Director; reviewing reports; and maintaining full and orderly project documentation.

- Task Manager(s) is responsible for the following: field activity QA/QC; task coordination; adherence to the project schedules; directing, reviewing, and assessing the adequacy of the performance of the technical staff and subcontractors assigned to the project; if warranted; interacting with the Project Manager; preparing reports; and maintaining full and orderly project documentation.

- The project team members include the task managers, field hydrogeologists, sampling team/field technicians, engineers, risk assessors, support staff (e.g., data processors, secretaries, and in-house experts in engineering, etc.) who are qualified to oversee/perform the Work, as appropriate, and will be responsible for work in their respective specialty areas. Project team members will be on-site to supervise all activities specified in this Work Plan.

- The Project QA/QC Officer is responsible for performing systems auditing and for providing independent data quality review of project documents and reports.
- The Site Health and Safety Officer is responsible for implementing the site-specific health and safety directives in the Health and Safety Plan (HASP – see RI/FS Work Plan Appendix C) and for contingency response.
- The Data Validator is responsible for review of laboratory data for compliance with the QA objectives for the PARCC parameters (i.e., precision, accuracy, reproducibility, comparativeness, and completeness), and notifications to the project manager of any QC deficiencies.

4. Quality Assurance/Quality Control – Field Sampling and Analysis Activities

The overall QA objective for this aspect of the project is to develop and implement procedures for field measurements, sampling, and analytical testing that will provide data of known quality that is consistent with the intended use of the information. Generally, the specific field sampling and analysis activities to be conducted during this project which require QA/QC protocols include OU3 RI soil and groundwater sampling (i.e., soil sampling, temporary and permanent well groundwater sampling, perched water sampling, and liquid and solid waste characterization sampling), and soil gas and ambient air sampling.

Quality assurance/quality control (QA/QC) protocols will be used to ensure the PARCC parameters of data collected during these field activities meets the objectives of the overall project. Specifically, data will be gathered or developed using procedures appropriate for the intended use of the data. The field measurements and laboratory analyses will be used to support one or more steps in the monitoring described above.

The QA/QC protocols for this aspect of the project will include laboratory analysis and validation procedures, field decontamination procedures, calibration and maintenance of field instruments, tracer gas analysis, and QA/QC sampling procedures. The following sections outline the QA/QC protocols for each of these issues.

4.1 Field QA/QC

To ensure that data collected in the field is consistent, accurate and complete, forms will be utilized for repetitive data collection, such as depth to water in wells, groundwater sampling etc. These field forms include a Soil Sample/Core Log; Vertical Profile Boring Groundwater Screening Form; Test Pit Log Form; Monitoring Well Construction Log; Daily Log; Water-Level Measurement Log; a Water Sampling Log, and Soil Gas Sampling Logs, as applicable to a specific field task. Forms are provided in Attachment B-1.

QA/QC samples will be collected to assure quality control of soil and groundwater samples. Analyses of QA/QC samples will enable data evaluation for accuracy and integrity. A QA/QC sample set includes one or more of the following: field (equipment rinsate) blank, trip blank, blind (field) duplicate, and site-specific matrix spike/matrix spike duplicate (MS/MSD), as applicable. The QA/QC sample set will vary depending on the objective of the collected sample as well as the parameter or group of parameters specified for analysis. A summary of the QA/QC samples is provided in Table B-1. In general, blanks and duplicate samples will be used to verify the quality of the sampling results. Demonstrated analyte-free water will be supplied by the laboratory for the preparation of equipment and trip blank QA/QC samples; documentation for the analysis of QA/QC blank water will be provided if contamination is detected in the blanks. A brief description of these QA/QC samples follows.

4.1.1 Field (Equipment Rinsate) Blank

A field (equipment rinsate) blank is a water sample that consists of laboratory-supplied analyte-free water that is poured through or over a decontaminated segment of sampling or other down-hole equipment to assess or document the thoroughness of the decontamination process. A rinsate blank will be collected from the decontaminated down-hole equipment by pouring analyte-free water over the equipment and into sample containers before using the equipment in sampling. Field blanks will be collected as specified in Table B-1. These QA/QC samples will only be collected in connection with the collection of aqueous-phase and soil samples and submitted for the appropriate chemical analysis (see Table B-1).

4.1.2 Trip Blank

A trip blank will contain laboratory supplied analyte-free water and will be transported to the site and returned to the laboratory without opening. This will serve as a check for contamination originating from sample transport, shipping, and from site conditions. One trip blank per day per sampling team will be utilized during groundwater sampling. The maximum number of samples per trip blank is 20. These QA/QC samples will only be collected in connection with the collection of aqueous samples (associated with groundwater sampling) for VOC analysis and submitted for the appropriate chemical analysis (see Table B-1).

4.1.3 Blind (Field) Duplicate

The relative difference in analytical results between samples and their blind duplicates will be used to determine if the data reported by the laboratory meet PARCC requirements. The blind duplicate samples will be assigned fictitious identifications; the correct sample identification number will be recorded on the water sampling log. One blind duplicate sample per 20 groundwater samples will be collected during groundwater sampling activities. These QA/QC samples will be collected in connection with the collection of aqueous and soil gas samples (associated with groundwater sampling) and submitted for the appropriate chemical analysis (see Table B-1). These QA/QC samples will also be collected in connection with the collection of and submitted for the appropriate chemical analysis (see Table B-1).

4.1.4 MS/MSD Sample

Site-specific MS and MSD samples will be collected and submitted to the laboratory as separate samples to provide site-specific matrix-interference data. Upon arrival at the laboratory, the MS/MSD samples will be spiked with appropriate analytes and analyzed by the appropriate method. The purpose of spiking and analyzing the samples is to evaluate any site-specific matrix interference on the analytical results. One MS/MSD sample set will be collected for every 20 samples collected during groundwater and soil sampling activities. These QA/QC samples will only be collected in connection with the collection of aqueous and soil samples for VOC analysis and submitted for the appropriate chemical analysis (see Table B-1).

4.1.5 Field Records

Proper documentation will consist of all field personnel maintaining records of all work accomplished including the items listed below (in addition to the information required on the forms provided in Attachment B-1):

- Date and time of work events;
- Purpose of work;
- Description of methods;
- Description of samples;
- Number and size of samples;
- Description of sampling point;
- Date and time of collection of sample;
- Measurement or Sample collector's first initial and last name;
- Field observations; and
- Field measurements with portable instruments.

In addition, for soil gas sampling, the following information will be collected:

- Sample depth;
- Soil gas purge volumes;
- Volume of soil gas extracted;
- Vacuum of canisters before and after samples collected; and
- Apparent moisture content of the sampling zone

All information pertinent to field sampling activities will be recorded on the logs provided in Attachment B-1. Duplicates of field notes/forms will be prepared and kept in a secure place away from the Site.

4.2 Preparation and Preservation of Sample Containers

Laboratory pre-cleaned sample containers will be provided by the laboratory. Each sample container will be provided with a label for sample identification purposes. The information on the label will include a sample identification number, time, date and initials of the sample collector. All sample containers will be accompanied by a full chain-of-custody (see Attachment B-2).

Sample containers will be thoroughly cleaned at the laboratory prior to sampling and as appropriate, sample preservatives will be added to the bottles, prior to sample bottle shipment to the client. It is laboratory practice to preserve sample containers to minimize potential contaminants in the field and to reduce unnecessary sample handling in the field (see laboratory Quality Assurance Plans in Attachment B-3 for additional information). Table B-2 provides a summary of sample analytical methods, sample containers, holding times and preservation procedures to be used.

4.3 Decontamination

Proper decontamination of all sampling equipment will help ensure that the data collected will meet the PARCC requirements. Field decontamination procedures are provided in the FSP, Section 8.

4.4 Sample Custody

To maintain and document sample possession, chain-of-custody procedures will be followed. A chain-of-custody form contains the signatures of individuals who have possession of the samples after collection in the field; the chain-of-custody form is provided in Attachment B-2.

A sample is under custody if it is:

1. In one's actual possession; or

2. In one's view, after being in your physical possession; or

3. Was in one's physical possession and then was locked up or sealed to prevent tampering; or

4. It is in a designated secure place restricted to authorized personnel.

Each person involved with the samples will know chain-of-custody procedures. A detailed discussion of the stages of possession (i.e., field collection, transfer, and laboratory custody) is presented below in the following sections.

4.4.1 Environmental Samples Chain-of-Custody

The laboratory begins the chain-of-custody procedure with the preparation of the sample bottles. The field sampler continues the chain-of-custody procedure in the field and is the first to sign the form upon collection of samples. The field sampler is personally responsible for the care and custody of the samples until they are transferred and properly dispatched. Each sample will have sample labels completed (using waterproof ink), have proper preservation, and be packaged to preclude breakage during shipment. Every sample will be assigned a unique identification number that is entered on the chain-of-custody form. Samples can be grouped for shipment using a single form.

4.4.2 Transfer of Custody and Shipments

All samples will be accompanied by a chain-of-custody record. When transferring the possession of samples, the individual(s) relinquishing and receiving will sign, date, and note the time of transfer on the chain-of-custody form. This record documents transfer of custody of samples from the sampler to another person to the analytical laboratory.

Samples will be properly packed for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in each sample cooler. All chemical analytical samples will be delivered to the laboratory within 48 hours of collection or earlier, as needed, to meet analyte holding times.

Whenever samples are split with a facility or government agency, a separate chain-of-custody record will be prepared for those samples and marked to indicate with whom the samples were split.

4.4.3 Laboratory Sample Custody

The laboratory utilized for chemical analysis will have standard operating procedures for documenting receipt and tracking of samples and compilation of sample data. Sample custody, related to sampling procedures and sample transfer, is described below:

(1) Shipping or pickup of cooler by sampling personnel.

(2) Cooler packed at the laboratory after contact with sampling personnel.

(3) Cooler wrapped with evidence tape.

4.4.4 Field Chain of Custody

(1) Chain-of-Custody form filled out by field sampling personnel.

(2) Field sampling personnel supply evidence tape and seal cooler prior to shipment back to the laboratory.

4.4.5 Laboratory Sample Custody

(1) Samplers check for any external damage (such as leaking).

(2) Samplers sign the waybill for sending cooler to the laboratory.

(3) The laboratory receives cooler and completes chain of custody.

The samples will be stored at the proper temperature prior to analysis. It is the responsibility of the laboratory to properly dispose of samples beyond the holding period.

4.5 Laboratory Analyses

All soil, soil gas/air and groundwater samples will be analyzed by a NYSDOH-approved laboratory.

Soil samples will be analyzed by a NYSDOH-approved laboratory. Soil samples will be selectively analyzed for TCL VOCs, SVOCs, cadmium (Cd)/chromium (Cr), polychlorinated biphenyls (PCBs), and TOC using the methods specified in Table B-2. Analytes are provided in Tables B-3A to B-3C.

Groundwater samples will be analyzed for Target Compound List (TCL) VOCs (including Freon 113 under NYSDEC Analytical Services Protocol (ASP) 2000 Method OLM 4.2. The analytical laboratory will also conduct a library search of up to 10 tentatively identified compounds (TICs). Selected samples may be analyzed for semi-volatile organic compounds (SVOCs) (NYSDEC ASP Method OLM 4.2), Total Organic Carbon (TOC) (USEPA Method 9060), perchlorate (USEPA Method 314.0), Target Analyte List (TAL) Metals (NYSDEC ASP Method ILM 4.0), and biogeochemical/wet chemistry parameters (i.e., ethane, ethene, methane, alkalinity, nitrate, nitrite, sulfate, chloride, total iron, total manganese, dissolved iron, dissolved manganese, ammonia, orthophosphate, hardness, and total dissolved solids) using the methods specified in Table B-2. Analytes are provided in Tables B-3A to B-3C.

Soil gas samples will be analyzed for a selected list of site-related VOCs by a NYSDOH-approved laboratory using USEPA Method TO-15 (see Tables B-2 and B-4).

Tables B-3A, B-3B, B-3C, and B-4 summarize the list of parameters to be analyzed for in soil/solid, soil gas/air, and aqueous samples (i.e., perched water groundwater) along with the respective required quantitation limits for the following groups of analytes: VOCs, SVOCs, TOC, perchlorate, metals, and biogeochemical parameters. Geotechnical parameters will be determined during the course of RI activities and samples will be analyzed using the appropriate method under the American Society for Testing and Materials (ASTM).

The internal laboratory Standard Operating Procedures (SOPs) and QA/QC procedures are described in the individual laboratory facility Quality Assurance Plans (QAPs), independent plans provided by the analytical laboratory. Laboratory QAPs are provided in Attachment B-3.

4.6 Laboratory Reporting

The laboratory will provide a NYSDEC Category B deliverable (unless otherwise unavailable or specified) for the sampling effort within two weeks of receipt of samples. Additional documentation may be required from the laboratory based on the results of the data evaluation.

4.7 Data Validation

Data validation is the process in which analytical data generated by the laboratory are evaluated against a specific set of requirements and specifications, and determinations of data usability and limitations are made. The Data Validator examines the criteria pertaining to analytical data generated in accordance with Contract Laboratory Program (CLP) protocols from four perspectives, as follows:

- Technical requirements.
- Contractual requirements.
- Determination of compliance.
- Determination and action of how to define the usability or qualify the data.

Validation of the organic data will be performed on 5 percent of the data (20 percent of the Phase 2A soil RI data) following the QA/QC criteria set forth in the NYSDEC ASP, June 2000 and DER-10, and the USEPA CLP National Functional Guidelines for Organic Data Review, (USEPA 2001;2003). Validation of the inorganic data will be performed on 5 percent of the data (20 percent of the Phase 2A soil RI data) following the QA/QC criteria set forth in the NYSDEC ASP, June 2000 and DER-10 (NYSDEC 2002), and the USEPA CLP National Functional Guidelines for Inorganic Data Review, (USEPA 2004).

Groundwater and soil samples associated with sampling of monitoring wells and VPBs, soil samples associated with soil borings, waste characterization samples (liquid or solid-phase), and soil gas samples associated with sampling of soil gas points (SVPs) will require a NYSDEC Category B deliverable.

The NYSDEC Category B deliverable data review will include checking the following:

- Chain-of-custody forms.
- Holding times.
- GC/MS Instrument Performance checks.
- Instrument calibration.

- Trip and/or laboratory (method) blank-detected constituents.
- Surrogate spike recoveries.
- Matrix spike/spike duplicate precision and accuracy.
- Internal standards.
- Check for transcriptions between quantitation reports and Form I's.
- Blind duplicate precision.

Final validation of data obtained during the field sampling and analysis activities will be performed by the Data Validator. The laboratory deliverables will be reviewed for accuracy, precision, completeness, and overall quality of data. All laboratory data will be reviewed for adherence to method-specific QA/QC guidelines and to the data validation guidelines that are described above. If specific data quality issues arise based on the data validation and review guidelines described above, the data validation and review process may be expanded, as warranted, in order to address the specific data quality issue. Any additional validation performed will continue to be performed until the specific data quality issue is resolved.

4.8 Data Usability

The Data Validator for the project will review the analytical data for usability including determining if the data are accurate, precise, representative, complete, and comparable. The review of the analytical results will include checking chain-of-custody forms, sample holding times, blank contamination, spike recoveries, surrogate recoveries, internal standard, and precision of duplicate sample analysis, and laboratory control samples (as appropriate). This review will be used to classify the data as valid, usable, or unusable. Valid data will indicate that all QA/QC review criteria have been met and are acceptable (as per details outlined in the preceding section). Data will be characterized as usable when QA/QC parameters are marginally outside acceptable limits (example: sample holding times were slightly exceeded) where the data may be questionable, but still usable within limitation. Unusable data will be data that are observed to have gross errors or analytical interference that would render the data invalid for any purpose.

The data usability summary report (DUSR) will be prepared at the conclusion of validation.

4.9 Performance and System Audits

Performance and system audits will be performed on a periodic basis, as appropriate, to ensure that the work is implemented in accordance with the approved project SOPs and in an overall satisfactory manner. Examples of audits that will be performed during the project activities are as follows:

- The field personnel will supervise and check, on a daily basis during sampling activities, that monitoring well integrity is intact; that field measurements are made accurately; that equipment is thoroughly decontaminated; that samples are collected and handled properly; and that all field work is accurately and neatly documented.
- On a timely basis, the data packages submitted by the laboratory will be checked for the following information: that all requested analyses were performed; that sample holding times were met; that the data were generated through the approved methodology with the appropriate level of QC effort and reporting; and that the analytical results are in conformance with the prescribed acceptance criteria. The quality and limitations of the data will be evaluated based on these factors.
- The project manager will oversee the field personnel and check that the management of the acquired data proceeds in an organized and expeditious manner.
- Audits of the laboratory are performed on a regular basis by regulatory agencies. Audits are discussed in the laboratory Quality Assurance Plan. (Attachment B-3).

4.10 Preventive Maintenance

ARCADIS has established a program for the maintenance of field equipment to ensure the availability of equipment in good working order when and where it is needed, as indicated, in the following examples:

- An inventory of equipment, including model and serial number, quantity, and condition will be maintained. Each item will be tagged and signed out when in use and, its operating condition and cleanliness will be checked upon return. Routine checks will be made on the status of equipment, and spare parts will be stocked. An equipment manual library will also be maintained.

- The field personnel are responsible for making sure that the equipment is tested, cleaned, charged, and calibrated in accordance with the manufacturer's instructions before being taken to the field.

The laboratory also follows a well-defined program to prevent the failure of laboratory equipment and instrumentation. This preventive maintenance program is described in the laboratory Quality Assurance Plan. (Attachment B-3).

5. References

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Attachment B-1

Field Forms

Attachment B-2

Chain-of-Custody Forms

Attachment B-3

Laboratory Quality Assurance Plans (QAP)

Table B-1. Quality Assurance/Quality Control Sample Summary, Quality Assurance Project Plan (QAPP), RI/FS Work Plan, Former Grumman Settling Ponds, Bethpage, New York.

Matrix	Sampling Event	Sample Location/ Sample Point	Parameters (1)	Frequency	Estimated Sample Quantity per Event (4)	Estimated Field Blanks per Event (*)	Estimated Trip Blanks per Event (3)	Estimated Field Duplicates per Event (**)	Estimated MS/MSD (2) per Event
<u>Phase 1 Remedial Investigation (completed by ARCADIS)</u>									
Aqueous	Vertical Profile Borings	Phase 1 / VP-1 to VP-12	VOCs	Remedial Investigation	60	20	22	3	3
Aqueous	Vertical Profile Borings	Phase 1A / VP13 to VP-20	VOCs	Remedial Investigation	41	16	18	2	2
Aqueous	Vertical Profile Borings	Phase 1B / VP-21 to VP-33 (excluding VP-31)	VOCs	Remedial Investigation	59	11	12	3	3
			SVOCs		36	6	0	1	0
Soil	Vertical Profile Borings	Phase 1 / VP-2 to VP-8	TOC	Remedial Investigation	7	0	0	0	0
Soil	Vertical Profile Borings	Phase 1A / VP14 and VP-16	TOC	Remedial Investigation	6	0	0	0	0
Soil	Vertical Profile Borings	Phase 1B / VP-21 to VP-33 (excluding VP-31)	VOCs	Remedial Investigation	26	0	0	0	2
			SVOCs		16	0	0	0	0
			TOC		17	0	0	0	1
<u>Phase 2 Remedial Investigation (Proposed - ARCADIS and Dvirka & Bartilucci)</u>									
Soil***	Soil Borings	Phase 2A (see RI/FS Workplan Tables 3, 4, and 5)	VOCs (7)	Remedial Investigation	178	TBD	TBD	9	9
			SVOCs (7)		196	TBD	0	10	10
			Cd/Cr		3	TBD	0	0	0
			PCBs		274	TBD	0	0	0
Soil*****	Soil Borings	Phase 2B / CL-1 through CL-14 (See RI/FS Work Plan Table 1 and 5)	VOCs	Remedial Investigation	28	TBD	TBD	2	2
			TOC		28	0	0	0	0
			Physical Parameters (8)		7	0	0	0	0
Aqueous (groundwater)	Groundwater Quality Sampling of Monitoring Wells	Phase 2 CAMW-1 through CAMW-4/ B30MW-1, BCPMW-2 and BCPMW-3 (on-site); HN-40S, HN-40I, HN-42S, and HN-42I (off-site)	VOC	Remedial Investigation/IRM Pre-Design (Per Event)	11	3	TBD	1	1
			Metals		7	0	0	0	0
			ClO_4^-		11	0	0	0	0
			BioGeo (6)		7	0	0	0	0
			SVOCs		6	0	0	0	0
Aqueous (perched water)	Perched Water Quality Sampling from Piezometers	Phase 2 On-site Piezometers PZ-1 through PZ-5	VOC	Remedial Investigation (Per Event)	1	1	TBD	1	1
			Metals		1	1	0	1	0
			ClO_4^-		1	1	0	1	0
			BioGeo (6)		1	1	0	1	0
Aqueous (groundwater)	Vertical Profile Borings	Phase 2 On-site VPBs VP-3A, VP-19A, VP-27A. VP-3B, and VP-3C	VOC	Remedial Investigation****	13	TBD	TBD	1	1
			TOC		13	TBD	0	1	0
			Metals		13	TBD	0	1	0
			ClO_4^-		13	TBD	0	1	0
			BioGeo (6)		13	TBD	0	1	0
Aqueous (groundwater)	Vertical Profile Borings	Phase 2 Off-site VPBs / VP-100 through VP-108 (VP-102 to VP-104 are contingency VPBs)	VOC	Remedial Investigation****	TBD	TBD	TBD	TBD	TBD
			ClO_4^-		TBD	TBD	TBD	TBD	TBD
Soil Gas	Soil Gas/Ambient Air	Phase 2 On-site/ SVP-5 through SVP-10, Ambient Air	VOCs	Remedial Investigation	19	0	0	1	0
Soil Gas	Soil Gas/Ambient Air	Phase 2 Off-site/ SVP-100 through SVP-107, Ambient Air	VOCs	Remedial Investigation	13	0	0	1	0
Non-Aqueous Phase Liquid (9)	IF Encountered	Phase 2 Piezometers	TBD	Remedial Investigation	TBD	TBD	TBD	TBD	TBD
Solid/Aqueous (soil/water)	Waste Characterization	Grab	Varies (5)	Remedial Investigation	TBD	TBD	TBD	TBD	TBD

See next page for footnotes.

Table B-1. Quality Assurance/Quality Control Sample Summary, Quality Assurance Project Plan (QAPP), RI/FS Work Plan, Former Grumman Settling Ponds, Bethpage, New York.

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(1) Analyses will be performed in accordance with NYSDEC Analytical Services Protocol (ASP), or USEPA methods by a CLP-certified NYSDOH-approved laboratory, with the exception of physical properties, which will conform to ASTM Standards.

(2) Matrix spike/matrix spike duplicate (MS/MSD) analysis is performed on a site sample and therefore is not counted as separate samples.
For MS/MSDs, triple sample volume will be provided. MS/MSD sample sets collected at a frequency of one per 20 samples of the same matrix and will accompany the associated site sample during shipment.

(3) Trip blanks will be provided by the analytical laboratory and will accompany VOC samples as they are collected and during shipment. Trip blanks collected at a frequency of one per day. A trip blank will accompany the other samples collected the same day. The maximum number of samples per trip blank is 20.

(4) Sample count will depend on number of locations and number of samples collected per location.

(5) Waste characterization sample analysis will depend on generator knowledge and the requirements of the receiving facility.

(6) BioGeoChemical (BioGeo) sampling includes collection of field parameters (pH, specific conductance, temperature and sulfide) and the following laboratory analyses:
dissolved gases: (ethane and ethene and methane), alkalinity, nitrate, nitrite, sulfate, chloride, total iron, total managanese, dissolved iron and dissolved manganese. Selected wells will also be sampled for ammonia, hardness (as CaCO3), orthophosphate, TDS, and TOC. Samples will be submitted to Microseeps of Pittsburgh, Pennsylvania (dissolved gases only) and Severn Trent of Shelton, Connecticut.

(7) Additional samples will be taken if PID readings above background concentrations are detected. The soil sample exhibiting the highest PID reading, as well as the deepest soil sample collected from that boring, will be analyzed for VOC's and SVOC's. In addition, any soil sample exhibiting a PID reading of 50ppm or greater above background concentrations will also be analyzed for VOC's and SVOC's.

(8) Samples collected via Shelby Tube and submitted for analysis for porosity, bulk density, vertical permeability, moisture content, and fraction organic carbon by TetraTech/Woodward Clyde Consultants, Totowa, New Jersey.

(9) If non-aqueous phase liquid is encountered, a sample will be collected for fingerprinting and physical property analyses, to be determined.

*	One field blank collected per day every time non-dedicated (i.e., disposable or reusable) sampling equipment (i.e., split-spoons, pumps and/or bailers) is used.
**	A field (blind) duplicate will be collected at a frequency of one per 20 samples of the same matrix.
***	Soil boring Quality Assurance/Quality Control Summary obtained from Dvirka & Bartilucci.
****	Event for the purpose of sample collection - an event is considered one vertical profile boring.
*****	If the CPT/MIP methodology is selected, then the actual number of borings drilled, samples collected, and analytical parameters selected will be modified, as appropriate.
MS/MSD	Matrix spike/matrix spike duplicate
VOCs	Volatile organic compounds
SVOCs	Semi volatile organic compounds
Cd/Cr	cadmium/chromium
TOC	Total Organic Carbon
TAL	Target Analyte List of Metals
USEPA	U.S. Environmental Protection Agency
NYSDEC	New York State Department of Environmental Conservation
TBD	To be determined
ASTM	American Society for Testing and Materials
CPT	Cone Penetrometer Testing
MIP	Membrane Interface Probe
IRM	Interim Remedial Measure
TDS	Total Dissolved Solids

Table B-2. Summary of Sample Containers, Analytical Methods, Preservation, and Holding Times, Quality Assurance Project Plan (QAPP), RI/FS Work Plan, Former Grumman Settling Ponds, Bethpage, New York.

Matrix	Monitoring Program	Parameters (1)	Analytical Laboratory Methodology	Sample Containers	Preservation	Holding Time
Aqueous (groundwater)	VPB / Groundwater Quality Samples / Perched Water Samples	VOCs	NYSDEC ASP 2000 Method OLM 4.2	Two (2) 40 mL glass with Teflon-lined septa	Cool 4 degrees C, HCl to pH<2	10 days VTSR
		SVOCs	NYSDEC ASP 2000 Method OLM 4.2	Two (2) 1-L amber	Cool 4 degrees C	5 days to extract, then 40 days VTSR to analyze
		TAL Metals	NYSDEC ASP 2000 Method ILM 4.0	One (1) 500 mL plastic	HNO_3 to pH <2	28 Days; Hg 180 days - ICAP
		Ethane and Ethene	AM20GAX	Two (2) 40 mL glass with Teflon-lined septa	None	14 days
		Methane (CH_4)	AM20GAX	Two (2) 40 mL glass with Teflon-lined septa	None	14 days
		Alkalinity	USEPA Method 310.1	(1) 500 mL, plastic	Cool 4 degrees C	14 days
		Ammonia	USEPA Method 350.1	(1) 500 mL, plastic	Cool 4 degrees C, H_2SO_4 to pH<2	28 days
		Hardness (As $CaCO_3$)	USEPA Method 130.2	(1) 500 mL, plastic	Cool 4 degrees C, HNO_3 to pH<2	6 months
		Orthophosphate	USEPA Method 365.2	(1) 500 mL, plastic	Cool 4 degrees C	48 hours
		TDS	USEPA Method 160.1	(1) 500 mL, plastic	Cool 4 degrees C	7 days
		Nitrate (NO_3)	USEPA Method 300.0	(1) 1,000 mL, plastic	Cool 4 degrees C	48 hours
		Nitrite (NO_2)	USEPA Method 300.0	(1) 1,000 mL, plastic	Cool 4 degrees C	48 hours
		Sulfate (SO_4)	USEPA Method 300.0	(1) 1,000 mL, plastic	Cool 4 degrees C	28 days
		Chloride (Cl)	USEPA Method 300.0	(1) 1,000 mL, plastic	Cool 4 degrees C	28 days
		Total Iron	NYSDEC ASP 2000 Method ILM 4.0	(1) 500 mL, plastic	HNO_3 to pH <2	28 days
		Total Manganese	NYSDEC ASP 2000 Method ILM 4.0	(1) 500 mL, plastic	HNO_3 to pH <2	28 days
		Dissolved Iron	NYSDEC ASP 2000 Method ILM 4.0	(1) 500 mL, plastic	HNO_3 to pH <2	28 days

See last page for footnotes.

Table B-2. Summary of Sample Containers, Analytical Methods, Preservation, and Holding Times, Quality Assurance Project Plan (QAPP), RI/FS Work Plan, Former Grumman Settling Ponds, Bethpage, New York.

Matrix	Monitoring Program	Parameters (1)	Analytical Laboratory Methodology	Sample Containers	Preservation	Holding Time
		Dissolved Manganese	NYSDEC ASP 2000 Method ILM 4.0	(1) 500 mL, plastic	HNO_3 to pH <2	28 days
		TOC	USEPA Method 9060	Two (2) 40 mL glass with Teflon-lined septa	Cool 4 degrees C, H_2SO_4 to pH <2	28 days
		Perchlorate	USEPA Method 314.0	(1) 500 mL, Plastic	Cool 4 degrees C	28 days
Soil	VPB / Soil Borings*** / Shallow Soil Borings	VOCs	NYSDEC ASP 2000 Method OLM 4.2	One (1) 2 oz. glass	Cool 4 degrees C	10 days VTSR
		SVOCs	NYSDEC ASP 2000 Method OLM 4.2	One (1) 4 oz. glass	Cool 4 degrees C	10 days to extract, then 40 days VTSR to analyze
		Cd/Cr	NYSDEC ASP 2000 Method ILM 4.0	One (1) 4 oz. Glass	Cool 4 degrees C	6 months
		PCBs	NYSDEC ASP 2000 Method OLM 4.2	One (1) 4 oz. Glass	Cool 4 degrees C	10 days to extract, then 40 days VTSR to analyze
		TOC	USEPA Method 9060	One (1) 8 oz Glass	Cool 4 degrees C	28 days
Soil Gas	Soil Gas/Ambient Air	VOCs	USEPA Method TO-15	6L SUMMA, one (1) cannister	NA	28 days
Soil/Water	Waste Characterization (2)	Varies	Varies	Varies	Varies	Varies
Soil	Geotechnical	Varies	Varies	Varies	Varies	Varies

See last page for footnotes.

Table B-2. Summary of Sample Containers, Analytical Methods, Preservation, and Holding Times, Quality Assurance Project Plan (QAPP), RI/FS Work Plan, Former Grumman Settling Ponds, Bethpage, New York.

(1)	Refer to Tables B-3 and B-4 for specific analyte lists for analyses of aqueous and soil vapor samples, respectively.
(2)	Waste characterization sample analysis will depend on generator knowledge and the requirements of the receiving facility.
USEPA	U.S. Environmental Protection Agency
NYSDEC	New York State Department of Environmental Conservation
ASP	Analytical Services Protocol
C	Celsius
L	Liter
HNO_3	Nitric Acid
mL	Milli-liter
NA	Not applicable
VOCs	Volatile organic compounds (including Freon 113)
Cd/Cr	Total cadimum/chromium
SVOCs	Semivolatile organic compounds
VTSR	Verified Time of Sample Receipt at lab.
TOC	Total Organic Carbon
***	Soil boring Quality Assurance/Quality Control Summary obtained from Dvirka & Bartilucci (2005).

Table B-3A. Analyte List for Solid and Aqueous Sample Analysis (VOCs and TOC), Quality Assurance Project Plan (QAPP), RI/FS Work Plan, Former Grumman Settling Ponds, Bethpage, New York.

Method:	NYSDEC ASP 2000 OLM 4.2	NYSDEC ASP 2000 OLM 4.2
Matrix/Sample Type:	Aqueous/Groundwater & Water	Soil/Solid
Constituent [(1)]	Contract-Required Quantitation Limits (ug/L)	Contract-Required Quantitation Limits (ug/kg)
VOCs:		
Chloromethane	5	10
Bromomethane	5	10
Vinyl Chloride	2	10
Chloroethane	5	10
Methylene chloride	5	10
Acetone	50	10
Carbon disulfide	50	10
1,1-Dichloroethene	5	10
1,1-Dichloroethane	5	10
cis-1,2-Dichloroethene	5	10
trans-1,2-Dichloroethene	5	10
2-Butanone	50	10
Chloroform	7	10
1,2-Dichloroethane	5	10
1,1,1-Trichloroethane	5	10
Carbon tetrachloride	5	10
Bromodichloromethane	50	10
1,2-Dichloropropane	5	10
cis-1,3-Dichloropropene	5	10
Trichloroethene	5	10
Benzene	0.7	10
Dibromochloromethane	5	10
trans-1,3-Dichloropropene	5	10
1,1,2-Trichloroethane	5	10
Bromoform	50	10
4-Methyl-2-pentanone	50	10
2-Hexanone	50	10
Tetrachloroethene	5	10
1,1,2,2-Tetrachloroethane	5	10
Toluene	5	10
Chlorobenzene	5	10
Ethylbenzene	5	10
Styrene	5	10
Xylene (total)	5	10 10
Freon 113	5	10

See next page for Notes and Abbreviations.

Table B-3A. Analyte List for Solid and Aqueous Sample Analysis (VOCs and TOC), Quality Assurance Project Plan (QAPP), RI/FS Work Plan, Former Grumman Settling Ponds, Bethpage, New York.

	Groundwater Sampling	Soil Sampling
Method:	USEPA 9060	USEPA 9060
Matrix/Sample Type:	Aqueous/Groundwater & Water	Soil/Solid
Constituent [1]	Contract-Required Quantitation Limits (ug/L)	Contract-Required Quantitation Limits (ug/kg)
Total Organic Carbon	1	100

Notes and Abbreviations:

*	CRQLs/RQLs are the same for groundwater samples (environmental monitoring) and for water samples (waste characterization sampling).
(1)	Listed constituents represent Target Compound List (TCL) volatile organic compounds (VOCs), plus Freon 113 (also known as trichlorotrifluoroethane or 1,1,2-trichloro-1,2,2-trifluoroethane).

VOCs	Volatile organic compounds
TOC	Total Organic Carbon
USEPA	U.S. Environmental Protection Agency
NYSDEC	New York State Department of Environmental Conservation
ASP	Analytical Services Protocol
CRQLs	Contract-Required Quantitation Limits
RQLs	Required Quantitation Limits
ug/L	micrograms per liter
ug/kg	micrograms per kilogram

Table B-3B. Analyte List for Solid and Aqueous Sample Analysis (SVOCs), Quality Assurance Project Plan (QAPP), RI/FS Work Plan, Former Grumman Settling Ponds, Bethpage, New York.

Method:	NYSDEC ASP 2000 OLM 4.2	NYSDEC ASP 2000 OLM 4.2
Matrix/Sample Type:	Aqueous/Groundwater	Soil/Solid
Constituent [1]	Required Quantitation Limits (ug/L)	Required Quantitation Limits (ug/kg)
SVOCs:		
Phenol	10	330
Bis(2-chloroethyl)ether	10	330
2-Chlorophenol	10	330
1,3-Dichlorobenzene	10	330
1,4-Dichlorobenzene	10	330
1,2-Dichlorobenzene	10	330
2-Methylphenol	10	330
4-Methylphenol	10	330
N-Nitroso-di-n-propylamine	10	330
Hexachloroethane	10	330
Nitrobenzene	10	330
Isophorone	10	330
2-Nitrophenol	10	330
2,4-Dimethylphenol	10	330
Bis(2-chloroethoxy)methane	10	330
2,4-Dichlorophenol	10	330
1,2,4-Trichlorobenzene	10	330
Naphthalene	10	330
4-Chloroaniline	10	330
Hexachlorobutadiene	10	330
4-Chloro-3-methylphenol	10	330
2-Methylnapthalene	10	330
Hexachlorocyclopentadiene	10	330
2,4,6-Trichlorophenol	10	330
2,4,5-Trichlorophenol	25	800
2-Chloronaphthalene	10	330
2-Nitroaniline	25	800
Dimethylphthalate	10	330
Acenaphthylene	10	330
2,6-Dinitrotoluene	10	330
3-Nitroaniline	25	800
Acenaphthene	10	330
2,4-Dinitrophenol	25	800
4-Nitrophenol	25	800
Dibenzofuran	10	330
2,4-Dinitrotoluene	10	330
Diethylphthalate	10	330
4-chlorophenyl(phenyl) ether	10	330
Fluorene	10	330
4-Nitroaniline	25	800
4,6-Dinitro-2-methylphenol	25	800
N-Nitrosodiphenylamine (1)	10	330

See next page for Notes and Abbreviations.

Table B-3B. Analyte List for Solid and Aqueous Sample Analysis (SVOCs), Quality Assurance Project Plan (QAPP), RI/FS Work Plan, Former Grumman Settling Ponds, Bethpage, New York.

Method:	NYSDEC ASP 2000 OLM 4.2	NYSDEC ASP 2000 OLM 4.2
Matrix/Sample Type:	Aqueous/Groundwater	Soil/Solid
Constituent [1]	Required Quantitation Limits (ug/L)	Required Quantitation Limits (ug/kg)
SVOCs (continued):		
Hexachlorobenzene	10	330
Pentachlorophenol	25	800
Phenanthrene	10	330
Anthracene	10	330
Carbazole	10	330
Di-n-butylphthalate	10	330
Fluoranthene	10	330
Pyrene	10	330
Butylbenzylphthalate	10	330
3,3'-Dichlorobenzidine	10	330
Benzo(a)anthracene	10	330
Chrysene	10	330
Bis(2-ethylhexyl)phthalate (BEHP)	10	330
Di-n-octylphthalate	10	330
Benzo(b)fluoranthene	10	330
Benzo(k)fluoranthene	10	330
Benzo(a)pyrene	10	330
Indeno(1,2,3-cd)pyrene	10	330
Dibenz(a,h)anthracene	10	330
Benzo(g,h,i)perylene	10	330
4-bromophenyl-phenylether	10	330
Benzoic acid	10	330
Benzyl alcohol	10	330
Bis(2-chloroisopropyl)ether	10	330

Notes and Abbreviations:

SVOCs	Semivolatile organic compounds
USEPA	U.S. Environmental Protection Agency
RQLs	Required Quantitation Limits
ug/L	micrograms per liter
ug/kg	micrograms per kilogram

Table B-3C. Analyte List for Analysis of Aqueous Samples (Metals Perchlorate, Biogeochemical/Wet Chemistry Parameters),
Quality Assurance Project Plan (QAPP), RI/FS Work Plan, Former Grumman Settling Ponds, Bethpage, New York.

Matrix/Sample Type:	Aqueous/Groundwater	Aqueous/Groundwater	Soil/Solid	Soil/Solid
Constituent	Method	Contract Required Detection Limits (ug/L)	Method	Contract Required Detection Limits (mg/kg)
Inorganics (Metals):				
Aluminum	NYSDEC ILM4.0	200**	Same	258
Antimony	NYSDEC ILM4.0	60	Same	11.7
Arsenic	NYSDEC ILM4.0	10**	Same	8
Barium	NYSDEC ILM4.0	200	Same	2
Beryllium	NYSDEC ILM4.0	5	Same	2
Cadmium	NYSDEC ILM4.0	5**	Same	3
Calcium	NYSDEC ILM4.0	5000	Same	85
Chromium	NYSDEC ILM4.0	10	Same	3
Cobalt	NYSDEC ILM4.0	50	Same	2
Copper	NYSDEC ILM4.0	25	Same	5
Iron	NYSDEC ILM4.0	100	Same	145
Lead	NYSDEC ILM4.0	3**	Same	9
Magnesium	NYSDEC ILM4.0	5000	Same	35
Manganese	NYSDEC ILM4.0	15	Same	2.5
Mercury	NYSDEC ILM4.0	0.2**	Same	0.05
Nickel	NYSDEC ILM4.0	40	Same	5
Potassium	NYSDEC ILM4.0	5000	Same	200
Selenium	NYSDEC ILM4.0	5**	Same	16
Silver	NYSDEC ILM4.0	10	Same	3
Sodium	NYSDEC ILM4.0	5000	Same	94
Thallium	NYSDEC ILM4.0	10**	Same	20
Vanadium	NYSDEC ILM4.0	50	Same	4
Zinc	NYSDEC ILM4.0	20**	Same	20
BioGeochemical/Wet Chemistry:				
Ethane	AM20GAX	5 ng/L*	--	--
Ethene	AM20GAX	5 ng/L*	--	--
Methane (CH_4)	AM20GAX	15 ng/L*	--	--
Alkalinity	USEPA 310.1	0.594 mg/L	--	--
Nitrate (NO_3)	USEPA 300.0	0.002 mg/L	--	--
Nitrite (NO_2)	USEPA 300.0	0.003 mg/L	--	--
Sulfate (SO_4)	USEPA 300.0	0.012 mg/L	--	--
Chloride (Cl)	USEPA 300.0	0.147 mg/L	--	--
Total Iron	USEPA 6010	0.1 mg/L	--	--
Total Manganese	USEPA 6010	0.1 mg/L	--	--
Dissolved Iron	USEPA 6010	0.1 mg/L	--	--
Dissolved Manganese	USEPA 6010	0.1 mg/L	--	--
Ammonia	USEPA 350.1	40	--	--
Hardness (as $CaCo_3$)	USEPA 130.2	1000	--	--
Orthophosphate	USEPA 365.2	100	--	--
TDS	USEPA 160.1	10,000	--	--
Perchlorate:				
Perchlorate	USEPA 314.0	4	--	--

Notes and Abbreviations:

USEPA	U.S. Environmental Protection Agency
RQLs	Required Quantitation Limits
ug/L	micrograms per liter
mg/L	Milligrams per liter
ng/L	Nanograms per liter
ug/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
*	Method quantitation limits reported by Microseeps, Inc., Pittsburgh, PA.
**	MDL Reported in this instance.
--	Not Applicable

Table B-4. Analyte List for Analysis of Soil Gas and Air Samples (VOCs), Quality Assurance Project Plan (QAPP), RI/FS Work Plan, Former Grumman Settling Ponds, Bethpage, New York.

Constituent [(1)]	Method: USEPA Method TO-15 Matrix: Gas/Air Contract-Required Detection Limits ($\mu g/m^3$)
VOCs:	
1,1,1-Trichloroethane	1
1,1,2,2-Tetrachloroethane	1
1,1,2-Trichloroethane	1
1,1-Dichloroethane	1
1,1-Dichloroethene	1
1,2-Dichloroethane	1
1,2-Dichloropropane	1
1,3-Butadiene	1
Acetone	1
Benzene	1
Bromodichloromethane	1
Bromoform	1
Bromomethane	1
Carbon Disulfide	1
Carbon Tetrachloride	1
Chlorobenzene	1
Chloroethane	1
Chloroform	1
Chloromethane	1
cis-1,2-Dichloroethene	1
cis-1,3-Dichloropropene	1
Dibromochloromethane	1
Dichlorodifluoromethane (Freon 112)	1
Ethylbenzene	1
Freon 113 (1,1,2-Trichloro-1,2,2-trifluoroethane)	1
Methyl Butyl Ketone (2-hexanone)	1
2-Butanone (MEK)	1
Methyl Isobutyl Ketone (4-Methyl-2-pentanone)	1
Methylene Chloride	1
Styrene	1
Tetrachloroethene	1
Toluene	1
trans-1,2-Dichloroethene	1
trans-1,3-Dichloropropene	1
Trichloroethene	1
Vinyl Chloride	1
Xylene (m,p) [a]	1
Xylene (o)	1

Notes and Abbreviations:

(1)	Listed constituents based on Target Compound List (TCL) volatile organic compounds (VOCs), plus Freon 113 (also known as trichlorotrifluoroethane or 1,1,2-trichloro-1,2,2-trifluoroethane), except for acetone, 2-butanone, 4-methyl-2-pentanone, and 2-hexanone.
USEPA	U.S. Environmental Protection Agency
$\mu g/m^3$	Milligrams per cubic meter

ARCADIS

Attachment B-1

Field Forms

ARCADIS GERAGHTY & MILLER

Sample/Core Log

ring/Well ________ Project/No. ________ Page ____ of ____

Site Location ________ Drilling Started ________ Drilling Completed ________

Total Depth Drilled ________ Feet Hole Diameter ________ inches Type of Sample/ Coring Device ________

Length and Diameter of Coring Device ________ Sampling Interval ________ feet

Land-Surface Elev. ________ feet ☐ Surveyed ☐ Estimated Datum ________

Drilling Fluid Used ________ Drilling Method ________

Drilling Contractor ________ Driller ________ Helper ________

Prepared By ________ Hammer Weight ________ Hammer Drop ________ ins.

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description
From	To			

Samplelg.xls.xls
10/20/98

VERTICAL PROFILE BORING GROUNDWATER SCREENING
OPERABLE UNIT 3 REMEDIAL INVESTIGATION
NORTHROP GRUMMAN CORPORATION
BETHPAGE, NEW YORK

VPB DESIGNATION: ____________________

DATE(S): ____________

SAMPLER: ____________________

Page ____ of ____

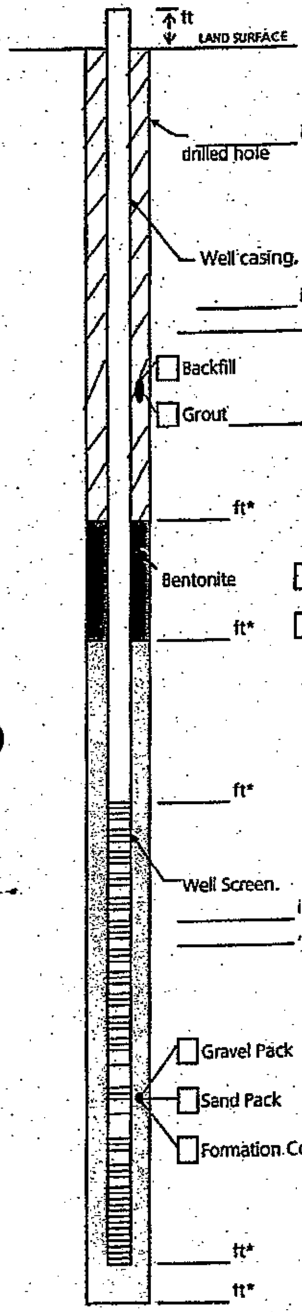
Date	Start Time	Pump Decon Prior to Sampling	Stainless-Steel Screen Depth (ft bls)	Depth to Water (ft bls)	Gallons In Well	Purge Volume (gallons) (3 well volumes)	Total Volume Purged	Initial Sample Appearance	Temperature (C) Purge Volume			pH Purge Volume			Conductivity (umhos/cm) Purge Volume			Final Sample Appearance	Coded Replicate	Time Sampling Completed
									1	2	3	1	2	3	1	2	3			

ft bls   feet below land surface.

ARCADIS G&M, Inc.

Well Construction Log

(Unconsolidated)



____ inch diameter drilled hole

Well casing, ____ inch diameter, ____

☐ Backfill

☐ Grout ____

____ ft*

Bentonite ☐ slurry ☐ pellets

____ ft*

____ ft*

Well Screen. ____ inch diameter ____, ____ slot

☐ Gravel Pack

☐ Sand Pack

☐ Formation Collaspse

____ ft*

____ ft*

Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

* Depth Below Land Surface

Project ____ Well ____

Town/City ____

County ____ State ____

Permit No. ____

Land-Surface Elevation and Datum:

____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) ____

Drilling Method ____

Drilling Contractor ____

Drilling Fluid ____

Development Technique(s) and Date(s)

Fluid Loss During Drilling ____ gallons

Water Removed During Development ____ gallons

Static Depth to Water ____ feet below M.P.

Pumping Depth to Water ____ feet below M.P.

Pumping Duration ____ hours

Yield ____ gpm Date ____

Specific Capacity ____ gpm/ft

Well Purpose ____

Remarks ____

Prepared by ____

ARCADIS GERAGHTY & MILLER

DAILY LOG

Well(s)________ Project/No.______________________________ Page ____ of ____

Site Location____

Prepared By ____

Date/Time	Description of Activities

ARCADIS G&M

Page ______ of ______

Water Level Record

Project ____________________

Date ______________

Well (s)	Depth to Water (ft)	Time	Remarks

ARCADIS GERAGHTY & MILLER

Water Sampling Log

Project No. ____________ Page 1 of ______

Project ____________

Date ____________

Site Location ____________

Replicate No. ____________ Code No. ____________

Site/Well No. ____________

Sampling Time: Begin ________ End ________

Weather ____________

Evacuation Data

Measuring Point ____________

MP Elevation (ft) ____________

Land Surface Elevation (ft) ____________

Sounded Well Depth (ft bmp) ____________

Depth to Water (ft bmp) ____________

Water-Level Elevation (ft) ____________

Water Column in Well (ft) ____________

Casing Diameter/Type ____________

Gallons in Well ____________

Gallons Pumped/Bailed Prior to Sampling ____________

Sample Pump Intake Setting (ft bmp) ____________

Purge Time begin ________ end ________

Pumping Rate (gpm) ____________

Evacuation Method ____________

Field Parameters

Color ____________

Odor ____________

Appearance ____________

pH (s.u.) ____________

Conductivity (mS/cm) ____________

(µmhos/cm) ____________

Turbidity (NTU) ____________

Temperature (°C) ____________

Dissolved Oxygen (mg/L) ____________

Salinity (%) ____________

Sampling Method ____________

Remarks ____________

Constituents Sampled	**Container Description**	**Number**	**Preservative**

Sampling Personnel ____________

Well Casing Volumes

Gal./Ft.	1-¼" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-½" = 0.09	2-½" = 0.26	3-½" = 0.50	6" = 1.47

bmp	below measuring point	ml	milliliter	NTU	Nephelometric Turbidity Units
°C	Degrees Celsius	mS/cm	Milisiemens per centimeter	PVC	Polyvinyl chloride
ft	feet	msl	mean sea-level	s.u.	Standard units
gpm	Gallons per minute	N/A	Not Applicable	umhos/cm	Micromhos per centimeter
mg/L	Miligrams per liter	NR	Not Recorded	VOC	Volatile Organic Compounds

ARCADIS

Soil Gas Sample Log

Sample ID ____________________
Date ____________________
Time ____________________
Weather ____________________
Atmos. Pressure ____________________

Project/No. ____________________
Sampling Personnel ____________________
____
____
Wind Speed: ____________________
Precipitation?: ____________________

DESCRIPTION OF SAMPLE LOCATION:

________ Outdoor

Location ____________________
Est. depth to water (ft): ____________________
Soil type: ____________________
____
Odor: ____________________
Color: ____________________

________ Indoor

Location ____________________
Basement: yes / no
Room size ft x ft: ____________________
Floor material: cement / wood / dirt
Slab Thickness (ft): ____________________
Visible cracks?: yes / no
Sub-slab material: dirt / gravel

PROBE INSTALLATION:

Date: ____________________
Method: ____________________
Diameter: ____________________
Depth: ____________________
Packing material: ____________________

Location Sketch:

PURGE:

Date: ____________________
Time: ____________________
Rate: ____________________
Volume: ____________________

SAMPLE COLLECTION:

Sample Time: ____________________
Sample Rate: ____________________
Sample Volume: ____________________
Sample Start Time: ____________________
Sample End Time: ____________________

CONTAINER VACUUM:

Initial Canister Vacuum: ____________________
Final Canister Vacuum: ____________________

CONTAINER DESCRIPTION:

Canister: 6-L Summa
Canister Serial Number: ____________________

ANALYTICAL METHOD:

____

Dvirka
and
Bartilucci
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

Project No.:
Project Name:

Boring No.:
Sheet __ of __ .
By:

Drilling Contractor:
Driller:
Drill Rig:
Date Started:

Geologist:
Drilling Method:
Drive Hammer Weight:
Date Completed:

Boring Completion Depth:
Ground Surface Elevation:
Boring Diameter:

Depth (ft.)	Soil Sample				Headspace Analysis			Sample Description	USCS
	No.	Type	Blows Per 6"	Rec	FID ppm	PID ppm	CH4 ppm		
-0-									
-1.5'-									
-2-									
-3-									
-4-									
-5-									
-6-									
-7-									
-8-									
-9-									
-10-									

Sample Types:
SS =
ST =
D&M =
UC = Undisturbed Core (Dennison Type)

NOTES:

D&B_BLOG

Dvirka and Bartilucci
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

Project No.:
Project Name:

Test Pit No.:
Sheet of
By:

Contractor:

Operator:
Equipment:

Geologist:
Test Pit Method:

Date Started:
Date Completed:

Test Pit Completion Depth:
Ground Surface Elevation:
Test Pit Dimension(s):

Weather Conditions:

Depth *(ft.)*	OVA *(ppm)*	PID *(ppm)*	Description of Materials	Remarks
-0-				
-1-				
-2-				
-3-				
-4-				
-5-				
-6-				
-7-				
-8-				
-9-				
-10-				

NOTES:

Attachment B-2

Chain-of-Custody Forms

ARCADIS Laboratory Task Order No./P.O. No.____________ **CHAIN-OF-CUSTODY RECORD** Page____ of____

Project Number/Name ______________________

Project Location ______________________

Laboratory ______________________

Project Manager ______________________

Sampler(s)/Affiliation ______________________

Sample ID/Location	Matrix	Date/Time Sampled	Lab ID	ANALYSIS / METHOD / SIZE						Remarks	Total

Sample Matrix: L = Liquid; S = Solid; A = Air

Total No. of Bottles/Containers ____

Relinquished by: ____________	Organization: ____________	Date ___/___/___	Time ______	Seal Intact?
Received by: ____________	Organization: ____________	Date ___/___/___	Time ______	Yes No N/A
Relinquished by: ____________	Organization: ____________	Date ___/___/___	Time ______	Seal Intact?
Received by: ____________	Organization: ____________	Date ___/___/___	Time ______	Yes No N/A

Special Instructions/Remarks: ______________________

Delivery Method: ☐ In Person ☐ Common Carrier ____________ SPECIFY ☐ Lab Courier ☐ Other ____________ SPECIFY

AG 05-12

MITKEM CORPORATION

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

CHAIN-OF-CUSTODY RECORD

Page ____ of ____

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

CLIENT PROJECT NAME:

CLIENT PROJECT #:

CLIENT P.O.#:

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

1/8/08

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

WHITE: LABORATORY COPY   YELLOW: REPORT COPY   PINK: CLIENT'S COPY

ARCADIS

Attachment B-3

Laboratory Quality Assurance Plans
(QAP)

Laboratory Quality Assurance Plans
have been removed and do not apply to Soil Gas IRM activities

they are replaced by:

Columbia Analytical Services Inc. (CAS)
Quality Assurance Manual (QAM)
&
Standard Operating Procedures (SOPs)

CAS QAM & SOPs are included with the
December 31, 2007 Addendum to this Quality Assurance Project Plan,
Attachment C-1.2 of the
Sampling and Analysis Plan,
Operable Unit-3 Soil Gas Interim Remedial Measure,
Former Grumman Settling Ponds,
Bethpage, New York
Site # 1-30-003A

Dated: January 2008

Attachment C-1.2

Quality Assurance Project Plan Addendum

Document Date:
December 31, 2007

Attachment C-1.2: Addendum to Quality Assurance Project Plan (QAPP), Former Grumman Settling Ponds (Operable Unit 3-Bethpage Community Park), Bethpage, New York (March 8, 2006):

The following items are revisions to the QAPP, originally submitted as Appendix B of the Sampling and Analysis Plan (SAP) (ARCADIS March 2006), for the Grumman Remedial Investigation/Feasibility Study (RI/FS) Work Plan prepared for the Former Grumman Settling Ponds, Bethpage, New York. This addendum to the QAPP was prepared to include samples collected for the interim remedial measure (IRM) soil gas system, as specified in the Sampling and Analysis Plan (SAP) (ARCADIS 2008).

Items:

1. Throughout the QAPP document wherever "groundwater" sampling and monitoring are mentioned it is to be understood as "groundwater and condensate water" sampling and monitoring.

2. Throughout the QAPP document wherever "soil gas" sampling and monitoring are mentioned it is to be understood as "soil gas and system vapor" sampling and monitoring.

3. Throughout the QAPP document wherever "laboratory Quality Assurance Plan" is mentioned it is to be understood as Columbia Analytical Services Inc's. "laboratory Quality Assurance Manual". This Manual and relevant Standard Operating Procedures for the analytical methods to be used during the OU-3 Soil Gas IRM activities are attached to this addendum.

4. Section 4.1-Field QA/QC: This section, inclusive of subsections: 4.1.1-Field (Equipment Rinsate) Blank; 4.1.2-Trip Blank; 4.1.3-Blind (Field) Duplicates; 4.1.4-MS/MSD Sample; and, 4.1.5-Field records, defines and discusses the collection of QA/QC samples. It is to be understood to include (when applicable) condensate water and system vapor QA/QC sample collection.

   These sections reference Table B-1 for information on analytical methods, sample collection quantity, and QA/QC sample collection quantity. This table is not inclusive of the condensate water and system vapor samples. In regards to the condensate water and system vapor samples, please refer to the SAP, Operable Unit 3, Soil Gas Interim Remedial Measure (ARCADIS February 2008).

5. Section 4.2-Preparation and Preservation of Samples Containers: This section references Table B-2, which summarizes analytical methods, sample containers, holding times, and preservation procedures to be used. This table is not inclusive of the condensate water

and system vapor samples. In regard to the condensate water sample collection; sample collection guidelines should be followed. In regard to system vapor sample collection; "Soil Gas" sample collection guidelines should be followed.

6. Section 4.5-Laboratory Analysis: Columbia Analytical Services, Rochester, New York (NYSDOH certified laboratory, ID#: 10145) will be performing the condensate water sample analysis and the system vapor sample analysis.

- System Vapor Sample analytical method: USEPA Method TO-15 (modified list plus the top 15 tentatively identified compounds (TICs) including the TIC Freon 22). For analyte list, please refer to Table C-2 of the SAP, Operable Unit 3, Soil Gas Interim Remedial Measure (ARCADIS February 2008).

- Condensate Water Sample analytical method:USEPA 8260. For analyte list, please refer to Table C-3 of the SAP, Operable Unit 3, Soil Gas Interim Remedial Measure (ARCADIS February 2008).

7. Section 4-7-Data Validation: Analytical data for water condensate and system vapor samples collected during this event will receive an ARCADIS Level 1 data validation review. A Level 1 review includes checking the following: chain-of-custody; case narrative, holding time, trip/field/method blanks, and blind duplicate precision. The data validation will be performed by an experienced ARCADIS data validator. A data validation memo, delineating any comments, notes and/or applied qualification to the data, will be prepared for each sample delivery group (SDG) or data package received by the laboratory for such samples.

Columbia Analytical Services INC.
An Employee - Owned Company

QUALITY ASSURANCE MANUAL

©Columbia Analytical Services, Inc.
1 Mustard St. Suite 250
Rochester, NY 14609

Phone: (585) 288-5380
Fax: (585) 288-8475

Revision Date: March 29, 2006
Effective Date: April 10, 2006

Approved by:
Laboratory Director: Michael K Perry
Mike Perry

Quality Assurance Program Manager: Lisa Reyes 3/30/06
Lisa Reyes

Annual review of this QAM has been performed and the QAM still reflects current practice.
Initials: LMR Date: 5/11/07
Initials: ______ Date: __________
Initials: ______ Date: __________

DOCUMENT CONTROL
NUMBER: QAM-002
Initials: [illegible] Date: 4/10/06

2.0 TABLE OF CONTENTS

Figures Page

Appendices

3.0 INTRODUCTION AND COMPANY QUALITY ASSURANCE POLICY

Columbia Analytical Services, Inc. (CAS) is a professional consulting laboratory which performs chemical and microbiological analyses on a wide variety of sample matrices, including drinking water, groundwater, surface water, wastewater, soil, sediment, sludge, tissue, industrial and hazardous waste, and other material. CAS/Rochester is a part of a multi Lab Network operating throughout the USA. See Corporate Organization Chart (Appendix B) for locations.

It is a policy at CAS that there will be sufficient Quality Assurance (QA) activities conducted in the laboratory to ensure that all analytical data generated and processed will be scientifically sound, legally defensible, of known and documented quality, and will accurately reflect the material being tested. This goal is achieved by ensuring that adequate Quality Control (QC) procedures are used throughout the monitoring process, and by establishing a means to assess performance of these Quality Control and other QA activities. Under the authority of the owner of CAS, a quality policy statement is available under separate cover and is posted on the employee bulletin board.

We recognize that quality assurance requires a commitment to quality and ethics by everyone in the organization - individually, within each operating unit, and throughout the entire laboratory. All employees of CAS undergo lengthy data integrity training and are encouraged to participate in CAS open door policy to ensure a quality product and protect employees from any undue pressures. CAS also has stringent requirements and signed statements from employees to protect client confidentiality and ethical agreements. All personnel must familiarize themselves with the quality documentation and implement the policies and procedures in their work.

The information in this document has been organized according to the format described in *National Environmental Laboratory Accreditation Program (NELAP) Quality Systems Standards*, July 2003 in order to meet the compliance requirements of this standard. This document is controlled under policies required by CAS Document Control SOP (ADM-DOCCTRL). Each CAS network laboratory maintains its own lab specific Quality Assurance Manual.

4.0 QUALITY SYSTEM PROGRAM DESCRIPTION

The purpose of the QA program at CAS is to ensure that our clients are provided with analytical data that is scientifically sound, legally defensible, and of known and documented quality. The concept of Quality Assurance can be extended, and is expressed in the Vision of CAS:

> "CAS Holdings, Inc. applies creative thinking and strategic integration of our talents to be the best in all business endeavors we pursue. The Company is a leader in our industry demonstrated by:
>
> - Unprecedented customer satisfaction
> - Sustained profitability
> - Exceptional technical excellence
> - Superior Quality Systems
>
> We value our company's most valuable asset, our employee-owners. We are committed to make CAS Holdings Inc the preferred place to work and grow as individuals and professionals."

In support of this vision, our QA program addresses all aspects of laboratory operations, including laboratory organization and personnel, standard operating procedures, sample management, sample and quality control data, calibration data, standards traceability data, equipment maintenance records, method proficiency data (such as method detection limit studies and control charts), document storage and staff training records.

4.1 Facilities and Equipment

CAS features over 17,000 square feet of laboratory and administrative workspace at its Rochester, NY location. The facility is secured to the rest of the building using a swipe card entry system. Upon hire, each employee is assigned an access card and security code that must be used with their card. This employee-specific card provides access to the lab. SOP's are in place to protect the integrity of samples throughout the laboratory process (SMO-ICOC). A company software Quality Assurance plan exists to provide standard procedures to protect the integrity of electronic data. The laboratory has been designed and constructed to provide safeguards against cross-contamination of samples and is arranged according to work function, which enhances the efficiency of analytical operations.

Specialized areas include:

- Shipping and Receiving/Purchasing

- Sample Management Office (including a separate, controlled-access sample storage area)
- Inorganic/Metals Sample Preparation Laboratories (2)
- ICP and ICP/MS Laboratory
- AA Laboratory
- Water Chemistry & General Chemistry Laboratories
- Gas Chromatography Laboratory (including a separate sample preparation laboratory)
- Gas Chromatography/Mass Spectrometry Laboratory (including a separate sample preparation laboratory)
- Volatile Organics Laboratory (including a separate standard preparation laboratory)
- HPLC and Petroleum Laboratory (including GC and GC/MS)
- Microbiology Laboratory
- Laboratory Deionized Water System
- Laboratory Management, Client Service, Report Generation and Administration
- Data Archive
- Information Technology (IT) and LIMS
- Hazardous Waste Storage Area

In addition, segregated laboratory areas were designed for efficient and safe handling of a variety of sample types. Figures 4-1, 4-2, and 4-3 shows the facility location and layout of our Rochester, NY location. The laboratory is equipped with state-of-the-art analytical and administrative support equipment. Appendix A lists the major equipment at the Rochester facility, illustrating the laboratory's depth and overall capabilities. All analytical instrumentation must be verified for each test prior to reporting data to ensure documented quality (see analytical SOPs and/or ADM-TRANDOC).

Good housekeeping is an essential practice at CAS. Each department is responsible for their own area, keeping isles clear, counters free of debris and chemicals that may cause contamination during analysis. A contracted cleaning service removes all garbage and recyclables, mops the floors, and vacuums each working day.

4.2 Technical Elements of the Quality Assurance (QA) Program

4.2.1 Quality Assurance Manual.

This document describes in detail the company's quality assurance program as well as provides information about test methods available, personnel, equipment, and facilities. The contents of the manual are reviewed annually by the Quality Assurance Program Manager (QAPM) and revised as needed to ensure that it continuously reflects current policies and practices. Personnel information is also updated annually as needed. The QAPM and the Lab Manager must approve all revisions before they are put into effect.

4.2.2 Standard Operating Procedures (SOPs) and Laboratory Notebooks.

CAS maintains SOPs for use in both technical and administrative functions. Included in the list of available SOPs are procedures for the preparation of an SOP document, and for enforcing the control of documents through the laboratory

(ADM-SOP & ADM-DOCCTRL, respectively). Each SOP is implemented as written and has been reviewed and approved by the Laboratory Director, the Quality Assurance Program Manager. In most cases, the SOP has also been approved by the appropriate laboratory supervisor. The SOPs are reviewed annually and are revised as necessary to reflect actual objectives, flow of tasks, and staff responsibilities. The document control process associated with an SOP ensures that only the most currently prepared version of an SOP is being used for guidance and instruction. In addition to SOPs, each laboratory supervisor maintains a current file of all the promulgated methodology used to perform analyses. This file is accessible to all laboratory staff regardless of discipline. Laboratory notebook entries have been standardized following the guidelines in the *Making Entries into Logbooks and onto Benchsheets* SOP (SOP No. ADM-DATANTRY). The entries made into laboratory notebooks are reviewed and approved by the appropriate supervisor at a regular interval (e.g. monthly, quarterly, etc...)

4.2.3 Standard Reference Materials

All analytical measurements generated at CAS are performed using materials and/or processes that are traceable to a Standard Reference Material (SRM). Metrology equipment (analytical balances, thermometers, etc...) is calibrated using SRMs traceable to the National Institute of Standards and Technology (NIST). Consumable SRMs routinely purchased by the laboratories (e.g. primary stock standards) are purchased from nationally-recognized, reputable vendors. Most vendors have fulfilled the requirements for ISO 9001 certification and/or are accredited by A_2LA. Traceability throughout the laboratory is accomplished by following the guidelines set in the SOP, *Making Entries Into Logbooks and Onto Benchsheets* (ADM-DATANTRY).

All sampling containers provided to the client by the laboratory are purchased as precleaned (Level 1) containers, with certificates of analysis available for each bottle type. Certifications of Analysis provided by the vendors of reference materials and bottles are reviewed prior to use and kept on file by the laboratory.

4.2.4 Operational Assessments

There are a number of methods used to assess the laboratory and its daily operations. In addition to the routine quality control (QC) measurements used by a laboratory to measure quality, the senior laboratory management staff at CAS examine a number of other performance indicators to assess the overall ability of the laboratory to successfully perform analyses for its clients. On-time performance, Analytical Report defect rate and Customer Invoice defect rate are a few of the measurements performed at CAS that are used to assess performance from an external perspective (i.e. client satisfaction). A frequent, routine assessment must also be made of the laboratory's facilities and resources in anticipation of accepting an additional or increased workload. CAS utilizes a number of different methods to insure that adequate resources are available in anticipation of the demand for service. Regularly scheduled senior staff meetings, tracking of outstanding proposals and an accurate, current synopsis of incoming work all assist the senior staff in properly allocating resources to achieve the required results.

4.2.5 Additional Quality Records

Quality Reports to Management, Internal and External Audits, and NCAR Forms discuss quality assurance program issues, continuous process improvements, and corrective actions throughout the program and are the responsibility of the QAPM.

4.2.6 Deviation from Standard Operating Procedures, Policies, or Standard Specifications

When a customer requests a modification to an SOP, policy, or standard specification the Project Manager handling that project must discuss the proposed deviation with the lab director, departmental manager, or QA to obtain approval for the deviation. It is recommended that all project-specific requirements must be on-file and with the service request upon logging in the samples. A Project-Specific Communication Form is available to document such deviations.

4.3 Subcontracting

Analytical services are subcontracted when CAS/Rochester needs to balance workload and/or when the requested analyses are not performed in Rochester. However, subcontracting is only done with the knowledge and approval of the client. Subcontracting to another CAS laboratory is preferred over external-laboratory subcontracting. Further, subcontracting is only done to capable and qualified laboratories approved by the client. Subcontractors must be accredited by the applicable state or program to which apply to the samples being analyzed. Established procedures are followed to qualify external subcontract laboratories, see *Qualifying Subcontract Labs* (ADM-SUBLAB).

Figure 4-1
CAS/Rochester Laboratory Floor Plan

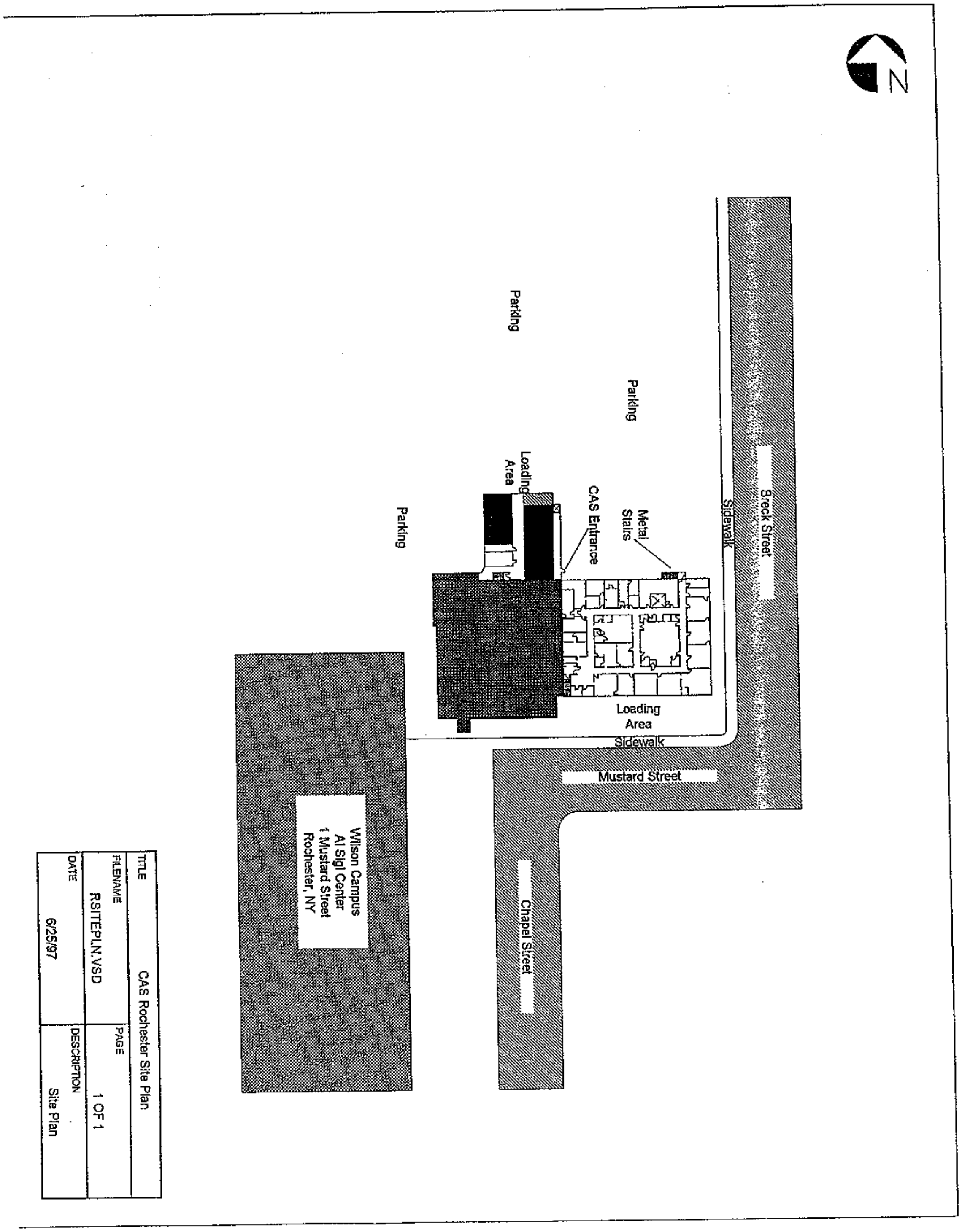


Figure 4-2
CAS/Rochester Laboratory Floor Plan

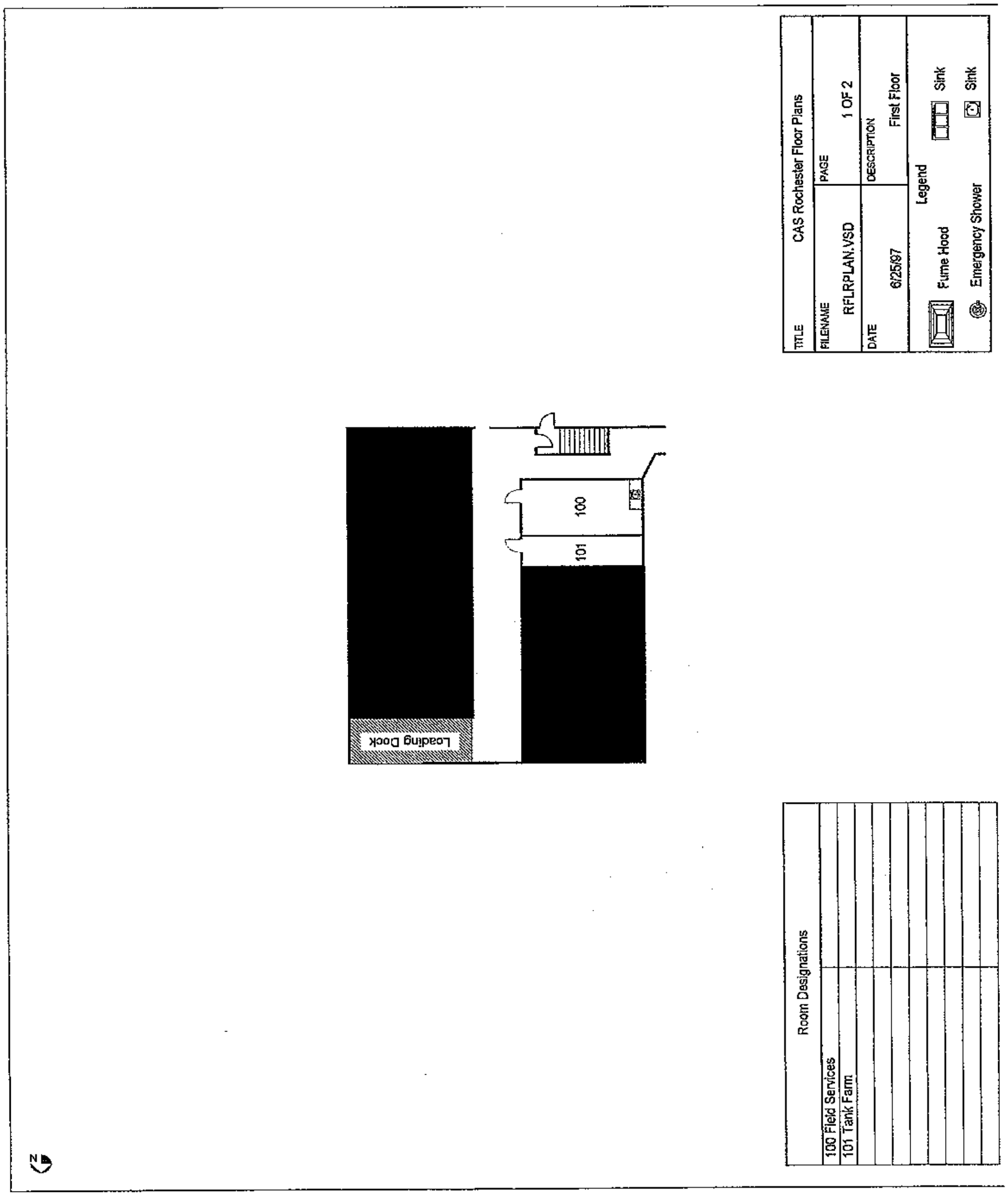
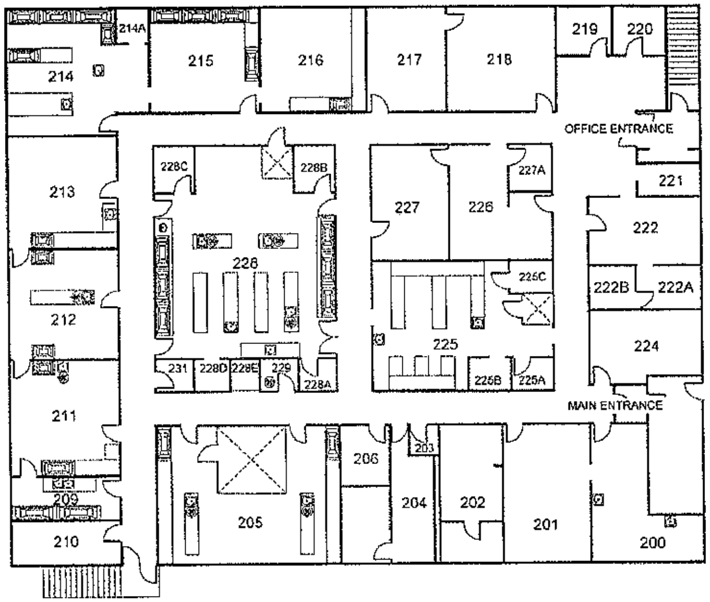


Figure 4-3
CAS/Rochester Laboratory Floor Plan



Room Designations			
200 HPLC and Pet Lab	212 Metal Furnace Lab	222 Copy and Mail Center	227A Project Management Files
201 Sample Storage	213 Metals ICP Lab	222A IT Director Office	228 General Chemistry Laboratory
202 Restroom (W)	214 SVOA Prep Laboratory	222B Computer Room	228A TOX/TOC Laboratory
203 Mop Closet	215 SVOA Prep Laboratory	224 Secure On-site Record Storage	228B Deionized Water System Room
204 Restroom (M)	216 SVOA GC&GCMS Laboratory	225 Volatile Organics Laboratory	228C Metals Office
205 Breakdown	217 Sales Office	225A Office	228D Gen Chem Storage
206 Restroom (ADA)	218 Project Management Office	225B Office	228E BOD Incubator
209 TCLP Lab	219 Lab Director Office	225C Prep Room	229 Microbiology Laboratory
210 Waste Storage	220 QA/Safety Coordinator Office	226 Lunch Room	231 Metals Digestates
211 Metals Prep	221 Office Supply Storage	227 Conference Room	

TITLE CAS Rochester Floor Plans	
FILENAME RMDESIG.VSD	PAGE 2 OF 2
DATE 7/8/04	DESCRIPTION Second Floor

Legend

Fume Hood

Emergency Shower

Sink

Sink

Walk-in Cooler

Eyewash

5.0 STATEMENT OF PROFESSIONAL CONDUCT AND LABORATORY PRACTICE

One of the most important aspects of the success of CAS as a company is the emphasis placed on the integrity of the data provided and the services rendered. This success is reliant on both the professional conduct of all employees within CAS as well as established laboratory practices. All personnel involved with environmental testing and calibration activities must familiarize themselves with the quality documentation and implement the policies and procedures in their work.

5.1 Professional Conduct

To promote quality, CAS requires certain standards of conduct and ethical performance among employees. The following examples of documented CAS policy are representative of these standards, and are not intended to be limiting or all-inclusive:

- Under no circumstances is the willful act of fraudulent manipulation of analytical data condoned. Such acts are to be reported immediately to senior management for appropriate corrective action.
- Unless specifically required in writing by a client, alteration, deviation or omission of written contractual requirements is not permitted. Such changes must be in writing and approved by senior management.
- Falsification of data in any form will not be tolerated. While much analytical data is subject to professional judgment and interpretation, outright falsification, whenever observed or discovered, will be documented, and appropriate remedies and punitive measures will be taken toward those individuals responsible.
- Unauthorized release of confidential information about the company or its clients is taken very seriously and is subject to formal disciplinary action. All employees sign a confidentiality agreement upon hire to protect the company and client's confidentiality and proprietary rights.

5.2 Prevention and Detection of Improper, Unethical or Illegal Actions

It is the intention of CAS to proactively prevent and/or detect any improper, unethical or illegal action conducted within the laboratory. This is performed by the implementation of a program designed for not only the detection but also prevention. Prevention consists of educating all laboratory personnel in their roles and duties as employees, company policies, inappropriate practices, and their corresponding implications as described in Section 5.3 of this document.

In addition to education, appropriate and inappropriate practices are included in SOPs such as manual integration, data review and specific method procedures. Other aspects of this program include electronic data tape audits, post-analysis and whenever possible single blind and/or double blind analyses. All aspects of this program is documented and retained on file according to the company policy on record retention.

5.3 Laboratory Ethics Training Plan (Data Integrity Training Plan)

Laboratory ethics training (approximately 8-hours) is held annually for every new on-site employee including all full and part time personnel. The training session includes at a minimum the following legal and ethical topics:

- Triggers and types of unethical behavior
- CAS Employee Handbook (overview including mechanism for reporting and seeking advice on ethical decisions, organizational mission and its relationship to critical need for honesty and full disclosure).
- CAS' Commitment to Excellence in Data Quality (overview including legal consequences and specific examples of breaches of ethical behavior)
- Discuss and review all data integrity procedures and documentation
- Measures taken to prevent and detect fraud; how and when to report data integrity issues.
- Record keeping and examples of data falsification or misrepresentation
- Acceptable and unacceptable solutions to typical laboratory problems (emphasis on the importance of proper written narration by the analyst with respect to where analytical data may be useful, but in some way partially deficient)
- Data validation (in-depth data monitoring and electronic audits)
- Implications of laboratory data fraud and data investigations
- Potential punishments and penalties for improper, unethical or illegal actions (immediate termination, or civil/criminal prosecution)

It is the responsibility of the Quality Assurance Program Manager to ensure that the training plan described in this section including content and frequency is conducted. All employees may review the mechanism for reporting and seeking advice on ethical decisions as well as the legal consequences of unethical behavior in the CAS Employee Handbook & CAS Commitment to Excellence in Data Quality Statement, both of which are available to all employees. In addition, the Excellence in data Quality Statement is reviewed and signed on an annual basis by all laboratory personnel. Also, all employees are required to complete an ethics "refresher" training (approximately 1-hour) session. The subject and content are generally at the discretion of the Corporate Quality Assurance Department.

5.4 Laboratory Practices Affecting Personnel

CAS makes an attempt to ensure that it is impartial and it's employees are free from any commercial, financial, or other undue pressures that might affect their technical judgement or quality of work. This is accomplished by utilizing each of the following policies, programs and procedures, wherever necessary.

CAS Corporate Ethics Point Program – An anonymous and confidential reporting system available to all employees that is used to communicate misconduct and other concerns. The program shall help minimize negative morale and promote a positive work place. Associated upper management is notified and the investigations are documented.

- Open Door Policy (CAS Employee Handbook) – Employees are encouraged to bring any work related problems or concerns to the attention of local management or their Human Resources representative. However, depending on the extent or sensitivity of the concern, employees are encouraged to directly contact any member of upper management.

- Project Scheduling – Jobs are scheduled (when prior notice is available) according to capacity and work schedules set and discussed by customer service personnel and laboratory supervisors. The scheduling is done not only to prevent missed holding times and on-time deliveries but as a way for management and analysts to be prepared for incoming samples and to utilize flexible work schedules, whenever necessary.

- Flexible Work Hours – Analysts are able to work flexible work hours (with management approval). Additionally, analysts may "team" with a co-worker (again with approval) and work split shifts in order to extend the work day and increase the number of samples that can be analyzed, whenever necessary.

- Gifts and Favors (CAS Employee Handbook) – To avoid possible conflict of interest implications, employees do not receive unusual gifts or favors to, nor accept such gifts or favors from, persons outside the Company who are, or may be, in any way concerned with the projects on the Company is professionally engaged. Anything beyond an occasional meal, an evening's entertainment, or a nominal holiday gift is considered an "unusual gift or favor".

6.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The CAS/Rochester staff, consisting of approximately 50 employees, includes chemists, technicians and support personnel. They represent diverse educational backgrounds and experience, and provide the comprehensive skills that a modern, state-of-the-art analytical laboratory requires.

CAS is committed to providing an environment that encourages excellence. Everyone within CAS shares responsibility for maintaining and improving the quality of our analytical services. The responsibilities of key personnel within the laboratory are described below. An organizational chart of the laboratory, as well as the resumes of key personnel, can be found in Appendix B. Specific Job Descriptions are available and kept on file by human resources.

- The role of the **Laboratory Director** is to provide technical, operational, and administrative leadership through planning, allocation and management of personnel and equipment resources. This person is responsible for quality (including compliance with the current version of the Quality Systems, NELAC, Chapter 5), overall laboratory efficiency, and financial performance of the Rochester CAS facility. The Laboratory Director also provides support for business development by identifying and developing new markets and through continuing support of the management of existing client activities. The Lab Director, QA Program Manager and Business Development Manager are authorized signatories for the Rochester facility.
- The responsibility of the **Quality Assurance Program Manager** (QAPM) is to provide a focus for overall QA activities within the laboratory and maintain compliance with the Quality Systems Standards (NELAC, Chapter 5). This person works with individual laboratory production units to establish effective quality assurance and quality control. The QAPM is also responsible for maintaining this QA Manual and performing an annual review of it, updating it if necessary; reviewing, approving, and controlling SOPs; ensure continuous process improvements through the use of control charts and proficiency test samples; reviewing data (Section 12.0); maintaining the laboratory's certifications and approvals (Section 13.0); performing internal QA audits (Section 13.0); preparing QA reports (Section 16.0); maintaining training documentation for all employees including IDCs, CDCs, Training Plan forms, and seminar attendance; maintaining MDL study documentation, responding to QA needs, problems, and requests from technical staff. This person is a technical advisor and is responsible for summarizing and reporting overall unit performance.
- The Quality Assurance Director (Corporate Quality Assurance) is responsible for the overall QA program at all the CAS laboratories. The QA Director is responsible for performing an annual on-site audit at each CAS laboratory and preparing a written report; maintaining a data base of information about state certifications and accreditation programs; writing laboratory-wide SOPs; maintaining a data base of CAS-approved subcontract laboratories; providing assistance to QAPMs and laboratory managers; preparing an annual QA activity report; etc.

- The **Health and Safety Officer** is responsible for the administration of the laboratory health and safety policies. This includes the formulation and implementation of safety policies, the supervision of new-employee safety training, the review of accidents, incidents and prevention plans, the monitoring of hazardous waste disposal and the conducting of departmental safety inspections. The safety officer is also designated as the Chemical Hygiene Officer.
- The **Client Services Manager** is responsible for the Client Services Department (customer services/project managers, and marketing functions). The Client Services Department provides a complete interface with clients from initial project specification to final deliverables.
- The **Project Manager** is a senior-level, non-line scientist assigned to each client to act as a technical liaison between the client and the laboratory. The Project Manager is responsible for ensuring that the analyses performed by the laboratory meet all project, contract, and regulatory-specific requirements. This entails coordinating with the CAS laboratory and administrative staff to ensure that client-specific needs are understood, and that the services CAS provides are properly executed and satisfy the requirements of the client.
- **Information Technology** (IT) staff are responsible for the administration of the Laboratory Information Management System (LIMS) and other necessary support services. Other functions of the IT staff include laboratory network maintenance, education of analytical staff in the use of scientific software, custom software development and implementation, Electronic Data Deliverable (EDD) generation and data back-up, archival and integrity operations.
- The Analytical Laboratory is divided into operational units, based upon specific disciplines. Each department is responsible for establishing, maintaining and documenting a quality control program based upon the requirements within the Quality Assurance Manual. Each **Department Supervisor/Manager** has the responsibility to ensure that quality control functions are carried out as planned, and to guarantee the production of high quality data. Supervisors have the responsibility to monitor the day-to-day operations to ensure that productivity and data quality objectives are met. Each analyst in the laboratory has the responsibility to carry out testing according to prescribed methods, standard operating procedures and quality control guidelines particular to the laboratory in which he/she is working.
- The **Sample Management Office** plays a key role in the laboratory QA program by providing documentation for all samples received by the laboratory, distributing samples, and maintaining proper storage.
- **Support Services** are provided by corporate purchasing departemtn and/or local purchasing representative to coordinate facility and instrument maintenance, ordering of standards, supplies, reagents, and any other services required.

Analytical work will be conducted by the laboratory under the approval of the client. If any aspect of a project requires sub-contracting, CAS project manager shall notify the client and obtain approval for any sub-contractors prior to completing the analytical program.

7.0 SAMPLING, SAMPLE PRESERVATION, AND HANDLING PROCEDURES

The quality of analytical results is highly dependent upon the quality of the procedures used to collect, preserve and store samples. CAS recommends that clients follow sampling guidelines described in specificly reference methods including EPA, NIOSH, ASTM, and SW846. Sample handling factors that must be taken into account to insure accurate, defensible analytical results include:

- Amount of sample taken
- Type of container used
- Type of sample preservation
- Sample storage time
- Proper custodial documentation

CAS uses the sample preservation, container, and holding-time recommendations published in a number of documents. The primary documents of reference are: USEPA SW-846, Third Edition (wastewater, soils, and hazardous waste samples), USEPA 600/4-79-020 and 600/4-82-057 (wastewater samples), USEPA 600/4-88-039, 600/4-91-010 and 600/R-93/100 (drinking water samples) and NIOSH, Manual of Analytical Methods 4th Edition (air samples) . The complete citation for each reference can be found in section 18.0 of this document. The container, preservation and holding time information are summarized in Table 7-1.

CAS routinely provides sample containers with appropriate preservatives for our clients. The containers are purchased as "precleaned" to a level 1 status, and conform to the requirements for analytical sample established by the USEPA. Certificates of analysis for the sampling containers are available upon request. Our sample kits typically consist of foam-lined, precleaned shipping coolers, specially prepared and labeled sample containers individually wrapped in bubble wrap, chain-of-custody (COC) forms, and custody seals. An example of a sample container label and a custody seal is shown in Figure 7-1. Figure 7-2 is a copy of the chain-of-custody form used at CAS. For extremely large sample container shipments, the containers may be shipped in their original boxes. Such shipments will consist of several boxes of labeled sample containers and sufficient materials (bubble wrap, COC forms, custody seals, shipping coolers, etc...) to allow the sampling personnel to process the sample containers and return them to CAS. The proper preservative will be always be added to the sample containers or provided in a separate vial prior to shipment, unless otherwise instructed by the client. CAS keeps client-specific shipping requirements on file and utilizes all major transportation carriers to guarantee that sample shipping requirements (same-day, overnight, etc.) are met. CAS also provides its own courier service that makes regularly scheduled trips to the Buffalo, Rochester area.

Table 7-1
Sample Preservation and Holding Times[a]

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Bacterial Tests				
Coliform, Fecal and Total	W	P,G	Cool, 4°C, 0.008% $Na_2S_2O_3$[d]	6-24 hours[e]
Inorganic Tests				
Acidity	W	P,G	Cool, 4°C	14 days
Alkalinity	W	P,G	Cool, 4°C	14 days
Ammonia	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Biochemical Oxygen Demand (BOD)	W	P,G	Cool, 4°C	48 hours
Bromide	W	P,G	None Required	28 days
Chemical Oxygen Demand (COD)	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Chloride	W	P,G	None Required	28 days
Chlorine, Total Residual	W	P,G	None Required	24 hours
Color	W	P,G	Cool, 4°C	48 hours
Cyanide, Total and Amenable to Chlorination	W	P,G	Cool, 4°C, NaOH to pH>12, plus 0.6 g Ascorbic Acid	14 days
Cyanide, Weak Acid Dissociable	W	P,G	Cool, 4°C, NaOH to pH >12	14 days
Fluoride	W	P,G	None Required	28 days
Hardness	W	P,G	HNO_3 or H_2SO_4 to pH<2	6 months
Hydrogen Ion (pH)	W	P,G	None Required	24 hours
Ignitability	W	G	None Required	14 days
Kjeldahl and Organic Nitrogen	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Nitrate	W	P,G	Cool, 4°C	48 hours
Nitrate-Nitrite	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Nitrite	W	P,G	Cool, 4°C	48 hours
Orthophosphate	W	P,G	Filter Immediately, Cool, 4°C	48 hours
Oxygen, Dissolved (Probe)	W	G, Bottle and Top	None Required	Analyze immediately
Oxygen, Dissolved (Winkler)	W	G, Bottle and Top	Fix on Site and Store in Dark	8 hours
Phenolics, Total	W	G Only	Cool, 4°C, H_2SO_4 to pH<2	28 days
Phosphorus, Elemental	W	G Only	Cool, 4°C	48 hours
Phosphorus, Total	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Residue, Total	W	P,G	Cool, 4°C	7 days
Residue, Filterable (TDS)	W	P,G	Cool, 4°C	7 days
Residue, Nonfilterable (TSS)	W	P,G	Cool, 4°C	7 days
Residue, Settleable	W	P,G	Cool, 4°C	48 hours
Residue, Volatile	W	P,G	Cool, 4°C	7 days

Table 7-1 (continued)
Sample Preservation and Holding Times[a]

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Silica	W	P Only	Cool, 4°C	28 days
Specific Conductance	W	P,G	Cool, 4°C	28 days
Sulfate	W	P,G	Cool, 4°C	28 days
Sulfide	W	P,G	Cool, 4°C, Add Zinc Acetate plus Sodium Hydroxide to pH>9	7 days
Sulfite	W	P,G	None Required	24 hours
Surfactants (MBAS)	W	P,G	Cool, 4°C	48 hours
Tannin and Lignin	W	P,G	Cool, 4°C	28 days
Temperature	W	P,G	None Required	Analyze immediately
Turbidity	W	P,G	Cool, 4°C	48 hours
Metals				
Chromium VI	W	P,G	Cool, 4°C	24 hours
Mercury	W	P,G	HNO_3 to pH<2	28 days
	S	P,G	Cool, 4°C	28 days
Metals, except Chromium VI and Mercury	W	P,G	HNO_3 to pH<2	180 days
	S	G, Teflon-Lined Cap	Cool, 4°C	180 days
	A	Filters in Cassettes	None Required	180 days
Organic Tests				
Oil and Grease	W	G, Teflon-Lined Cap	Cool, 4°C, H_2SO_4 to pH<2	28 days
Organic Carbon, Total (TOC)	W	P,G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Organic Halogens, Total (TOX)	W	G, Teflon-Lined Cap	Cool, 4°C, H_2SO_4 to pH<2	28 days
Organic Halogens, Adsorbable (AOX)	W	G, Teflon-Lined Cap	Cool, 4°C, HNO_3 to pH<2	28 days
Petroleum Hydrocarbons, Total Recoverable	W	G, Teflon-Lined Cap	Cool, 4°C, HCl or H_2SO_4 to pH<2	28 days
Petroleum Hydrocarbons, Total	W	G, Teflon-Lined Cap	Cool, 4°C, HCl or H_2SO_4 to pH<2	7 days until extraction; 40 days after extraction
	S	G, Teflon-Lined Cap	Cool, 4°C	14 days until extraction; 40 days after extraction
Petroleum Hydrocarbons, Volatile (Gasoline-Range Organics)	W	G, Teflon-Lined Septum Cap	Cool, 4°C, HCl to pH<2 No Headspace	14 days
	S	G, Teflon-Lined Cap	Cool, 4°C Minimize Headspace	14 days

Table 7-1 (continued)
Sample Preservation and Holding Times[a]

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Volatile Organics				
Purgeable Halocarbons	W	G, Teflon-Lined Septum Cap	**No Residual Chlorine Present:** HCl to pH<2, Cool, 4°C, No Headspace **Residual Chlorine Present:** 10% $Na_2S_2O_3$, HCl to pH<2, Cool, 4°C, No Headspace	14 days
	S	G, Teflon-Lined Cap	Cool, 4°C, Minimize Headspace	14 days
Purgeable Aromatic Hydrocarbons (including BTEX and MTBE)	W	G, Teflon-Lined Septum Cap	**No Residual Chlorine Present:** HCl to pH<2, Cool, 4°C, No Headspace **Residual Chlorine Present:** 10% $Na_2S_2O_3$, HCl to pH<2, Cool, 4°C, No Headspace	14 days
	S	G, Teflon-Lined Cap	Cool, 4°C, Minimize Headspace	14 days
Acrolein, Acrylonitrile, Acetonitrile	W	G, Teflon-Lined Septum Cap	Adjust pH to 4-5, Cool, 4°C, No Headspace	14 days
Semivolatile Organics				
Petroleum Hydrocarbons, Extractable (Diesel-Range Organics)	W,S	G, Teflon-Lined Cap	Cool, 4°C	7 days until extraction;[f] 40 days after extraction
EDB and DBCP	W,S	G, Teflon-Lined Cap	Cool, 4°C, HCl to pH<2, No Headspace	28 days
Alcohols and Glycols	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Phenols	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Phthalate Esters	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Nitrosamines	W,S	G, Teflon-Lined Cap	Cool, 4°C, Store in Dark[g]	7 days until extraction;[f] 40 days after extraction
Organochlorine Pesticides and PCBs	W,S	G, Teflon-Lined Cap	Cool, 4°C	7 days until extraction;[f] 40 days after extraction

Table 7-1 (continued)
Sample Preservation and Holding Times[a]

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Nitroaromatics and Cyclic Ketones	W,S	G, Teflon-Lined Cap	Cool, 4°C, Store in Dark[g]	7 days until extraction;[f] 40 days after extraction
Polynuclear Aromatic Hydrocarbons	W,S	G, Teflon-Lined Cap	Cool, 4°C, Store in Dark[g]	7 days until extraction;[f] 40 days after extraction
Haloethers	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Chlorinated Hydrocarbons	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Organophosphorus Pesticides	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Nitrogen- and Phosphorus-Containing Pesticides	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Chlorinated Herbicides	W,S	G, Teflon-Lined Cap	Cool, 4°C[g]	7 days until extraction;[f] 40 days after extraction
Chlorinated Phenolics	W	G, Teflon-Lined Cap	Cool, 4°C[g]	30 days
Resin and Fatty Acids	W	G, Teflon-Lined Cap	Cool, 4°C[g]	30 days
Carbonyl Compounds (Formaldehyde)	W	G, Teflon-Lined Cap	Cool, 4°C	3 days until extraction, 3 days after extraction
Industrial Hygiene Solvents	A	IH Air Tubes	None Required	14 days from sample collection
Toxicity Characteristic Leaching Procedure (TCLP)				
Mercury	HW	P,G	Sample: Cool, 4°C TCLP extract: HNO_3 to pH<2	28 days until extraction; 28 days after extraction
Metals, except Mercury	HW	P,G	Sample: Cool, 4°C TCLP extract: HNO_3 to pH<2	180 days until extraction; 180 days after extraction
Volatile Organics	HW	G, Teflon-Lined Cap	Sample: Cool, 4°C Minimize Headspace TCLP extract: Cool, 4°C, HCl to pH<2, No Headspace	14 days until extraction; 14 days after extraction

Table 7-1 (continued)
Sample Preservation and Holding Times[a]

DETERMINATION	MATRIX[b]	CONTAINER[c]	PRESERVATION	MAXIMUM HOLDING TIME
Semivolatile Organics	HW	G, Teflon-Lined Cap	Sample: Cool, 4°C, Store in Dark[g] TCLP extract: Cool, 4°C, Store in Dark[g]	14 days until TCLP ext'n; 7 days until extraction; 40 days after extraction
Organochlorine Pesticides	HW	G, Teflon-Lined Cap	Sample: Cool, 4°C TCLP extract: Cool, 4°C	14 days until TCLP ext'n; 7 days until extraction; 40 days after extraction
Chlorinated Herbicides	HW	G, Teflon-Lined Cap	Sample: Cool, 4°C TCLP extract: Cool, 4°C	14 days until TCLP ext'n; 7 days until extraction; 40 days after extraction
Contract Laboratory Program (CLP)				
Cyanide, Total and Amenable to Chlorination	W	P,G	Cool, 4°C, NaOH to pH 12, plus 0.6 g Ascorbic Acid	12 days[h]
	S	P,G	Cool, 4°C	12 days[h]
Mercury	W	P,G	HNO_3 to pH<2	26 days[h]
	S	P,G	Cool, 4°C	26 days[h]
Metals, except Mercury	W	P,G	HNO3 to pH<2	180 days[h]
	S	P,G	Cool, 4°C	180 days[h]
Volatile Organics	W,S	G, Teflon-Lined Cap	W-Cool, 4°C, Minimize Headspace Soil – see SOP	10 days[h]
Semivolatile Organics	W,S	G, Teflon-Lined Cap	Cool, 4°C, Store in Dark[g]	5 days until extraction;[h,i] 40 days after extraction
Organochlorine Pesticides and PCBs	W,S	G, Teflon-Lined Cap	Cool, 4°C	5 days until extraction;[h,i] 40 days after extraction

a See Section 18.0 for sources of holding time information.
b W = Water; S = Soil or Sediment; HW = Hazardous Waste; A = Air
c P = Polyethylene; G = Glass
d For chlorinated water samples
e The recommended maximum holding time is variable, and is dependent upon the geographical proximity of sample source to the laboratory.
f Fourteen days until extraction for soil, sediment, and sludge samples.
g If the water sample contains residual chlorine, 10% sodium thiosulfate is used to dechlorinate.
h Number of days following sample receipt at the laboratory.
i Ten days until extraction for soil, sediment, and sludge samples.

Figure 7-1
Sample Container Label and Custody Seal

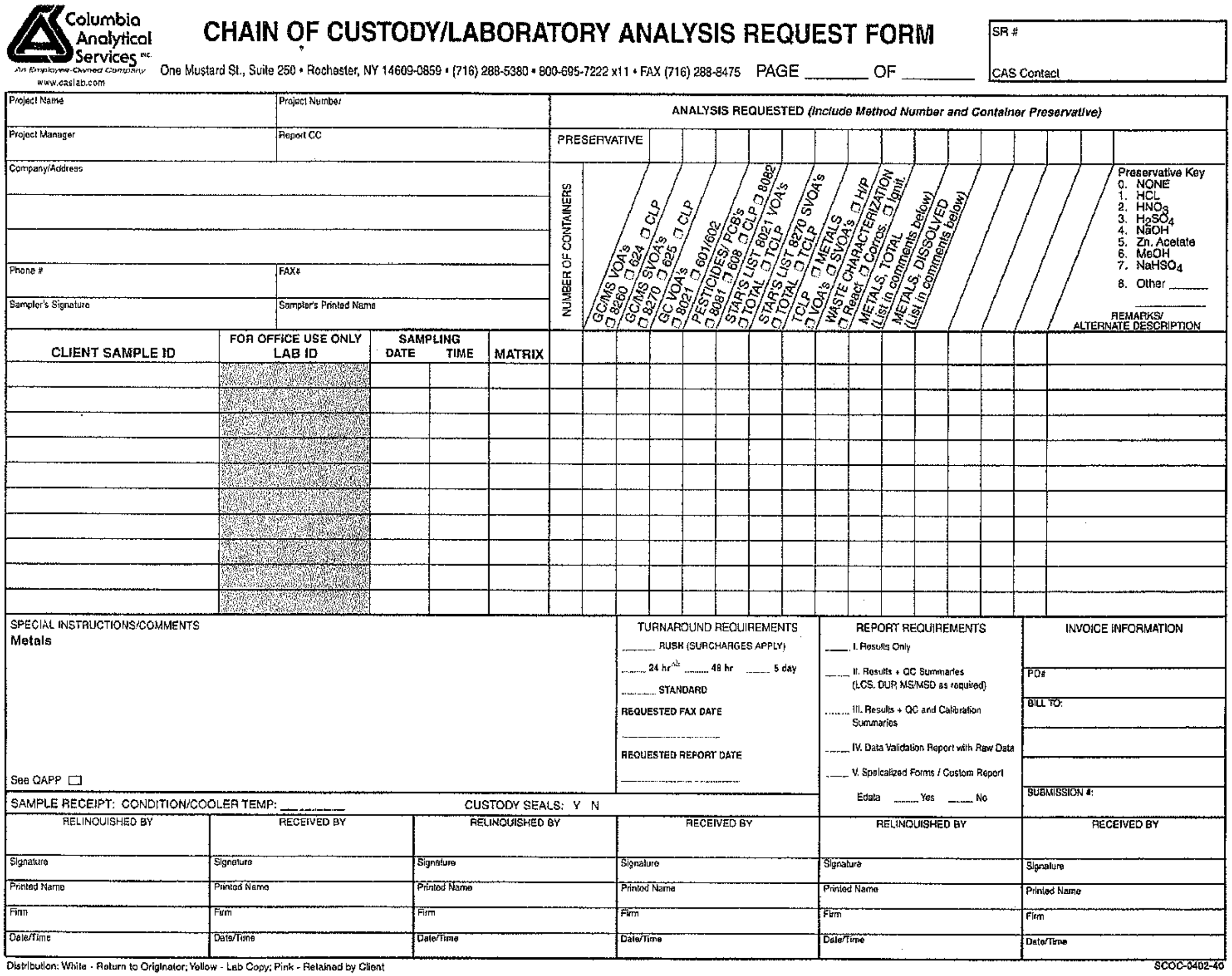
CLIENT: JOB#: 006
LOCATION:
DATE SAMPLED:
ANALYSIS:
PRESERVATIVE:
COMMENTS:

Custody Seal

Date__________ Project ______________________________

Signature__________________________ Container#_____ of _____

Figure 7-2
Chain of Custody Form



Columbia Analytical Services INC.
An Employee-Owned Company
www.caslab.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

One Mustard St., Suite 250 • Rochester, NY 14609-0859 • (716) 288-5380 • 800-695-7222 x11 • FAX (716) 288-8475 PAGE ______ OF ______

SR #
CAS Contact

Project Name	Project Number
Project Manager	Report CC
Company/Address	
Phone #	FAX#
Sampler's Signature	Sampler's Printed Name

ANALYSIS REQUESTED *(Include Method Number and Container Preservative)*

CLIENT SAMPLE ID	FOR OFFICE USE ONLY LAB ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NUMBER OF CONTAINERS	GC/MS VOA's ☐ 8260 ☐ 624 ☐ CLP	GC/MS SVOA's ☐ 8270 ☐ 625 ☐ CLP	GC VOA's ☐ 8021 ☐ 601/602	PESTICIDES/ PCB's ☐ 8081 ☐ 608 ☐ CLP ☐ 8082	STAR'S LIST 8021 VOA's ☐ TOTAL ☐ TCLP	STAR'S LIST 8270 SVOA's ☐ TOTAL ☐ TCLP	TCLP ☐ METALS ☐ VOA's ☐ SVOA's ☐ H/P	WASTE CHARACTERIZATION ☐ React. ☐ Corros. ☐ Ignit.	METALS, TOTAL (List in comments below)	METALS, DISSOLVED (List in comments below)					REMARKS/ ALTERNATE DESCRIPTION
					PRESERVATIVE															

Preservative Key
0. NONE
1. HCL
2. HNO_3
3. H_2SO_4
4. NaOH
5. Zn. Acetate
6. MeOH
7. $NaHSO_4$
8. Other ______

SPECIAL INSTRUCTIONS/COMMENTS
Metals

See QAPP ☐

TURNAROUND REQUIREMENTS
______ RUSH (SURCHARGES APPLY)
______ 24 hr ______ 48 hr ______ 5 day
______ STANDARD
REQUESTED FAX DATE
______
REQUESTED REPORT DATE
______

REPORT REQUIREMENTS
______ I. Results Only
______ II. Results + QC Summaries (LCS, DUP, MS/MSD as required)
______ III. Results + QC and Calibration Summaries
______ IV. Data Validation Report with Raw Data
______ V. Spelcalized Forms / Custom Report
Edata ______ Yes ______ No

INVOICE INFORMATION
PO#
BILL TO:
SUBMISSION #:

SAMPLE RECEIPT: CONDITION/COOLER TEMP: ______ CUSTODY SEALS: Y N

RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY
Signature	Signature	Signature	Signature	Signature	Signature
Printed Name	Printed Name	Printed Name	Printed Name	Printed Name	Printed Name
Firm	Firm	Firm	Firm	Firm	Firm
Date/Time	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time

Distribution: White - Return to Originator; Yellow - Lab Copy; Pink - Retained by Client

SCOC-0402-40

8.0 SAMPLE CUSTODY

Standard Operating Procedures have been established for the receiving of samples into the laboratory. These procedures ensure that samples are received and properly logged into the laboratory, and that all associated documentation, including chain of custody forms, is complete and consistent with the samples received.

Sample Acceptance Policy:

Samples delivered to the CAS Sample Management Office (SMO) and are received by a Sample Custodian. The Chain of Custody (COC) is reviewed for completeness and accuracy and a Cooler Receipt and Preservation Form (CRPF) (Figure 8-1) is used to document the condition of the cooler and its contents as received by the sample custodian. Verification of sample integrity by the Sample Custodian includes the following activities:

- Assessment of custody seal presence/absence, location and signature.
- Temperature of sample containers upon receipt.
- Chain of custody documents present and properly completed.

  Entries should be made in blue or black ink and at a minimum, shall include sample identification, description, date, time, and location of sample collection, the name and signature(s) of the sample collector and intermediate sample custodian(s), date and time of each sample transfer, and signature of the CAS Sample Custodian upon receipt. For an example COC, see Figure 7-2.
- Sample containers checked for integrity (broken, leaking, etc...)
- Sample is clearly marked with the sample ID, date and time of collection.
- Appropriate containers (size, type) are received for the requested analyses.
- Sample container labels and/or tags agree with chain of custody entries (Identification, required analyses, etc...)
- Assessment of proper sample preservation (If inadequate, corrective action is employed).
- VOC containers are inspected for the presence/absence of bubbles. (No assessment of proper preservation is performed for VOC containers by SMO personnel).

Any anomalies or discrepancies observed during the initial assessment are recorded on the CRPF and/or chain of custody documents. All potential problems with a sample shipment are addressed by contacting the client and discussing the pertinent issues. When the Project Manager and client have reached a satisfactory resolution, the log-in process may commence. The laboratory has formally accepted the samples. If resolution cannot be reached with the client or the samples do not comply with the requirements of the CRPF, these samples may be rejected by the laboratory.

Sample Log-in;

During the log-in process, each sample is given a unique laboratory code and an analytical request form is generated. The laboratory code consists of an order number and submission number. Each sample is given an order number by the LIMS system based upon the order of log-in. A submission number is assigned to a particular job in the same manner. The submission number is coded with the lab location and year as follows:

e.g. Submission No. R20001784 = R - Rochester
20 - Year 2000
001784 - Job Number (sequential number of jobs logged)

The analytical request contains client information, sample descriptions, sample matrix information, required analyses, sample collection dates, analysis due dates and other pertinent information. This analytical request is reviewed by the appropriate Project Manager for accuracy, completeness, consistency of requested analyses and for client project objectives and COC.

Each container received by the lab receives a unique barcode which is scanned by those handling the sample for storage, analysis, or disposal. The sample tracking information from the scan is put in a database which can create a complete Internal Chain of Custody for each sample container. This information is reported in package reports only.

All samples, except those designated for metals analyses, are kept in a refrigerated condition until they undergo analysis. CAS stores samples in one of three walk-in refrigerators. These refrigerators are segregated by method of analysis. The temperature of each storage facility used at CAS is monitored daily and the data recorded in a logbook.

Disposal:

Upon completion of all analyses, most aqueous and soil samples and sample extracts are retained at 0-6°C refrigerators for 30 days (unless other arrangements have been made in advance). Upon expiration of these time limits, the samples are either returned to the client or disposed of according to approved disposal practices. All samples are characterized according to hazardous/non-hazardous waste criteria and are segregated accordingly. All hazardous waste samples are disposed of according to formal procedures outlined in the Sample Disposal SOP (SMO-SPLDIS). It should be noted that all waste produced at the laboratory, including the laboratory's own various hazardous waste streams, is treated in accordance with all applicable local and Federal laws. The bar coding system used to track samples through the lab, including disposal, produces cradle to grave sample history for each sample aliquot.

Figure 8-1

Cooler Receipt And Preservation Check Form

Project/Client______________________Submission Number______________.

Cooler received on________ by:_______ **COURIER:** CAS UPS FEDEX CD&L CLIENT

1. Were custody seals on outside of cooler? YES NO
2. Were custody papers properly filled out (ink, signed, etc.)? YES NO
3. Did all bottles arrive in good condition (unbroken)? YES NO
4. Did any VOA vials have significant air bubbles? YES NO N/A
5. Were **Ice** or **Ice packs** present? YES NO
6. Where did the bottles originate? CAS/ROC, CLIENT
7. Temperature of cooler(s) upon receipt: ______ ______ ______ ______ ______

Is the temperature within 0° - 6° C?: Yes Yes Yes Yes Yes

If No, Explain Below No No No No No

Date/Time Temperatures Taken: ______________________________

Thermometer ID: 161 or IR GUN Reading From: Temp Blank or Sample Bottle

If out of Temperature, Client Approval to Run Samples______________________________

Cooler Breakdown: Date :______________________by:______________________

1. Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? YES NO
2. Did all bottle labels and tags agree with custody papers? YES NO
3. Were correct containers used for the tests indicated? YES NO
4. Air Samples: Cassettes / Tubes Intact Canisters Pressurized Tedlar® Bags Inflated N/A

Explain any discrepancies: ______________________________

		YES	NO	Sample I.D.	Reagent	Vol. Added
pH	Reagent					
12	NaOH					
2	HNO_3					
2	H_2SO_4					
Residual Chlorine (+/-)	for TCN & Phenol					
5-9**	P/PCBs (608 only)					

YES = All samples OK NO = Samples were preserved at lab as listed PC OK to adjust pH______________

**If pH adjustment is required, use NaOH and/or H_2SO_4

VOC Vial pH Verification (Tested after Analysis) Following Samples Exhibited pH > 2				

Other Comments:

9.0 QUALITY CONTROL OBJECTIVES (PRECISION, ACCURACY, SENSITIVITY, AND COMPLETENESS)

A primary focus of Columbia Analytical Services Quality Assurance (QA) Program is to ensure the accuracy, precision and comparability of all analytical results. CAS has established Quality Control (QC) objectives for precision and accuracy that are used to determine the acceptability of the data that is generated in its laboratories. These QC limits are either specified in the methodology or are statistically derived and are based on the laboratory's actual historical data obtained from control-charting the various QC measurements for each analytical method. The Quality Control objectives are defined below and the acceptable numeric values are shown in the table in Appendix C. The actual types of QC samples required for analysis is discussed in the specific analytical SOP.

9.1 Accuracy

Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the mean value of results from ongoing analyses of standard reference materials, standard solutions and laboratory-fortified blanks. In addition, laboratory-fortified (i.e. matrix-spiked) samples are also measured; this indicates the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery (% REC) of the measured value, relative to the true or expected value. The acceptance limits for accuracy (shown in the table in Appendix C) originate from two different sources: Where acceptance limits are defined and stated in the individual methods, CAS has adopted the limits without modification. If no acceptance limits are given in a method, CAS adopts the limits derived from control charts that are generated for each appropriate method. These control charts are updated once a year for the appropriate Surrogate, Laboratory Control Sample, and Matrix Spike compounds.

$$\text{Accuracy (\%REC)} = \frac{A - B}{C} \times 100$$

Where A = Analyte total concentration from spiked sample
B = Analyte concentration from unspiked sample
C = Concentration of spike added

9.2 Precision

Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling and in laboratory analysis.

Precision is measured through the use of replicate sample analyses within the same batch and is expressed as the relative percent difference (RPD) between the replicate measurements.

$$RPD = \frac{D1 - D2}{(D1+D2)/2} \times 100$$

Where D1 = Original Result
D2 = Duplicate Result

9.3 Practical Quantitation Limits

The PQLs used at CAS are the routinely reported lower limits of quantitation which take into account day-to-day fluctuations in instrument sensitivity as well as other factors. These PQLs are the levels to which CAS routinely reports results in order to minimize false positive or false negative results. The PQL is normally two to ten times the method detection limit (MDL), which is determined by a procedure outlined in 40 CFR 136, Appendix B. MDLs for analytical methods routinely performed at CAS are determined annually.

9.4 Completeness

Completeness is a measure of the amount of valid data that is obtained, compared to the amount that is expected. It is expected that all analyses conducted in accordance with the approved analytical methods and standard laboratory operating procedures will meet QC acceptance criteria for 95% if the samples tested, however, the CAS objective for completeness is 100%.

$$\text{Completeness (\%)} = \frac{\text{valid data obtained}}{\text{total data planned}} \times 100$$

9.5 Representativeness

Representativeness is the degree to which a samples aliquot that is analyzed gives results identical to analysis of the whole. CAS has sample handling protocols to ensure that the sample given to the laboratory for analysis is thoroughly homogenized before the aliquot for analysis is removed. Further, analytical SOPs specify appropriate sample sizes to further ensure the sample aliquot that is analyzed is representative of the whole.

9.6 Comparability

Comparability expresses the confidence with which one data set can be compared to another. To ensure comparability, SOPs are used for the preservation, handling, and analysis of all samples. Data is reported in units specified by the customer.

10.0 QUALITY CONTROL PROCEDURES

The specific types, frequencies, and processes for quality control sample analysis are described in detail in method-specific standard operating procedures. These sample types and frequencies have been adopted for each method and a definition of each type of QC sample is provided below. In addition, a number of other quality control processes which may impact analytical results are also described below.

10.1 Modified Procedures

CAS strives to perform published methods as described in the referenced documents. If there is a material deviation from the published method, the method is cited as a "Modified" method in the analytical report. Standard operating procedures are available to analysts and are also available to our clients for review. If the modification is such that the method becomes "Performance Based," client approval is obtained for the use of the method prior to the performance of the analysis.

10.2 Procedures for Accepting New Work

Due to the increase in analytes used in the industry and found in the environment, analytes are requested to be analyzed using existing methodologies and/or new methodologies. These requests must be reviewed prior to accepting new work and creating new methodologies. These requests typically include:

1. The addition of analytes to an existing scan.
2. Complete start-up of an established method.
3. Analyte(s) requested with no established method.
4. Specific Confidentiality requests

<u>The addition of analytes to an existing scan.</u>
The analytical method is reviewed to determine if its use is appropriate for the new analyte. The standards are purchased from a commercial vendor and prepared. If the analyte is available from more than one source, a second source may be purchased to verify the calibration standard. A reference is spiked with a mid-level concentration of the appropriate standard and analyzed to determine retention time, resolution, etc. Temperature programs and instrument conditions may be modified to optimize resolution for the analyte. If the analyte may be resolved and detected by the method, an MDL study is performed to determine a detection limit suitable for the analyte. An in-house SOP may be written or modified to include the analyte.

<u>Complete start-up of an established method</u>
The method is obtained and reviewed by the analyst, technical manager, and/or supervisor to determine if the instrumentation and reagents needed by the method are

available. If the required instrumentation is available, then reagents, standards, equipment, and supplies are gathered and purchased. If the analyte(s) are available from more than one source, a second source may be purchased to verify the calibration source. A qualified analyst performs the method, elution times are determined, temperature programs are optimized, and batch QC is performed to monitor accuracy and precision. An MDL study is performed per instrument to determine detection limit(s) and each analyst performing the method must complete an Initial Demonstration of Capability (IDOC) study. An SOP is written by a qualified analyst and QAPM.

<u>Analyte(s) requested with no established method.</u>
The analyte to be analyzed is researched and reviewed by the technical manager for chemical nature, formula, and other related information. The Merck Index and CRC Handbook are reviewed for boiling point, vapor pressure to determine the type of compound. After determining the type of compound, it is assumed that it can be analyzed by an existing method. If not, perhaps a modification of a method or the creation of a method could be tried. The different approaches to testing the analyte may be tried, comparing the efficiency of the various approaches. The method, which allows for the acceptable precision and accuracy, shall be used. Follow procedures outlined above. Precision and accuracy should be documented using the MDL and DOC studies where applicable.

<u>Specific confidentiality requests</u>
Investigate the confidentiality requests of the client. The client may have specific requests regarding the release of the report/data, the retention of the samples and the data, and the disposal of the samples.

<u>Method Performance</u>
Reporting limits are based upon an MDL study performed according to ADM-MDL. At Columbia Analytical Services, the MDL is equal to the limit of detection (LOD) which is used to determine the limit of quantitation (LOQ). See SOP, ADM-MDL.

10.3 Analytical Batch

The basic unit for analytical quality control is the analytical batch. An analytical batch is that all the samples in a batch, both field samples and quality control samples, are to be handled and processed in exactly the same way, and all of the data from each analysis is to be manipulated in exactly the same manner.

The <u>minimum</u> requirements of an analytical batch are:

1. The number of field samples in a batch is not to exceed 20.

2. All field samples in a batch are of the same matrix.

3. The QC samples to be processed with the field samples include:
    - Method Blank - to determine possible laboratory contamination.
    - Laboratory Control Sample - to assess method performance.

- Matrix Spike (field sample) - to assess possible matrix problems.
- Duplicate Matrix Spike or Duplicate (field) Sample - to assess batch precision and possible matrix problems.

4. A single lot of reagents is used to process the batch of samples.

5. Refer to SOP, *Analytical Batches and Sequences* (ADM-BCHSQ), for additional batching requirements. Specific project, program or method requirements may create exceptions. The more stringent QC requirements shall be followed in most all cases.

10.4 Method Blank

The method blank is either analyte-free water or analyte-free soil (when available), subjected to the entire analytical process. When analyte-free soil is not available, anhydrous sodium sulfate, organic-free sand, or an acceptable substitute may be used instead. The method blank is analyzed to demonstrate that the analytical system itself is not contaminated with the analyte(s) being measured. The method blank results should be below the reporting limit for the analyte(s) being tested. A method blank is included with the analysis of every analytical batch, every 20 samples, or as stated in the method, whichever is more frequent.

For Industrial Hygiene samples, blanks shall be analyzed with each batch of samples to detect and measure possible contamination of sampling media and reagents used for analysis. Blanks should be supplied by the client as a representative sampling media of the same lot or batch as the field samples.

10.5 Calibration Blanks

Calibration blanks are prepared along with calibration standards. Calibration blanks are free of the analyte of interest, and provide the zero point of the calibration curve.

10.6 Continuing Calibration Blanks

Continuing calibration blanks (CCBs) are solutions of either analyte-free water or solvent that are analyzed in order to verify the zero point of the analytical system. The frequency of CCB analysis is either once every ten samples or as indicated in the method, whichever is greater.

10.7 Calibration Standards

Calibration standards are solutions of known concentration prepared from primary standard solutions which are, in turn, prepared from stock standard materials. Calibration standards are used to calibrate the instrument response with respect to analyte concentration. Standards are analyzed in accordance with the requirements stated in the particular method being used.

10.8 Initial (or Independent) Calibration Verification Standards

Initial (or independent) calibration verification standards (ICVs) are standards that are analyzed *after* calibration but *prior to* sample analysis, in order to verify the calibration of the analytical system. They are prepared from materials obtained from a source independent of that used for preparing the calibration standards. ICVs are also analyzed in accordance with method-specific requirements.

10.9 Continuing Calibration Verification Standards

Continuing calibration verification standards (CCVs) are midrange standards that are analyzed in order to verify that the calibration of the analytical system is still acceptable. The frequency of CCV analysis is either once every ten samples, or as indicated in the method, whichever is greater.

10.10 Internal Standards

Internal standards consist of known amounts of specific compounds that are added to each sample following sample preparation or extraction. Internal standards are generally used for GC/MS and ICP-MS procedures to correct sample results that have been affected by changes in instrument conditions or changes caused by certain matrix effects. The integrated area of the internal standard compared to the continuing calibration check standard should vary by no more than the limits specified in each method.

10.11 Surrogates

Surrogates are organic compounds which are similar in chemical composition and chromatographic behavior to the analytes of interest, but which are not normally found in environmental samples. Depending on the analytical method, one or more of these compounds is added to method blanks, calibration and check standards, and samples (including duplicates, matrix spike samples, duplicate matrix spike samples and laboratory control samples) prior to extraction and analysis in order to monitor the method performance on each sample. The percent recovery is calculated for each surrogate, and the recovery is a measurement of the overall method performance. The acceptance criteria for these various analytes are listed in Appendix C, along with other data quality capabilities.

10.12 Matrix Spikes

Matrix spiked samples are aliquots of samples to which a known amount of the target analyte (or analytes) has been added. The samples are then prepared and analyzed in the same analytical batch, and in exactly the same manner as are routine samples. The spike recovery measures the effects of interferences caused by the sample matrix and reflects the accuracy of the method for the particular matrix in question. Spike recoveries are calculated as discussed in Section 9.1.

For the appropriate methods, matrix spiked samples are prepared and analyzed at a minimum frequency of one spiked sample (and one duplicate spiked sample, if appropriate) per twenty samples. Control limits are summarized in Appendix C.

Matrix spikes are not applicable with industrial hygiene sampling media for air analysis.

Note: A sample identified as a field blank, equipment blank, or trip blank is *<u>not</u>* *to be matrix spiked.*

10.13 Laboratory Duplicates and Duplicate Matrix Spikes

Duplicates are additional replicates of samples that are subjected to the same preparation and analytical scheme as the original sample. Depending on the method of analysis, either a duplicate analysis (and/or a matrix spiked sample) or a matrix spiked sample and matrix spike duplicate sample (MS/MSD) are analyzed. The relative percent difference between duplicate analyses or between an MS and MSD is a measure of the precision for a given method and analytical batch. The relative percent difference (RPD) for these analyses is calculated as discussed in Section 9.2.

Depending on the method of analysis, either duplicate and/or matrix spike duplicate analyses are performed at a minimum frequency of one set per 20 samples. Control limits are summarized in Appendix C.

Duplicate analysis is not applicable with industrial hygiene sampling media for air analysis.

Note: A sample identified as a field blank, equipment blank, or trip blank is *<u>not</u>* *to be duplicated.*

10.14 Laboratory Control Samples

The laboratory control sample (LCS) is an aliquot of analyte-free water or analyte-free soil (or anhydrous sodium sulfate or equivalent) to which known amounts of the method analyte(s) is(are) added. A standard reference material (SRM) of known matrix type, containing certified amounts of target analytes, may also be used as an LCS. The LCS sample is prepared and analyzed in the same analytical batch, and in exactly the same manner, as the other routine samples. Stock solutions used for LCSs are purchased or prepared independently of calibration standards. The percent recovery (% REC.) of the target analytes in the LCS assists in determining whether the methodology is in control and whether the laboratory is capable of making accurate and precise measurements at the required reporting limit. Comparison of batch-to-batch LCS analyses enables the laboratory to evaluate batch-to-batch precision and accuracy. An LCS is prepared and analyzed at a minimum frequency of one LCS per 20 samples, with every analytical batch or as stated in the method, whichever is more frequent. Acceptance criteria for LCS analyses are summarized in Appendix C.

For industrial hygiene samples (air) LCSs shall be performed in duplicate to assess accuracy and precision for each batch, not to exceed 10 samples. Acceptance criterion of 80 – 120% shall be used until enough data points are available to statistically generate a lab QC limit.

10.15 Interference Check Samples

An interference check sample (ICS) is a solution containing both interfering and analyte elements of known concentration that can be analyzed to verify background and interelement correction factors in metals analyses. The ICS is prepared to contain known concentrations of interfering elements that will provide an adequate test of the correction factors. The ICS is spiked with the elements of interest at concentrations of approximately ten times the instrument detection limits. The ICS is analyzed at the beginning and end of an analytical run or every eight hours, whichever is more frequent, and the results must be within ± 20% of the true values.

10.16 Post Digestion Spikes

Post digestion spikes are samples prepared for metals analyses that have an analyte spike added to determine if matrix effects may be a factor in the results. The spike addition should produce a method-specified minimum concentration above the instrument detection limit. A post digestion spike is analyzed with each batch of samples and recovery criteria are specified for each method.

10.17 Source and Preparation of Standard Reference Materials

CAS relies on a primary vendor for the majority of its analytical supplies. In addition, consumable primary stock standards are obtained from certified commercial sources or from sources referenced in a specific method, as discussed in section 4.2.2 of this document. All reference materials that are received at CAS are recorded by the technical staff in the appropriate notebook(s) and are stored under conditions that provide maximum protection against deterioration and contamination. The notebook entry includes such information as an assigned logbook identification code, the source of the material (i.e. vendor identification), solvent (if applicable) and concentration of analyte(s), reference to the certificate of analysis and an assigned expiration date. In addition, the date that the standard is received in the laboratory is marked on the container.

Stock solutions and/or calibration standard solutions are prepared fresh as often as necessary according to their stability. After preparation, all standard solutions are properly labeled as to name, concentration, date, preparer, and expiration date; these entries are also recorded in the appropriate notebook. See SOP, *Making Entries onto Benchsheets and Logbooks* (ADM-DATANTRY). To ensure traceability, all standards are labeled with an in-house code that can be traced back to the original stock standard received by the vendor and thus, the certificate of analysis. Prior to introduction into the analytical system/process, some reference materials are verified for accuracy with a second, independent source of the material. In addition, the independent source of reference material is also used to check the calibration standards for signs of deterioration. All standards, reagents and reference materials shall be stored per analytical SOP requirements to ensure their integrity. Safe handling and transportation of these materials are discussed in the respective analytical SOP and/or Laboratory Safety Manual.

10.18 Control Charting

The generation of control charts is performed annually at CAS. MS, LCS, and Surrogate recoveries are monitored and charted for key parameters to determine new control limits using the data generated in the previous year. After review of the data by the Quality Assurance Program Manager, the new acceptance criteria may replace the previous criteria and method conformity is assessed using the new values. See SOP for *Determination of Statistical Control Limits* (ADM-CRTL-LIM). Old charts are archived for a period of 10 years.

10.19 Proficiency Testing Participation

Each discipline and test method for most analytes are monitored using A2LA or NELAP approved vendors for Proficiency Testing on a semi-annual basis. Results of the proficiency samples are reviewed by the Laboratory Director, the QAPM, the Corporate QA Director and the laboratory staff. Any problems surfacing during the review are investigated, and corrective action is taken regarding any and all deficiencies.
Interlaboratory Proficiencies are performed annually to determine continued lab performance throughout the network of CAS laboratories. Such studies are organized by Corporate QA. Proficiency test results are also used to show continued acceptable performance per analyst.

10.20 Glassware Washing

Glassware washing and maintenance play an crucial role in the daily operation of a laboratory. The glassware used at CAS undergoes a rigorous cleansing procedure prior to every usage. Departmental specific glassware washing SOP's (GEN-GC, MET-GC and EXT-GC) have been generated that outline the various procedures used at CAS; each is specific to the end-use of the equipment as well as to the overall analytical requirements of the project.

11.0 CALIBRATION PROCEDURES AND FREQUENCY

All equipment and instruments used at CAS are operated, maintained and calibrated according to the manufacturer's guidelines and recommendations, as well as to criteria set forth in the applicable analytical methodology. Operation and calibration are performed by personnel who have been properly trained in these procedures. Documentation of calibration information is maintained in appropriate reference files. The frequency of calibration and concentration of calibration standards are determined by the manufacturers guidelines, the analytical method, or the requirements of special contracts. See specific analytical SOP's for frequency and criteria. Generally, purchased standards have a shelf life of 12-36 months and prepared standards have a shelf life of 1-12 months. Recalibration is required at anytime that the instrument is not operating correctly or functioning at the proper sensitivity. Brief descriptions of the calibration procedures for our major laboratory equipment and instruments are described below.

11.1 Temperature Control Devices

Temperatures are monitored and recorded for all of our temperature-regulating devices including ovens, incubators and refrigerators. Bound record books are kept which contain recorded temperatures, identification and location of equipment, and the initials of the technician who performed the checks. All thermometers have been identified and the calibration of these thermometers is checked annually against a National Institute of Standards and Technology (NIST) certified thermometer. Calibration records are maintained by the QA PM. (See SOP SMO-DALYCK).

11.2 Analytical Balances

Analytical balances are serviced on an annual basis by a professional metrology organization. New certificates of calibration for each balance are issued to the laboratory on an annual basis. The calibration of each analytical balance is checked prior to use with Class-1 verified weights, which assess the accuracy of the balance at the working range. Bound record books are kept which contain the recorded measurements, identification and location of equipment, and the initials of the technician who performed the checks. (See SOP SMO-DALYCK).

11.3 Inductively Coupled Plasma (ICP) and ICP-Mass Spectrometry (ICP-MS)

Each emission line on the ICP is calibrated daily against a blank and three standards. Analyses of calibration standards, initial and continuing calibration verification standards, and inter-element interference check samples are carried out as specified in the applicable method being utilized (see Section 18.0 for references).

11.4 Atomic Absorption Spectrophotometers (AAS)

These instruments are calibrated daily using a minimum of four standards and a blank. Calibration is validated using reference standards, and is verified at a minimum frequency of once every ten samples.

11.5 GC/MS Systems

All GC/MS instruments are calibrated at five different concentration levels for the analytes of interest, using procedures outlined in Standard Operating Procedures (SOPs) and/or appropriate USEPA method citations. All SRMs used for this function are "EPA-Certified." Compounds selected as system performance check compounds (SPCCs) must show a method-specified response factor in order for the calibration to be considered valid. Calibration check compounds (CCCs) must also meet method specifications for percent difference from the multipoint calibration. Method-specific instrument tuning is regularly checked using bromofluorobenzene (BFB) for volatile organic chemical (VOC) analysis, or decafluorotriphenylphosphine (DFTPP) for semi-volatile analysis. Mass spectral peaks for the tuning compounds must conform both in mass numbers and in relative intensity criteria before analyses can proceed.

11.6 Gas Chromatographs

Calibration and standardization follow SOP guidelines and/or appropriate USEPA method citations. Initial calibration standards are prepared at three to five concentration levels for each analyte of interest. The lowest standard is near the method reporting limit; additional standards define the working range of the GC detector. Results are used to establish response factors and retention-time windows for each analyte. Calibration is verified at a minimum frequency of once every ten samples.

11.7 Infrared Analyzer

The instrument is calibrated using a blank and four standards. The calibration is validated at the beginning of each analysis, and continuing calibration is verified at a minimum frequency of once every ten samples.

11.8 UV-Visible Spectrophotometer (manual colorimetric analyses)

Routine calibrations for colorimetric and turbidimetric analyses involve generating a 5-point calibration curve including a blank. Correlation coefficients must meet method or SOP specifications before analysis can proceed. Independent calibration verification standards (ICVs) are analyzed with each batch of samples. Continuing calibration is verified at a minimum frequency of once every ten samples.

11.9 Flow Injection Analyzer (automated colorimetric analysis)

A minimum of five standards and a blank are used to calibrate the instrument daily. Standard CAS acceptance limits are used to evaluate the calibration curve prior to sample analysis. All linear regressions must have a correlation coefficient of 0.995 or better before analysis may proceed.

11.10 Ion Chromatographs

Calibration of the ion chromatograph (IC) involves generating a 5-point calibration curve. A correlation coefficient of 0.995 or better for the curve is required before analysis can proceed. Quality Control (QC) samples that are routinely analyzed include blanks and laboratory control samples. The target analytes typically determined by the IC include nitrate, chloride, fluoride, and sulfate.

11.11 Turbidimeter

Calibration of the turbidimeter requires analysis of formazin and polymer standards measured as NTU. Quality Control samples that are routinely analyzed include blanks, and duplicates.

11.12 Ion-selective electrode

Two standards are used to calibrate the electrodes before analysis. The slope of the curve must be within acceptance limits before analysis can proceed. Quality Control samples that are routinely analyzed include blanks, LCSs and duplicates.

11.13 HPLC

Calibration and standardization follow SOP guidelines and/or appropriate USEPA method citations. Initial calibration standards are prepared with at least five concentration levels for each analyte of interest. The lowest standard is near the method reporting limit; additional standards define the working range of the detector. Results are used to establish response factors and retention-time windows for each analyte. Calibration is verified at a minimum frequency of once every ten samples.

11.14 Other Instruments

Calibration for the total organic carbon (TOC) and other instruments is performed following manufacturer's recommendations and applicable SOPs.

12.0 DATA REDUCTION, VALIDATION, AND REPORTING

CAS reports the analytical data produced in its laboratories to the client via the certified analytical report. This report typically includes a transmittal letter, a case narrative, client project information, specific test results, quality control data, chain of custody information, and any other project-specific support documentation. The following procedures describe our data reduction, validation and reporting procedures.

12.1 Laboratory Information Management System (LIMS)

CAS/Rochester currently uses StarLIMS v.6.11a throughout the laboratory. This data management and retrieval system is the PC based StarLIMS that runs on a Novell Network. The LIMS is used for sample tracking, sample workload projections, sample result storage, reporting, and invoicing. The system allows you to acquire data from instrumentation and can generate ASCII, spreadsheet, database, and/or print files.
Periodically, historical data is checked on the LIMs for authenticity and ability to recreate data files. These files are reviewed for data integrity and possible corruption. See Software Quality Assurance Plan.

12.2 Data Reduction and Custody

All data is initially reviewed and processed by analysts using appropriate methods (e.g. chromatographic software, instrument printouts, hand calculation, etc.) The resulting data set is either manually entered (e.g. some general chemistry parameters) into the LIMS system or is electronically transferred into LIMS from the software used to process the original data set (e.g. chromatographic software). A file of all raw data is generated and given to the departmental supervisor or other certified analyst for secondary review. Once the complete data set has been reviewed to be complete and correct by two analysts, the LIMs data is validated against the raw data which allows the data to be available to Project Managers and Report Writers. Upon approval of the data the supervisor relinquishes the raw data file to a Report Writer, who generates a final report from the LIMS system. The resulting final report is then reviewed by the Project Manager for accuracy. Typically, all data is reported in the units and MRLs listed in Appendix C. An estimation of the uncertainty of the measurements is available upon request using the procedures in the CAS SOP ADM-UNCERT. Assessment of the analytical data includes a check on data consistency by looking for comparability of duplicate analyses, comparability of previous data from the same sampling location (if available), adherence to accuracy and precision control limits, and anomalous low or high parameter values. Once the data has been checked for accuracy and acceptability, the final report and raw data is forwarded to the Lab Director or Quality Assurance Project Manager, who further reviews the data package for errors. When the entire data set has been found to be acceptable the report is signed, distributed, and the raw data is filed for approximately one year, then archived.

All hard copy and electronic backups are archived in a secured room for a period of at least 5 years from the date of the final report (as discussed in section 12.6.1). It is not unusual to have various clients require a 10-year retention of records, therefore, the archivist, project manager, and possibly the client are consulted prior to the destruction of the records.

12.3 Confirmation Analysis

12.3.1 Gas Chromatographic Analyses

For gas chromatographic (GC) analyses, most positive results are confirmed by a second column, a second detector, or by GC/MS analysis, <u>unless</u> exempted by one of the following situations:

- The analyte of interest produces a chromatogram containing "pattern" peaks which match appropriate standards. These analytes include polychlorinated biphenyls (PCBs) and hydrocarbon fuels (e.g., gasoline and diesel).
- The sample is analyzed for benzene, toluene, ethylbenzene and xylenes (BTEX), and the sample is found, by a separate analysis, to contain gasoline. In a sample containing no gasoline, the presence of BTEX compounds will be confirmed.
- The sample meets <u>all</u> of the following requirements:
    1. All samples (liquid or solid) come from the same source (e.g., groundwater samples from the same well) for continuous monitoring.
    2. All analytes have been previously analyzed, identified and confirmed by a second column or by GC/MS. The documents indicating previous confirmation must be available for review.
    3. The resulting chromatogram is relatively simple and does not contain complex or overlapping peaks.
    4. The chromatogram is largely unchanged from the one for which confirmation was carried out.

12.3.2 Confirmation Data

Confirmation data will be provided as specified in the method. Identification criteria for GC or GC/MS methods are summarized below:

- GC Methods - The analyte must fall within plus or minus three times the standard deviation (SD) of the retention time of the daily midpoint standard in order to be qualitatively identified. The retention-time windows will be established and documented, as specified in the appropriate Standard Operating Procedure (SOP).
- GC/MS Methods - Two criteria are used to verify identification:
    1. Elution of the analyte in the sample will occur at the same relative retention time (RRT) as that of the analyte in the standard.

2. The mass spectrum of the analyte in the sample must, in the opinion of a qualified analyst or the department manager, correspond to the spectrum of the analyte in the standard or the current GC/MS reference library.

12.4 Data Validation

The integrity of the data generated in the laboratory is primarily assessed by the analyst, supervisor and project manager through the use of a variety of measures that may include reagent blanks, laboratory fortified blanks, duplicates, matrix spikes and QC samples. The numerical criteria for evaluation of these QC samples are listed in Appendix C; these various QC sample analyses are evaluated using the flow diagrams found in Figures 12-1 through 12-9. Other validation measures of the data include a check of the linearity of the calibration curve, an accuracy check of the QC standards and a check of the system sensitivity. Data transcriptions and calculations are also reviewed. Specific calculations used for determining the concentration or value of the measured parameters from the raw data are given in each of the analytical methods or CAS SOPs.

The QA department performs in-depth periodic monitoring of the data integrity program using data validation and electronic data audits (see ADM-IAUD and ADM-E DATA).

12.5 Data Reporting

When an analyst determines that the data has met the data quality objectives (and/or any client-specific data quality objectives) of the method and has qualified any anomalies in a clear, acceptable fashion, the data is validated by the supervisor. Validated data is reported from LIMS by report writers using specialized forms created by LIMS (see SOP, ADM-RG). Prior to release of the report to the client, the project manager must also review the entire body of data for completeness and to ensure that any and all client-specified objectives were successfully achieved. If required, samples exceeding any established state/federal maximum contaminant level or reportable concentration level, must be reported to the client. A case narrative may be written by the project manager to explain any unusual problems with a specific analysis or sample, client-specific objectives, exceedences, etc... The original raw data, along with a copy of the final report, is filed for archiving. CAS maintains control of analytical results by adhering to standard operating procedures and by observing sample custody requirements. All data are calculated and reported in units consistent with project specifications, to enable easy comparison of data from report to report. Typical qualifiers used to flag analytical results are listed in Appendix D.

12.6 Document Control

A document control system ensures that all documents are accounted for when the project is complete. A submission number is assign to each project for reporting and filing purposes. This number is associated with each order number (sample).

12.6.1 Documentation and Archiving of Routine Analysis Data

The archiving system includes all of the following items for each set of analyses performed:

- Benchsheets describing sample preparation (if appropriate)
- Instrument parameters
- Sample analysis sequence
- Analysis benchsheets and instrument printouts

- Chromatograms and peak integration reports for all samples, standards, blanks, spikes and reruns
- Log book ID number for the appropriate standards
- Copies of report submitted to the client

Individual sets of analyses are indexed by analysis date and/or submission number. Since many analyses are performed with computer-based data systems, the final sample concentrations can be automatically calculated. If additional calculations are needed, they are written on the integration report or securely stapled to the chromatogram, if done on a separate sheet. The archive room is a separte file room in which files shall be maintained for a period of at least five years (from date of report issue). It is not unusual to have various clients require a 10-year retention of records, such as NAVY and NYS Drinking Water Programs, therefore the archivist, project manager, and possibly the client are consulted prior to destruction of the records. The archive room is kept locked and access keys are controlled. All documents must be signed out if needed outside of the archive room and returned in a timely manner. A designated archivist monitors filing, incoming, and outgoing data from the archive.

In the event that the laboratory transfer's ownership or goes out of business, laboratory records shall be maintained for the contracted period and clients shall be notified prior to early destruction / disposal of samples or data.

All related quality documentation such as the quality manual, standard operating procedures, temperature and balance records, maintenance logs, (see Section 4.2 QAM) etc. are controlled and retained by the laboratory for 5-10 years depending upon the program (See ADM-DOC_CTRL).

12.6.2 Reporting Deliverables

In order to meet individual project needs, CAS provides several levels of analytical reports. Basic specifications for each level of deliverable are described in Table 12-1. Turnaround time and package level are negotiable on a project to project basis.

12.6.3 Electronic Data Deliverables (EDD)

CAS/Rochester offers standard Excel format as well as a variety of custom developed EDDs such as ASCII, dBase, and GISKEY. EDDs are available upon request on a project to project basis.

Figure 12-1
Evaluation of Method Calibration

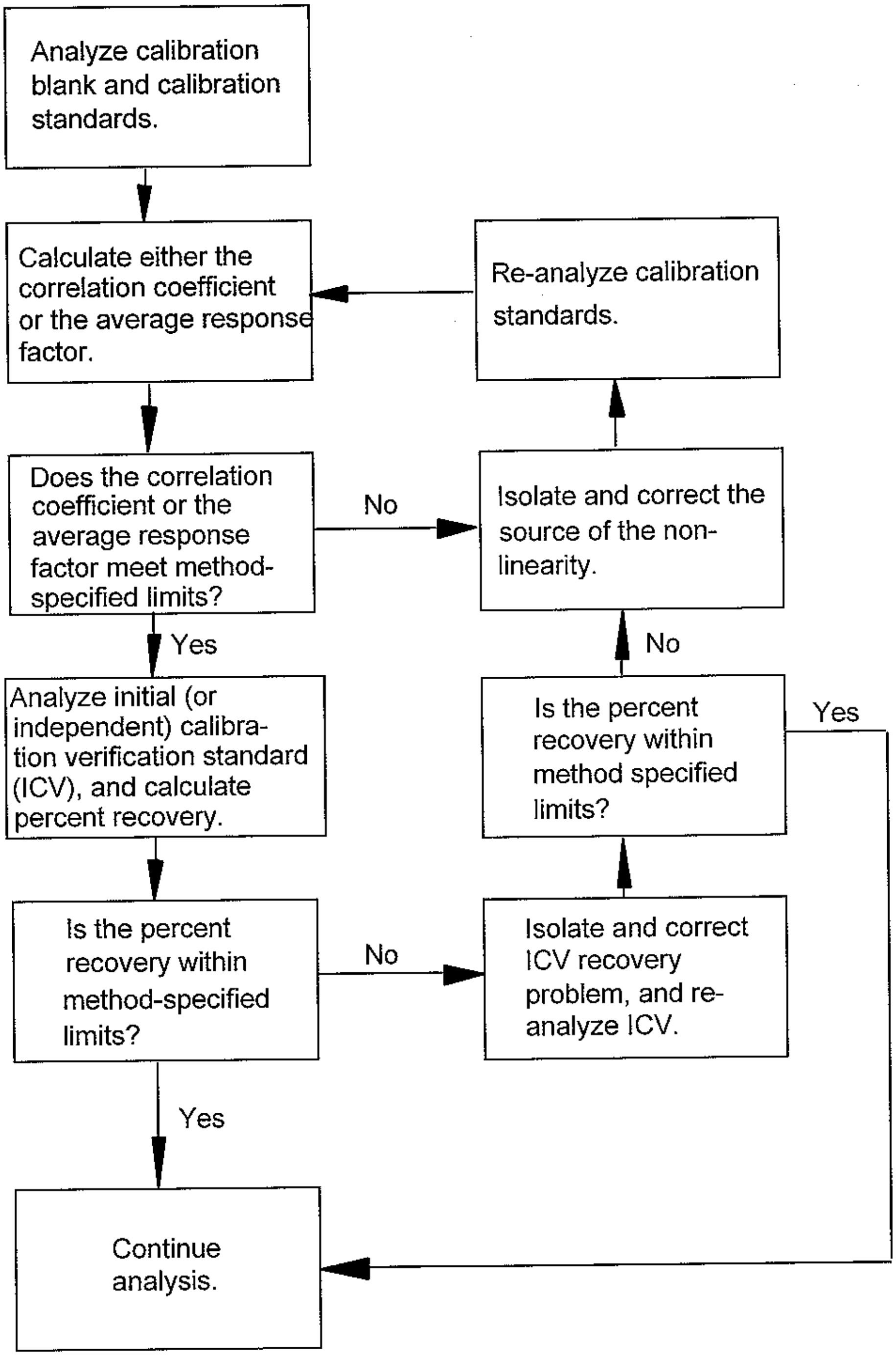


Figure 12-2
Evaluation of Continuing Calibration

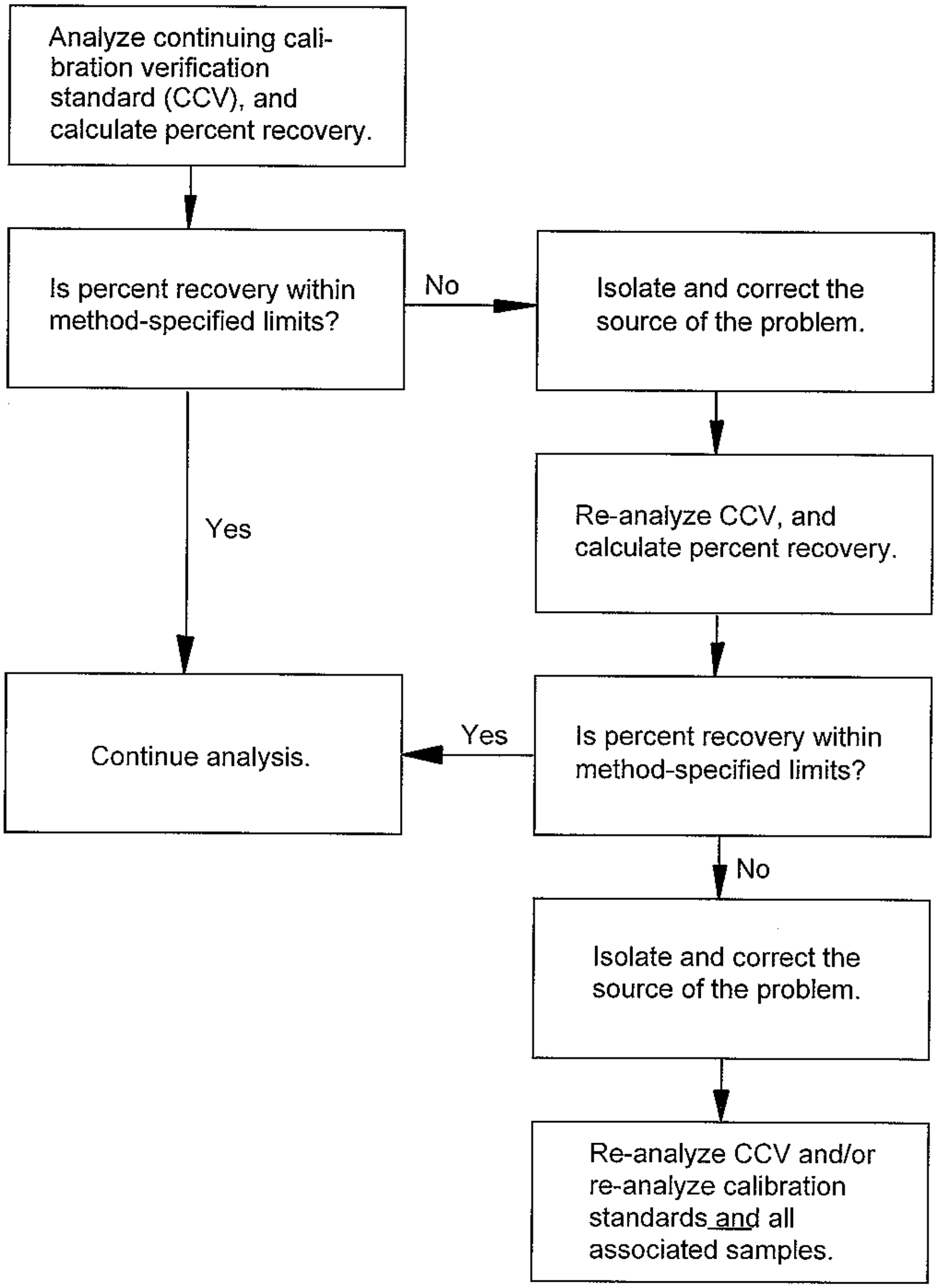


Figure 12-3
Evaluation of Method Blank and Instrument Blank Results

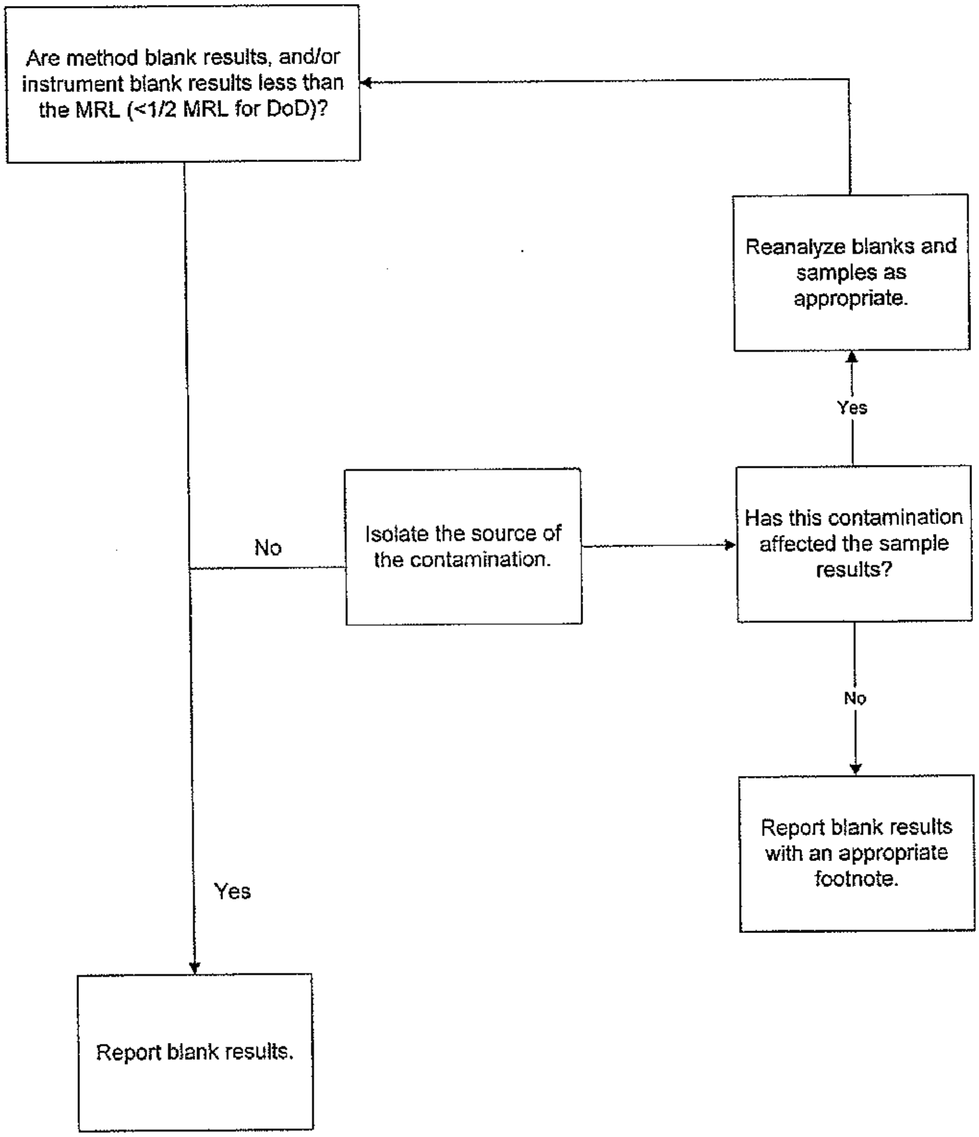


Figure 12-4
Evaluation of Sample Results for Inorganic Analyses

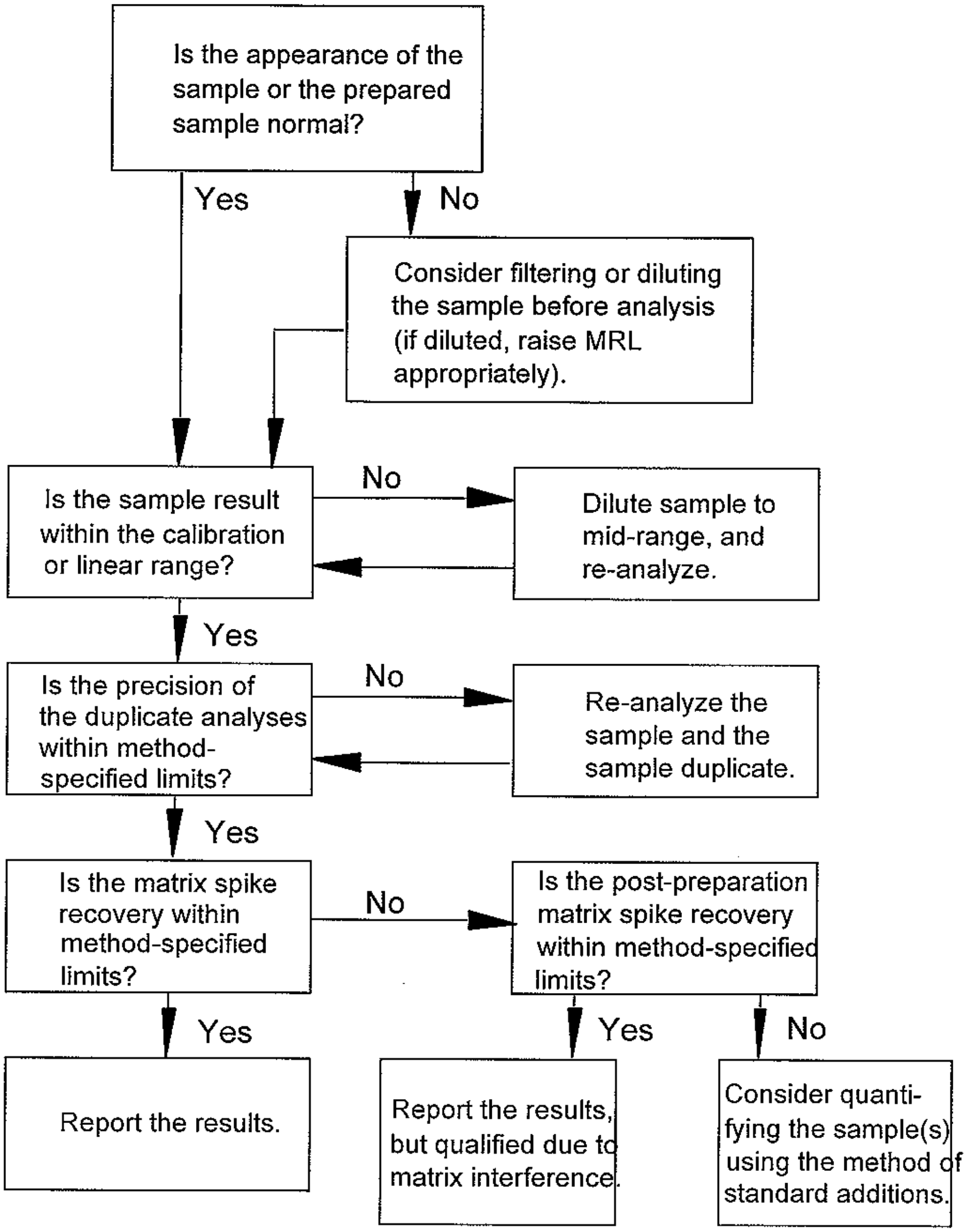


Figure 12-5
Evaluation of Sample Results for Organic Analyses

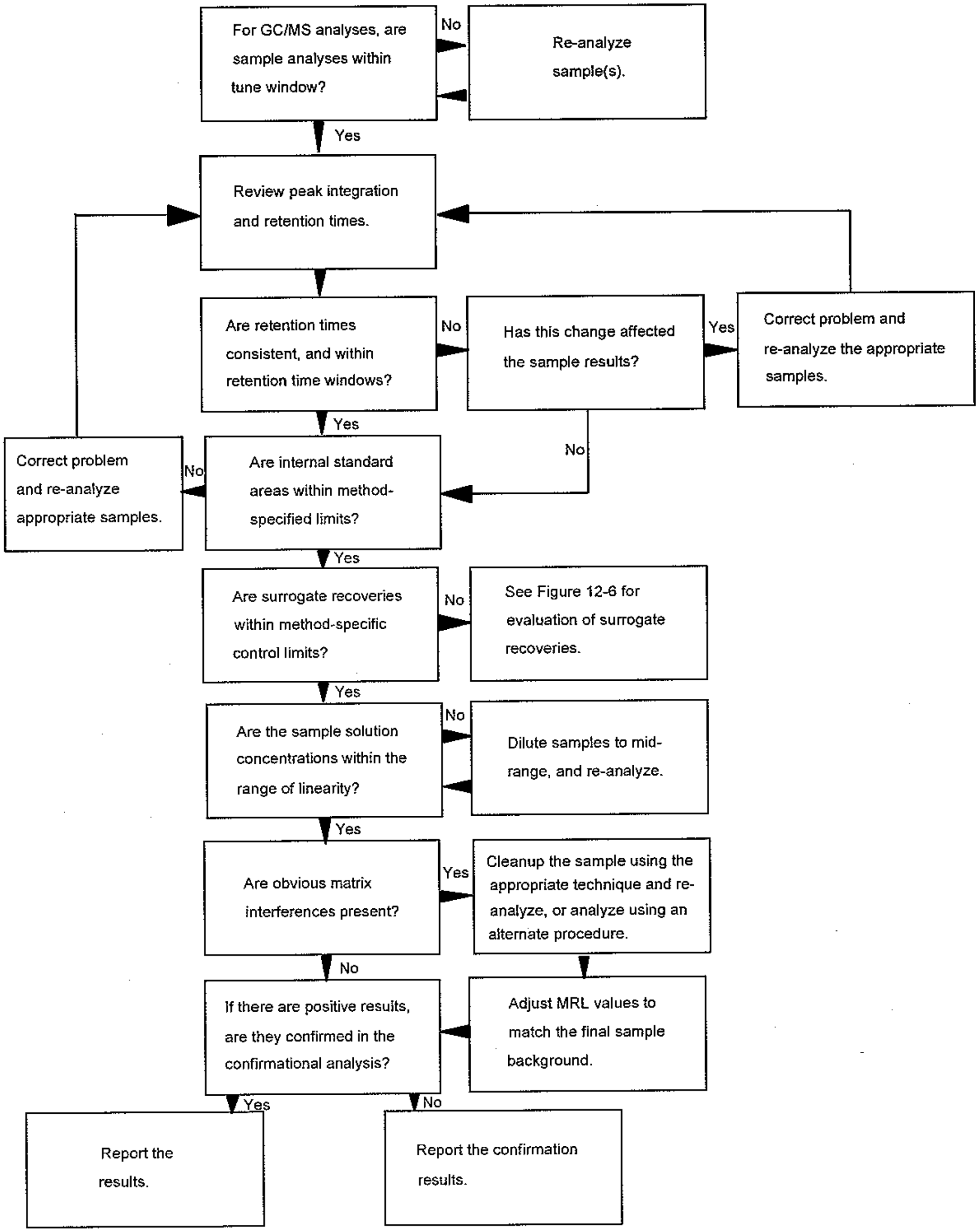


Figure 12-6
Evaluation of Surrogate Compound Recoveries

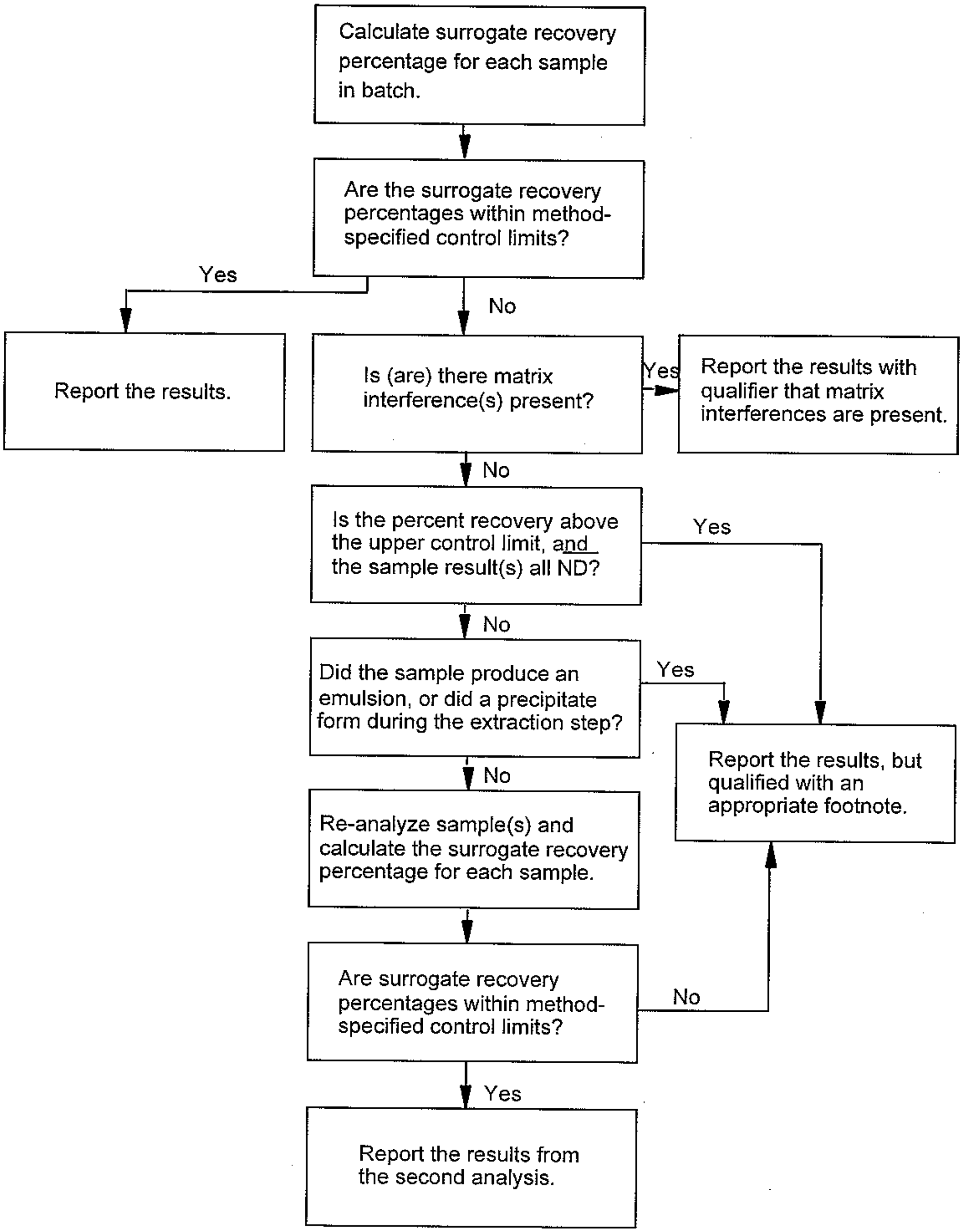


Figure 12-7
Evaluation of Duplicate Sample and/or Duplicate Matrix Spike Results

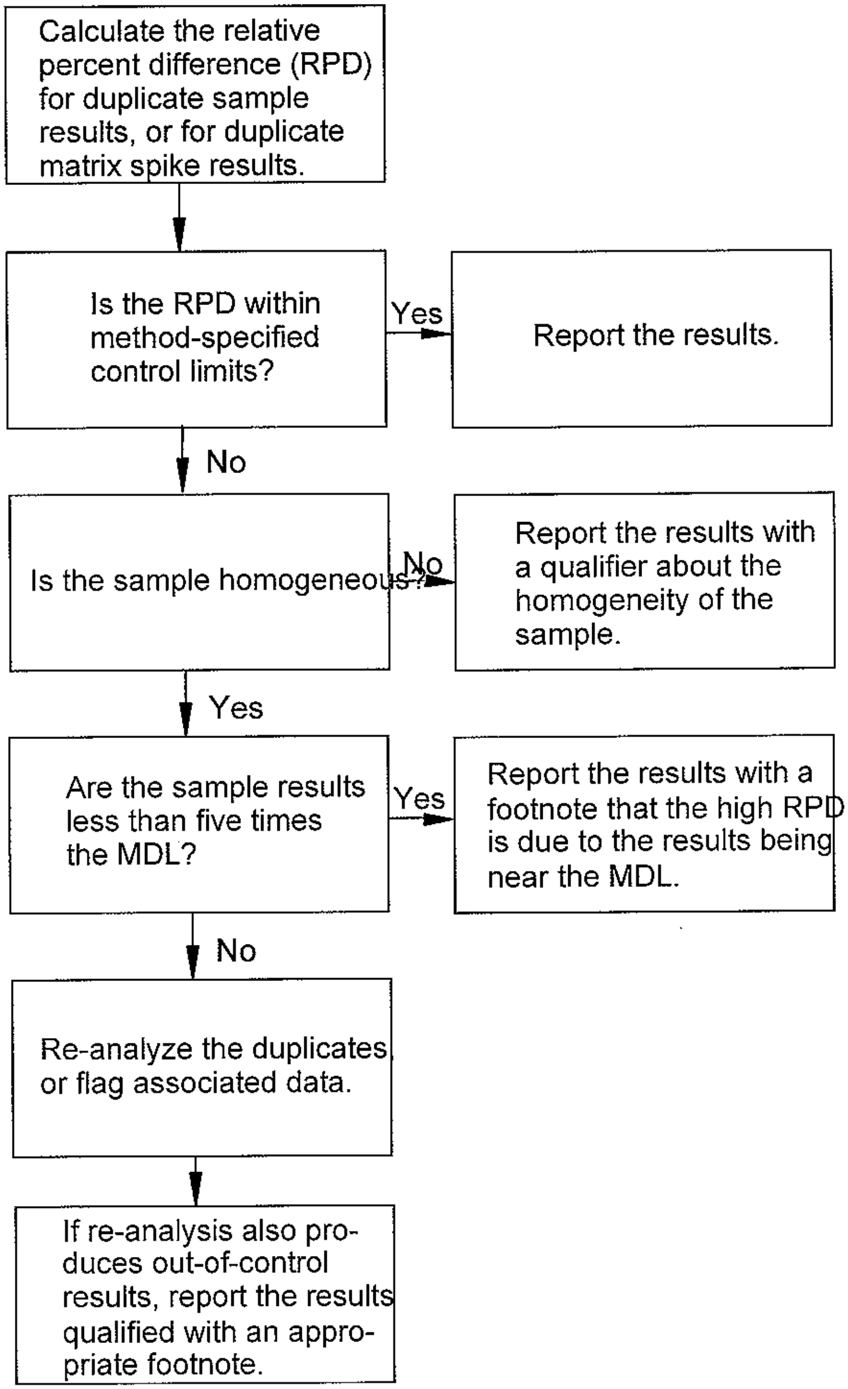


Figure 12-8
Evaluation of Matrix Spike Recoveries

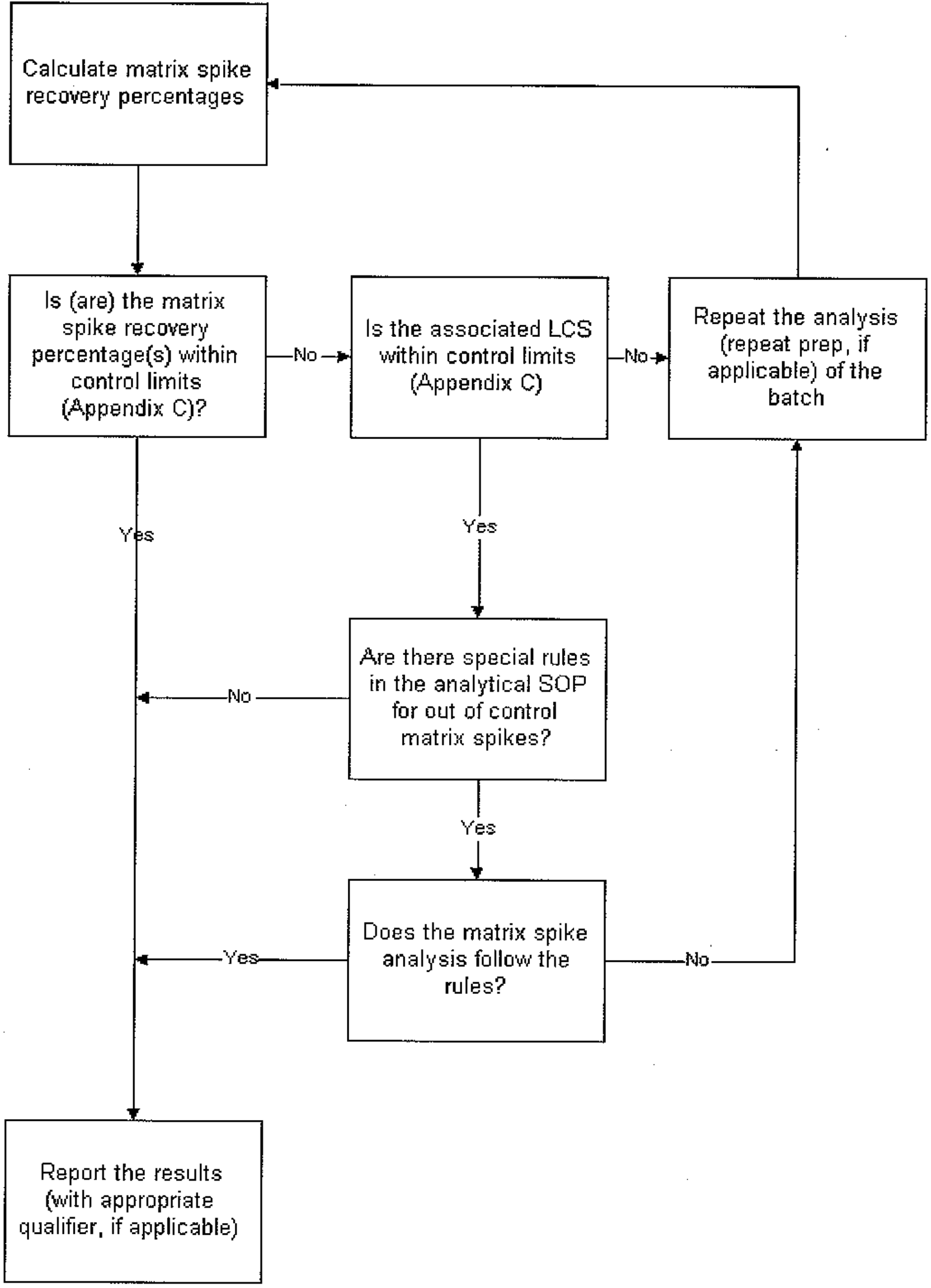


Figure 12-9
Evaluation of Laboratory Control Sample (LCS) Results

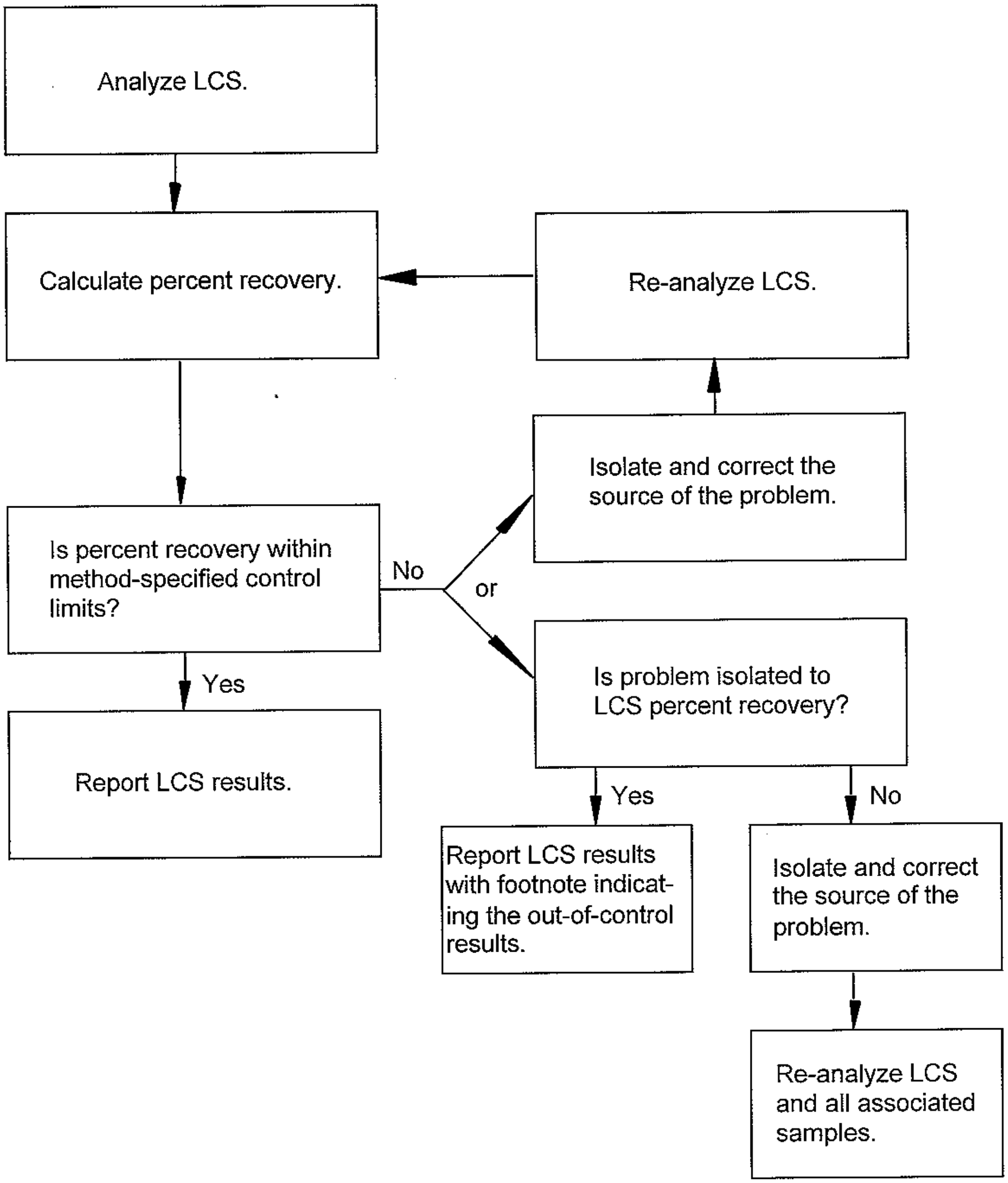


Table 12-1
Laboratory Data Deliverables

Package 1. A Routine Certified Analytical Report Includes the Following

1. Transmittal Letter
2. Sample Analytical Results
3. Method Blank Results
4. Surrogate Recovery Results for appropriate organic methods, including associated EPA or CAS acceptance criteria
5. Chain of Custody Documents

Package 2. In Addition to the Package 1 Deliverables, this Report Includes the Following:

1. Case Narrative

Package 3. In Addition to the Package 2 Deliverables, this Report Includes the Following:

1. Calibration Summaries and Results of initial and continuing calibration verification standards, with calculated recoveries
2. Method Blank Summaries

Package 4. In Addition to the Package 3 Deliverables, this Report Includes the Following:

1. Sample Quantitation Report
2. Standards Prepartation Information

Package 5. Full Data Packages

A complete validatable data package, fulfills all deliverable requirements, as specified in the EPA CLP Statement of Work. The data package may include diskette deliverables, upon request.

13.0 AUDITS AND VERIFICATION PRACTICES

Quality Control (QC) audits are an essential part of CAS's QA program. There are two types of audits used at the facility: System Audits are conducted to qualitatively evaluate the operational details of the field and laboratory QA program, while Performance Audits are conducted by analyzing performance evaluation samples in order to quantitatively evaluate the outputs of the various measurement systems.

The system audit examines the presence and appropriateness of laboratory systems. External system audits of CAS are conducted regularly by various regulatory agencies and clients. Appendix F summarizes some of the major programs in which CAS/Rochester participates. Additionally, internal system audits of CAS/Rochester are conducted regularly by the Quality Assurance Program Manager and by the CAS Quality Assurance Director. The internal system audits are scheduled as four to five auditing events:

- Comprehensive lab-wide system audit - annually
- Audits examining compliance with all QA program requirements as applied to selected projects - 2 per year.

The results of each audit are reported to the Laboratory Director and Supervisors for review and comment. Any deficiencies noted by the auditor are summarized in an audit report and corrective action is taken within a specified length of time to correct each deficiency. Should problems impacting data quality be found during an internal audit, any client whose data is adversely impacted will be given written notification if not already provided. (See SOP ADM-IAUD).

Additionally, CAS/Rochester participates in the analysis of performance evaluation (PE) samples. Results of the performance evaluation samples and audits are reviewed by the Laboratory Director, the QA Program Manager, the Corporate QA Director and the laboratory staff. Any problems surfacing during the audit are investigated, and corrective action is taken regarding any and all deficiencies. See SOP ADM-PTS.

14.0 PREVENTIVE MAINTENANCE

Preventive maintenance is a crucial element of Columbia Analytical Services Quality Assurance program. Instruments at CAS (e.g., GC/MS systems, atomic absorption spectrometers, analytical balances, gas and liquid chromatographs, etc...) are maintained under commercial service contracts or by qualified, in-house personnel. All instruments are operated and maintained according to the instrument operating manuals. All routine and special maintenance activities pertaining to the instruments are recorded in instrument maintenance logbooks. The maintenance logbooks used at CAS contain extensive information about the instruments used at the laboratory.

All preventive maintenance requires a reference to acceptable QC to verify instrument has returned to proper operating functions. An initial demonstration of analytical control is required on **every** instrument used at CAS before sample analyses may proceed. If an instrument is modified or repaired, a return to analytical control is **required** before subsequent sample analyses can continue. When an instrument is acquired at the laboratory, the following information is recommended to be noted in a bound maintenance notebook specifically associated with the new equipment:

- Instrument Name, manufacturer, make, model and type
- The equipment's serial number.
- Date the equipment was received.
- Date the equipment was placed into service.
- Condition of equipment when received (new, used, reconditioned, etc...)
- Prior history of damage, malfunction, modification or repair (if known).

Preventative maintenance procedures, frequencies, etc... are available for each instrument used at CAS. They may be found in the various SOPs for routine methods performed on an instrument and may also be found in the operating or maintenance manuals provided with the equipment at the time of purchase. Responsibility for ensuring that routine maintenance is performed lies with the section supervisor. Each laboratory section maintains a critical parts inventory. The parts inventories include the items needed to perform the preventative maintenance procedures listed in Appendix E. This inventory or "parts list" also includes the items needed to perform any other routine maintenance and certain in-house non-routine repairs.

When performing maintenance on an instrument (whether preventative or otherwise), additional information about the problem, attempted repairs, etc... is also recorded in the notebook. Typical logbook entries include the following information:

- Details and symptoms of the problem
- Repairs and/or maintenance performed
- Description and/or part number of replaced parts
- Source(s) of the replaced parts
- Analyst's signature and date
- Demonstration of return to analytical control

For most major equipment, back-up equipment is available to avoid downtime. All major analytical equipment is summarized in Appendix A. The section supervisor is responsible to coordinate repair with the manufacturer. The project manager shall assess the effect of the downtime on the samples in-house and notify the appropriate clients of any delays and/or the possibilities of subcontracting.

15.0 CORRECTIVE ACTION AND COMPLAINTS

Failure to meet established analytical controls, such as the quality control objectives outlined in Sections 9.0 and 12.0, prompts corrective action. In general, corrective action may take several forms and may involve a review of the calculations, a check of the instrument maintenance and operation, a review of analytical technique and methodology, and reanalysis of quality control and field samples. If a potential problem develops that cannot be solved directly by the responsible analyst, the supervisor, the department manager, and/or the QAPM may examine and pursue alternative solutions. In addition, the appropriate project manager may be notified in order to ascertain if contact with the client is necessary.

The QAPM initiates corrective action due to a performance audit or a check sample problem; the affected laboratory personnel are promptly informed, as are the laboratory supervisors and managers. In cases where data quality is or may be impacted, the client is notified.

In either case, a Nonconformity and Corrective Action Form is generated to document and notify the appropriate personnel of the nonconformity. Procedures for issuing and filing nonconformities are discussed in SOP, *Nonconformity and Corrective Action* (ADM-NCAR).

In special cases, the Laboratory Director may give permission to the analyst, Supervisor, or Project Manager to deviate from CAS Policy. Typically, a Nonconformity form must be issued to the Director and signed off as being acceptable. Otherwise verbal instructions are given and documented on the raw data as being accepted by the Laboratory Director.

In cases were there are complaints from the clients, follow policy procedures outlined in the SOP, *Dealing with Complaints* (ADM-CMPLT).

Corrective actions may also be used to monitor continuous process improvements and tracking of missed proficiency test samples. Laboratory management is responsible for following through with the proficiency testing programs, ensuring that the corrective actions are implemented after testing, and evaluating the effectivness of the corrective action.

Figure 15-1

Nonconformity and Corrective Action Report

SAMPLES/SYSTEM/JOB/CLIENT AFFECTED

N&CA Report No. ____________

NONCONFORMITY

Analysis/Event: ____________

Instrument/System: ____________ Date: ____________

Detailed Description of Nonconformity:

Originator (name): ____________ Date: ____________

Supervisor Verification: ____________ Date: ____________

CORRECTIVE ACTION AND OUTCOME

Detailed Description: (Re-establishment of conformity must be demonstrated and documented. Describe the steps that were taken, or are planned to be taken, to correct the particular Nonconformity <u>and</u> prevent the reoccurrence of the Nonconformity.)

Is the data to be flagged in the Analytical Report with an appropriate qualifier? **No** **Yes**

Person Responsible: ____________ Date: ____________

Supervisor Verification: ____________ Date: ____________

NOTIFICATION - CUSTOMER/CLIENT - INTERNAL/EXTERNAL

Project Chemist Notified by: ____________ Date: ____________

Customer Notified? No Yes If Yes, Notifier: ____________ Date: ____________

Project Chemist/Customer Comments (Retain record, e.g. telephone record, e-mail) ____________

ACCEPTANCE OF CORRECTIVE ACTION

Comments:

Corrective Action(s) have been implemented. QA Pgm Mgr: ____________ Date: ____________

Original: Client File Photocopies: Supervisor and QA Pgm Mgr N&CA_RPT.DOC 1/26/2001

16.0 QUALITY ASSURANCE REPORTS

Quality assurance requires an active, ongoing commitment by CAS personnel at all levels of the organization. Information flow and feedback mechanisms are designed so that analysts, supervisors and managers are aware of quality assurance issues in the laboratory.

Analysts performing routine tests in the laboratory are aware of the various method acceptance criteria and in-house control limits that must be met in order to generate acceptable results. Any non-conformities and corrective actions may also be attached to the data prior to review. Supervisors, or designee, review all of the completed analytical batches to ensure that all QC criteria have been examined and any deficiencies noted and corrected if possible.

It is the responsibility of each laboratory unit to provide the Project Manager with a final report of the data, accompanied by signature approval. Footnotes and/or narrative notes must also accompany any data package if problems were encountered that require further explanation to the client. Each data package is submitted to the appropriate project manager, who in turn reviews the entire collection of analytical data for completeness. The Project Manager must also review the entire body of data to ensure that any and all client-specified objectives were successfully achieved. A case narrative may be written by the project manager to explain any unusual problems with a specific analysis or sample, etc...

The Quality Assurance Program Manager provides overview support to the Project Manager if required to do so (e.g. contractually specified, etc...) The Quality Assurance Program Manager is also responsible for the oversight of all internal and external audits, for all performance evaluation sample and analysis programs, and for all laboratory certification/accreditation responsibilities.

The QAPM also prepares quarterly reports for the QA Director which summarizes the various QA/QC activities that have occurred during the previous quarter. These reports include a summary of the various audits performed during the last quarter, new accreditations/certifications received by the laboratory, scores of the most current performance evaluation studies, updates/revisions to controlled documents, etc...

On an annual basis, the lab director shall review the laboratory's quality system to introduce any necessary changes or improvements. The review will take into account the outcome of recent internal or external audits, proficiency results, changes in volume and type of work, feedback from clients or authorities, corrective action reports, complaints, etc. See SOP ADM-MGMTRVW.

17.0 PERSONNEL TRAINING

Technical position descriptions are available for all employees, regardless of position or level of seniority. These documents are maintained by the QA Program Manager and Human Resources. In order to assess the technical capabilities and qualifications of a potential employee, all candidates for employment at CAS are evaluated, in part, against the appropriate technical description.

Training begins the first day of employment at CAS when the administrative, quality assurance, and health and safety policies are presented and discussed. Each new employee is presented with example ethical dilemmas and resolutions as an initial Ethics training. Within 12 months, each employee shall participate in an 8-hour company Ethics Training Seminar. Thereafter, ethics training is on-going throughout the tenure of each employee.

Technical training is documented following SOP requirements discussed in *Documentation of Technical Training* (ADM-TRANDOC). Training for analytical procedures typically begins with the reading of the analytical SOP. Hands-on training begins with the observation of an experienced analyst performing the method, followed by the trainee performing the method under close supervision, and culminating with independent performance of the method on quality control samples. Successful completion of the analysis must include an Initial Demonstration of Capability Study of four replicate quality control samples. If quality control samples are not readily available, the following approach may be used to show adequate capability per analyst for particular parameters, such as solids, paint filter, peroxides, etc.

Analyze a fictitiously prepared sample volume or use excess sample volume from historical samples to demonstrate acceptable performance of the method. Use results from another analyst for the same four aliquots to demonstrate accuracy (relative) and precision.

Continued demonstration of capability is monitored by QA or departmental supervisor. Copies of all training forms and certifications (demonstrations of capability) are maintained by QA department.

Safety training begins with the reading of the *Safety Manual*. All employees are recommended to attend quarterly safety meetings during which the safety programs discussed and safety training is presented by the Environmental, Health and Safety Officer.

CAS encourages its personnel to continue to learn and develop new skills that will enhance their performance and value to the company. Ongoing training occurs for all employees through a variety of mechanisms. The "CAS University" education system, external and internal technical seminars and training courses, laboratory-specific training exercises and performance of external PE samples analysis are all used to provide employees with professional growth opportunities.

Safety and QA/QC requirements are integral parts of all technical SOPs and, consequently, are integral parts of all processes at CAS.

18.0 REFERENCES FOR ANALYTICAL PROCEDURES

The analytical methods used at CAS generally depend upon the end-use of the data. Since most of our work involves the analysis of environmental samples for regulatory purposes, specified federal and/or state testing methodologies are used and followed closely. Several factors are involved with the selection of analytical methods to be used in the laboratory. These include the method detection limit, the concentration of the analyte being measured, method selectivity, accuracy and precision of the method, the type of sample being analyzed, and the regulatory compliance objectives. Typical methods used at CAS are taken from the following references:

- *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, 1986 and Updates I (7/92), II (9/94), IIA (8/93), IIB (1/95), and III (12/96). See Chapters 1, 2, 3, and 4.

- *Methods for Chemical Analysis of Water and Wastes*, EPA 600/4-79-020, Revised March 1983.

- *Methods for the Determination of Metals in Environmental Samples*, EPA 600/4-91-010, June 1991 and Supplement I, EPA/600/R-94/111, May, 1994.

- *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*, EPA 600/4-82-057, July 1982 and 40 CFR Part 136, Appendix A.

- *Methods for the Determination of Inorganic Substances in Environmental Samples*, EPA 600/R-93/100, August 1993.

- *Methods for the Determination of Organic Compounds in Drinking Water*, EPA 600/4-88-039, December 1988 and Supplement I (7/90) and Supplement II (8/92).

- *Standard Methods for the Examination of Water and Wastewater*, 16th Edition, 1985; 17th Edition, 1989; 18th Edition, 1992, and 19th Edition, 1995.

- 40 CFR Part 136, Guidelines for Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act.

- 40 CFR Part 141, National Primary Driniking Water Regulations.

- State-specific total petroleum hydrocarbon methods for the analysis of samples for gasoline, diesel, and other petroleum hydrocarbon products.

- Annual Book of ASTM Standards.
- EPA Contract Laboratory Program, Statement of Work for Organics Analysis, OLM04.2. May 1999 and OLM04.3.
- EPA Contract Laboratory Program, Statement of Work for Inorganics Analysis, ILM04.1 and ILM05.1.
- *Good Automated Laboratory Practices, Priciples and Guidance to Regulations For Ensuring Data Integrity In Automated Laboratory Operations*, EPA 2185, August 1995.
- *National Environmental Laboratory Accreditation Conference, Quality Standards, Chapters 1-5*, July 2003.

APPENDIX A

MAJOR ANALYTICAL EQUIPMENT

Columbia Analytical Services
Rochester, NY

EQUIPMENT LIST

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
MASS SPECTROMETERS - VOAs					
GC/MS #3	Gas Chromatograph	HP 5890II	3133A37456	VOAs	2001
	Mass Spec Detector	HP 5971A	3118A02764		
	AutoSampler	Archon	13070		
	Concentrator	Tekmar 2000	91227014		
	Computer Workstation	Gateway P5-133	5360356		
	Analytical Software	Enviroquant Chemstation G1032C v.C.01.00			
GC/MS #5	Gas Chromatograph	HP 5890II	3121A35679	VOAs	1991
	Mass Spec Detector	HP 5971	3118A02532		
	AutoSampler	Archon	12727		
	Concentrator	Tekmar 3000	98125008		
	Computer Workstation	Gateway P5-133	5360357		
	Analytical Software	Enviroquant Chemstation G1032C v.c.01.00			
GC/MS #6	Gas Chromatograph	HP 6890	US00023178	VOAs	1998
	Mass Spec Detector	HP 5973	US82311143		
	AutoSampler	Archon			
	Concentrator	EST Encon	261043003		
	Computer Workstation	HP Kayak XA	US3T653217		
	Analytical Software	Enviroquant Chemstation G1701BA v.B.00.00			
GC/MS #7	Gas Chromatograph	HP 5890II	3235A43994	VOAs	2001
	Mass Spec Detector	HP 5971	323A03964		
	AutoSampler	Archon	13589		
	Concentrator	Tekmar 2000	91267022		
	Computer Workstation	Compaq DeskPro	6124FR4ZD257		
	Analytical Software	Enviroquant Chemstation G1701BA v.B.01.00			

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
GC/MS #8	Gas Chromatograph	HP 5890II	3126A36850	VOAs	2004
	Mass Spec Detector	HP 5972	3435A01975		
	AutoSampler	EST Centurion	CENT145061104		
	Concentrator	EST Encon	374062504		
	Computer Workstation	Compaq DeskPro	6946CJM7M878		
	Analytical Software	Enviroquant Chemstation G1701BA v.B.01.00			
GC/MS #9	Gas Chromatograph	HP 6890	US00029263	VOAs in air TO-15	2004
	Mass Spec Detector	HP 5973	US91922619		
	AutoSampler	Enteck 7016CA	00156		
	Concentrator	Enteck 7100	0088		
	Computer Workstation	HP Kayak XA	92181198		
	Analytical Software	Enviroquant Chemstation G1701BA v.B.01.00 Enteck Smart Lab 2000 v3.32			
GC/MS #10	Gas Chromatograph	Agilent 6890N	CN10633045	VOAs	2006
	Mass Spec Detector	Agilent 5975B	US62723782		
	Purge and Trap	EST-Varian Archon	14702		
	Concentrator	EST Encon	ELEC-523103006E PATH-523103006P		
	Computer Workstation	Dell E520	8PT52C1		
	Analytical Software	Chemstation	D.03.00.552		
Digital Display 1-Channel	Mass Flow Controller Digital Display	MKS Instruments 247C	92290101A	VOAs	2006
Digital Display 4-Channel		MKS Instruments 246B	94200203A	VOAs	2006
Flow Controller #1	Mass Flow Controllers	Model 1359C-10000SK	0258C10583442	VOAs	2006
Flow Controller #2		Model 1359C-00200SK	0258C10598442	VOAs	2006
Flow Controller #3		Model 1359C-000205SK	0258C15231304	VOAs	2006
Flow Controller #4		Model 1359C-00010SK	0258C10581442	VOAs	2006

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
MASS SPECTROMETERS -SVOAs					
GC/MS 5973A	Gas Chromatograph	HP 6890	US00024148	SemiVOAs/CLP	1998
	Mass Spec Detector	HP 5973	US82311266		
	AutoSampler	HP 7683	US00307019		
	Injector	Agilent 7683	US10301831		
	Computer Workstation	Gateway GP7-600	17904248		
	Analytical Software	HP Chemstation B.02.05 EnviroQuant G1701BA v.B.01.00			
GC/MS 5973B	Gas Chromatograph	HP 6890	US00029105	SemiVOAs/CLP	1999
	Mass Spec Detector	HP 5973	US91911849		
	AutoSampler	HP7683	US92005373		
	Injector	HP7683	US93408790		
	Computer Workstation	HP Kayak XA6/400	US92280466		
	Analytical Software	HP Chemstation B.02.05 EnviroQuant G1701BA v.B.01.00			
GC/MS 5973C	Gas Chromatograph	Agilent 6890N (G1530N)	US10232036	SemiVOAs	2002
	Mass Spec Detector	Agilent 5973 (G2578A)	US21853642		
	AutoSampler	Agilent 7683 (G2614A)	CN23021382		
	Injector	Agilent 7683 (G2613A) Agilent LVI being installed	CN23126455		
	Computer Workstation	Gateway P7-450	13645026		
	Analytical Software	HP Chemstation Enviroquant G1701 v.D.00.00.38			

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
GAS CHROMATOGRAPHS - EXTRACTABLES					
HP5890(II)- A	Gas Chromatograph	HP 5890II	3203A41098	Petroleum Hydrocarbons	1990
	Detector	FID	(integrated)		
	Injector	HP7673	3120A26909		
	Autosampler	18596B	3050A23516		
	Controller	HP7673	3113A26132		
	Computer Workstation	Gateway P5-133	5360538		
	Analytical Software	HPChemstation G1034C v.03.00			
HP5890(II)-B	Gas Chromatograph	HP 5890	2728A14298	Petroleum Hydrocarbons	1988
	Detector	FID	(integrated)		
	Autosampler	HP7673	3417A35264		
	Injector	HP7673	303A22979		
	Controller	HP7673	3416A35332		
	Computer Workstation	Gateway P5-133	5360538		
	Analytical Software	HPChemstation G1034C v.03.00			
HP5890(II)-H	Gas Chromatograph	HP 5890II	3336A56596	Alcohols/ WAPA	2005
	Detector	FID	(integrated)		
	Autosampler	18596C	US22508157		
	Injector	Agilent 6890	CN34222775		
	Controller	G1512A	CN00005087		
	Computer Workstation	HP KAYAK XA	US8345093		
	Analytical Software	HP Chemstation B.02.05 EnviroQuant G1701BA v.B.01.00			

EQUIPMENT LIST

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
HP5890(II)- C	Gas Chromatograph	HP 5890II	2643A11567	Herb/PCB	1989
	Detector	Dual ECD			
	Autosampler	18596B	3032A22303		
	Injector	HP7673	3205A29661		
	Computer Workstation	HP Vectra XA 5/233	US81450241		
	Analytical Software	HP Chemstation v.B.02.05 EnviroQuant G1701BA v.B.01.00			
HP5890(II)-L	Gas Chromatograph	HP 5890II	2950A27718	Herb/PCB	1989
	Detector	Dual ECD			
	Autosampler	18596C	US4008144		
	Injector	Agilent 6890	CN22321966		
	Computer Workstation	HP Vectra XA 5/233	US81450241		
	Analytical Software	HP Chemstation v.B.02.05 EnviroQuant G1701BA v.B.01.00			
HP6890- D	Gas Chromatograph	HP 6890	22174	Pest/PCB/8011	1998
	Detector	Dual ECD			
	Injector	HP7683	US81501041		
	Autosampler	G2614A	US81800809		
	Computer Workstation	DELL	7BQRS71		
	Analytical Software	Enviroquant MSD Chemstation D.01.02.16 15 June 2001			
6890N- G	Gas Chromatograph	Agilent 6890N	US10520018	Herb/PCB	2005
	Detector	Micro ECD			
	Injector	Agilent G2913A	CN51624717		
	Autosampler	Agilent G2614A	CN51032422		
	Computer Workstation	DELL	7BQRS71		
	Analytical Software	Enviroquant MSD Chemstation D.01.02.16 15 June 2001			

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
EXTRACTABLES SUPPORT EQUIPMENT					
GPC	GPC	OI Analytical AP2000	A122330318	Cleanups	2002
RapidVap #1	Nitrogen Evaporation System	LabConco RapidVap	11296345E	Concentrations	2001
RapidVap #2	Nitrogen Evaporation System	LabConco RapidVap	20998065F	Concentrations	2002
N-EVAP	Organomation N-EVAP	Model 112	7531	Concentrations	
Hot Orbital Shaker		Armalab OR200	3560	Extractions	2004
Autoshaker#1	Lab-Line Extraction Mixer	Model 6000	0904-3735	Extractions	2004
Autoshaker#2	Lab-Line Extraction Mixer	Model 6000	0904-3736	Extractions	2004
Autoshaker#3	Lab-Line Extraction Mixer	Model 6000	0904-3737	Extractions	2004
SPE-DEX 4790#1	Solid Phase Extractor	Horizon	05-0593	Extractions	2005
SPE-DEX 4790#2	Solid Phase Extractor	Horizon	05-0595	Extractions	2005
SPE-DEX 4790#3	Solid Phase Extractor	Horizon	05-0594	Extractions	2005
Tekmar 500		TM-500	7460E	Sonication	
Tekmar 600		TM-600	13232	Sonication	
VibraCell #1		VC375	15144E	Sonication	
VibraCell#2		VC505	37629G	Sonication	

EQUIPMENT LIST

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
GAS CHROMATOGRAPHS - VOLATILES					
V1	Gas Chromatograph	Varian 3400	4808	VOAs	1998
	PID Detector	OI 4430	OI 1009		
	PID Controller	OIA 5200	A240213		
	ELCD Detector	OIA 4420	2942-8-686		
	AutoSampler	Tekmar 2016	89016001		
	Concentrator	Tekmar 2000	91063007		
	Computer Workstation	GP6-233	9767125		
	Analytical Software	Varian System Control v.4.5.2	D57543610		
V2	Gas Chromatograph	Varian 3300	4130	Alcohols/Gases	1999
	Detector	FID	(integrated)		
	Computer Workstation	PowerFlex	120518		
	Analytical Software	Varian System Control v.4.51	D57543610		
V3	Gas Chromatograph	Varian 3400	10989	VOAs	1999
	PID Controller	OIA 5200	B509500481		
	PID Detector	OI 4430			
	ELCD Detector	OIA 5300	B05223456		
	AutoSampler	Varian Archon	13316		
	Concentrator	Tekmar 3000	98124003		
	Computer Workstation	Gateway 2000	10221502		
	Analytical Software	Varian System Control v.4.51	D57543610		
V4	Gas Chromatograph	Varian 3400	15248	VOAs	2001
	PID Detector	OI 4436	OI1000		
	ELCD Detector	OI 5300	C449553665		
	PID Controller		A218047		
	AutoSampler	Archon	13596		
	Concentrator	Encon	130122900 E/P		
	Computer Workstation	GP6-233	9767125		
	Analytical Software	Varian System Control v.4.5.2	D57543610		

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
HP1	Gas Chromatograph	HP5890II	3121A35575	VOAs	2001
	PID Detector	OIA 4430	31030		
	FID Detector	(integrated)	-		
	AutoSampler	Tekmar 2016	89220008		
	Concentrator	Tekmar 2000	89013002		
	Sample Heater	Tekmar	91065008		
	Computer Workstation	Gateway GP5-233	9352344		
	Analytical Software	Varian System Control v.4.5.2	00159-1908-cd1-22bd		
T6	Gas Chromatograph	Varian 3400	4143	VOAs/VPH/GRO	1998
	PID Detector	OI 4430	OI1006		
	FID Detector	Integrated	-		
	AutoSampler	Tekmar 2016	91298028		
	Concentrator	Tekmar 2000	91331001		
	Sample Heater	Tekmar	88264001		
	Computer Workstation	Gateway GP5-233	9352344		
	Analytical Software	Varian System Control v.4.5.2	00159-1a08-cd1-22bd		

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
HPLC					
HPLC02 (LC/MS)	Binary Pump	Agilent 1100	DE11108496	Perchlorate Explosives	2005
	Diode Array Detector	Agilent 1100	DE11112376		
	Column Thermostat	Agilent 1100	DE11120893		
	Wellplate Autosampler	Agilent 1100	DE11300879		
	Sample Thermostat	Agilent 1100	DE82207519		
	MSD	Agilent G1946D	US12411208		
	Computer Workstation	HP Vectra	US12475439		
	Analytical Software	Chemstation for HPLC Rev.A.10.02			
HPLC03	Binary Pumps	Shimadzu LCD10ADVP	1(A) C20963851348US 2(B) C20963851344US	Formaldehyde Metabolic Acids Hydroquinone Tolytriazole PAHs	2005
	UV/VIS Detector	Shimadzu SPD10AVVP	C21004050470US		
	Electrochemical Detector	BAS LC4C/CC5	LC-4C 7014		
	AutoSampler	Shimadzu SIL10ADVP	C21053850511US		
	System Controller	Shimadzu SCL10AVP	C21013851302US		
	Degasser	Shimadzu DGU 14A	101076		
	Temperature Control Module	Waters	TCM-001304		
	Computer Workstation				
	Analytical Software				

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
METALS					
FIMS	CVAA-FIMS	Perkin Elmer	1258	Mercury	1997
	Computer Workstation	Soyata			
	Analytical Software	PE AA WinLab for Windows v.2.50			
4100ZL #1	AA	Perkin Elmer AA 4100ZL	6066	Furnace Metals	1991
	Computer Workstation	Gateway GP5-233			
	Analytical Software	PE AA WinLab for Windows v.2.50			
4100ZL #2	AA	Perkin Elmer AA 4100ZL	6245	Furnace Metals	1998
	Computer Workstation	Gateway GP6-400			
	Analytical Software	PE AA WinLab for Windows v.2.50			
Leeman Hydra AFG+	CVAF	Leeman Hydra AFG+	112-00067-1	Low Level Mercury (Method 1631)	2004
	Computer Workstation	Dell Dimension 2400	35180912881		
	Analytical Software	WinHg Runner 1.5 CT Rev0.286	-		
ICP #1	Instrument	Perkin Elmer Optima 3000XL	069N4060401	Metals - Low Level	1994
	Computer Workstation	Gateway GP5-233	10221500		
	Analytical Software	PE ICP WinLab v.1.42			
ICP #2	Instrument	Perkin Elmer Optima 3000XL	069N6062602	Metals - Low Level	1999
	Computer Workstation	Gateway GP5-233	9352702		
	Analytical Software	PE ICP WinLab v.1.42			
ICP #3	Instrument	Perkin Elmer 5300DV	077N5112802	Metals	2006
	Computer Workstation	Dell Optiplex GX620			
	Analytical Software	PE ICP WinLab v.3.1			
ICPMS	SCIEX ICP/MS	Perkin Elmer Elan 9000	PO370203	Metals	2002
	Autosampler	PE AS93Plus			
	Computer Workstation	Dell Optiplex GX150			
	Analytical Software	ELAN v.2.4			

EQUIPMENT LIST

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
HOTBLOCKS - METALS					
Hotblock #1		Environmental Express		Metals Digestions	2001
Hotblock #2		Environmental Express		Metals Digestions	2001
Hotblock #3		Environmental Express		Metals Digestions	2005
Hotblock #4		Environmental Express		Metals Digestions	2005
ModBlock A		CPI		Metals Digestions	2003
ModBlock B		CPI		Metals Digestions	2003

EQUIPMENT LIST

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
GENERAL CHEMISTRY					
TOC#1	TOC Analyzer	OI Model 1010	J245710349	TOC - waters	2003
	Autosampler	OI Model 1051	B247751184		
	Computer Workstation	Gateway GP6-300	10709094		
	Analytical Software	OI WinTOC for 1010 v.01 Rev 225	-		
TOC#2	TOC Analyzer	Dohrman DC190	9507646	TOC - soils	2001
	Boat Sampler	Dohrman 183 s/s1	9507610		
Lachat 8000	Flow Injection System	Lachat 8000		Chloride, TKN, NO2/NO3, NH3, Alkalinity, Hardness, Phosphorus, Silica, Cr6+	1999
	Colorimeter	Lachat	A83000-1286		
	Pump	Lachat	A82000-525		
	Autosampler	Lachat	A81010-168		
	Computer Workstation	Gateway GP6-233	9767124		
	Analytical Software	Omnion FIA v.2	-		
QCIV	Flow Injection System	Lachat Quick Chem IV		Chloride, TKN, NO2/NO3, NH3, Alkalinity, Hardness, Phosphorus, Silica, Cr6+	1986
	Colorimeter	Lachat	125181		
	Pump	Lachat	125209		
	Module	Lachat	125304		
	Autosampler	Lachat	125203		
	Computer Workstation	IBM-compatable generic brand	-		
Technicon #1	Flow Injection System	Technicon		Cyanide	Pre-1982
	Colorimeter	Technicon	19900670		
	Pump	Technicon	TE80139		
	Chart Recorder	Technicon	199-051241		
	Autosampler	Technicon	worn-off		
Technicon #2	Flow Injection System	Technicon		Phenol	Pre-1982
	Colorimeter	Technicon	199-006701D		
	Pump	Technicon	PR0276		
	Chart Recorder	Technicon	82A3321		
	Autosampler	Technicon	681-Rest worn off		
	Module	Technicon	83035		
AquaKem	Instrument	AquaKem 200	A0419913	Nitrite, Ammonia, Phosphate, Chloride, Hexavalent Chromium	2005
	Computer Workstation	Sell SX280	3KSDF1J		
	Analytical Software	6.5.AQ1 rc4			

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
IC#1	Ion Chromatograph	Dionex Series 4000i		Anions	Pre-1982
	Basic Chromatography Module	Dionex	871602		
	Gradient Pump	Dionex	871608		
	Conductivity Detector	Dionex	871242		
	Controller Pump	Dionex	31528		
	Autosampler	Dionex	931526		
	Integrator	4270	037/24782		
	Computer Workstation	Gateway GP6-400	11809650		
	Analytical Software	Dionex PeakNet v.5.1	116-987-2806		
IC#2	Ion Chromatograph	Dionex Series 4000i	13458	Anions	Pre-1982
	Gradient Pump	Model APG-1	921553		
	Conductivity Detector	Model CDM-2	921513		
	Degas Module	EDM-2	930211		
	Autosampler	ASM-2	880113		
	Interface	ACI-1	925205		
	Computer Workstation	Gateway GP6-400	11809650		
	Analytical Software	Dionex PeakNet v.5.1	116-987-2806		
IC#3	Ion Chromatograph	Metrohm 861 Advanced Compact IC		Anions	2005
	Basic Chromatography Module	Metrohm	861-02114		
	Pump	Metrohm	62824100s20		
	Conductivity Detector	Metrohm	integrated		
	Autosampler	Metrohm	838-04105		
	Computer Workstation	Dell OptiPlex GX520	6VRC581		
	Analytical Software	IC NET 2.3 SR2	A.701.0016		

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
IC # 4	Ion Chromatograph	Dionex 500DX		ANIONS	2007
	Basic Chromatography Module	LC20-1	97110393		
	Gradient Pump	GP40-1	97110534		
	Conductivity Detector	ED40-1	97110074		
	Autosampler	AS40-1	97110671		
	Computer Workstation	Gateway 2000 GP6-266	10239250		
	Analytical Software	Peaknet 5.21	192-994-1564		
Adiabatic Calorimeter	Adiabatic Calorimeter	Parr 1241	3744	BTU, Combustion Prep	1997
Isoperibol Calorimeter	Isoperibol Calorimeter	Parr 6300	27187	BTU, Combustion Prep	2004
Autoclave	Autoclave	Amsco	none	Micro/TPO4	Pre-1970
Midi A	Midi Cyanide Distillation System	BSL Co	none	Cyanide/Phenol/ Sulfide Distillation	1997
Midi B	Midi Cyanide Distillation System	BSL Co	none	Cyanide/Phenol/ Sulfide Distillation	1997
Midi C	Midi Cyanide Distillation System			Cyanide/Phenol/ Sulfide Distillation	2004
Bullwinkle	pH Meter	Orion SA520	2305	pH	1990
Rocky	pH Meter	Orion 720A	5012		1992
	pH Electrode	Orion 915600			
	Fluoride Electrode	Orion 9409			
	Reference Electrode	Orion 90-01-00			
Jenway	pH/Conductivity Meter	Jenway 4330	1344	pH/Conductivity	2000
Turbidimeter	Turbidimeter	HF Scientific Micro 100	609246	Turbidity	2000

EQUIPMENT LIST

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
MR 21	Spectro-photometer	Milton Roy Spectronic 21	1225601	COD, MBAS, Cr6+, Ferrous Iron	1989
B&L	Spectro-photometer	B&L MSR002	114	Peroxide	1987
Buck IR	IR Spec / TPH Analyzer	Buck Scientific HC404	492	TPH	1994
DO Meter #1	Dissolved Oxygen Meter	YSI Model 54A	D8024621	DO, BOD	Pre-1990
DO Meter #2	Dissolved Oxygen Meter	YSI Model 57	A9016921	DO, BOD	Pre-1990
Open Cup	Open Cup Flashpoint Tester	Koehler Instru.Co. Model 420	none	Ignitability - solids	1989
Closed Cup	Closed Cup Flashpoint Tester	Boekel Model 152800	none	Ignitability - liquids	1993
Aquameter	Aquameter	Beckman KF4	none	% Water	1988

EQUIPMENT LIST

Instrument ID	Instrument Configuration	Manufacturer Part	Serial Number	Analyses Performed	Year Acquired
Mettler Toledo PB602-1	**Top Loading Balances**	Mettler Toledo PB602-1	1118331281	Wetchem/Metals	
American Scientific PTL2500-1		American Scientific PTL2500-1	20466	Wetchem	
Denver S-400		Denver S-400	25232	Extractables	
Fisher		Fisher	7384	Metals	
Fisher Scientific 7303 OA		Fisher Scientific 7303 OA	13556	Volatiles	

Fisher Analytical Balance	**Analytical Balances**	Fisher Analytical Balance	8887	Volatiles	1990
Mettler AG204		Mettler Toledo Balance	120330501	Wetchem	2001
Mettler AE240		Mettler Analytical Balance	F96727	Wetchem	1996 used

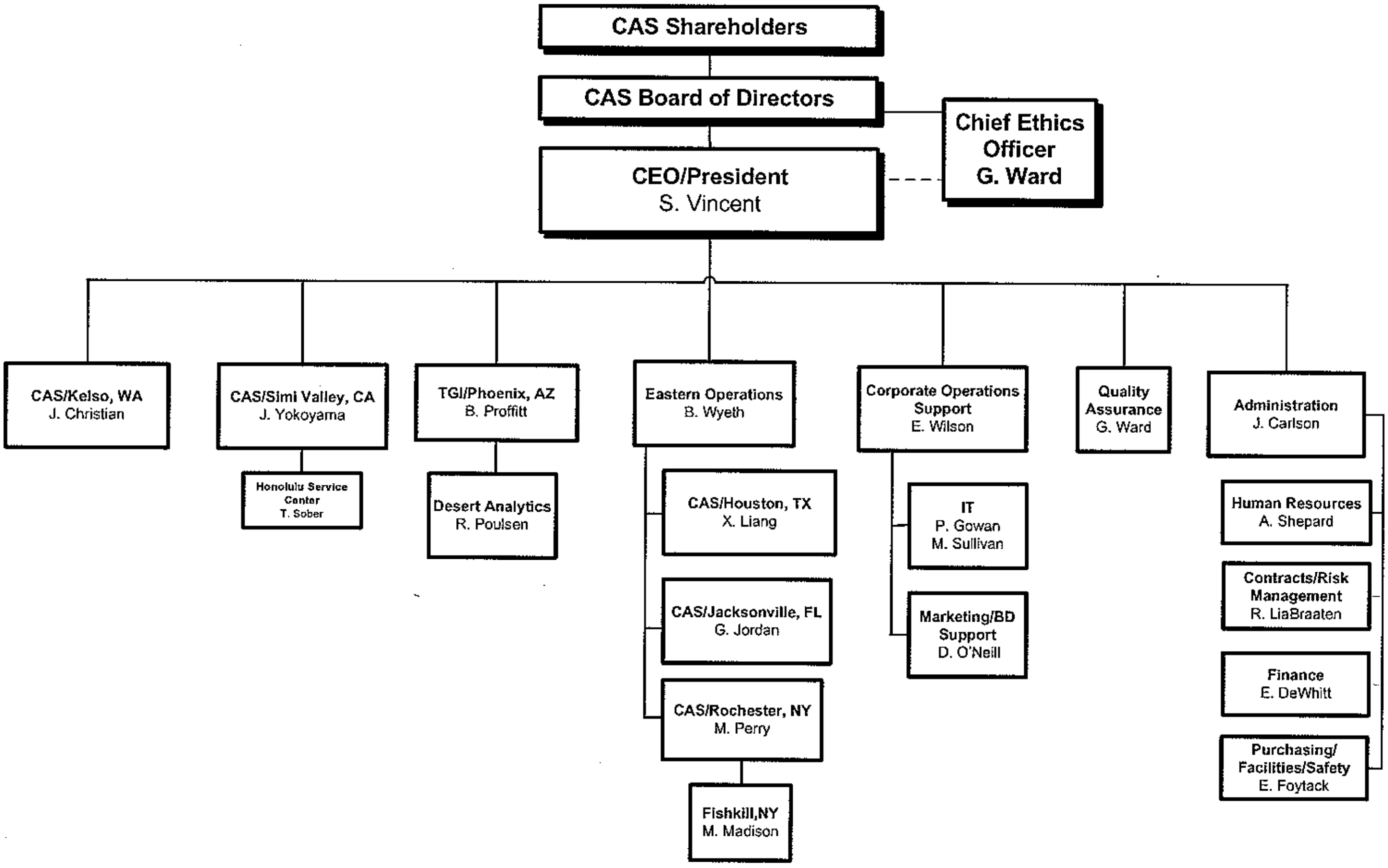
Note that the computers listed with the instruments are dedicated to that instrument for data aquisition, but the data files are saved to a lab-wide network and data may be accessed by any computer with the correct software - provided the user is authorized to do so.

APPENDIX B

ORGANIZATIONAL CHART and RESUMES OF KEY PERSONNEL

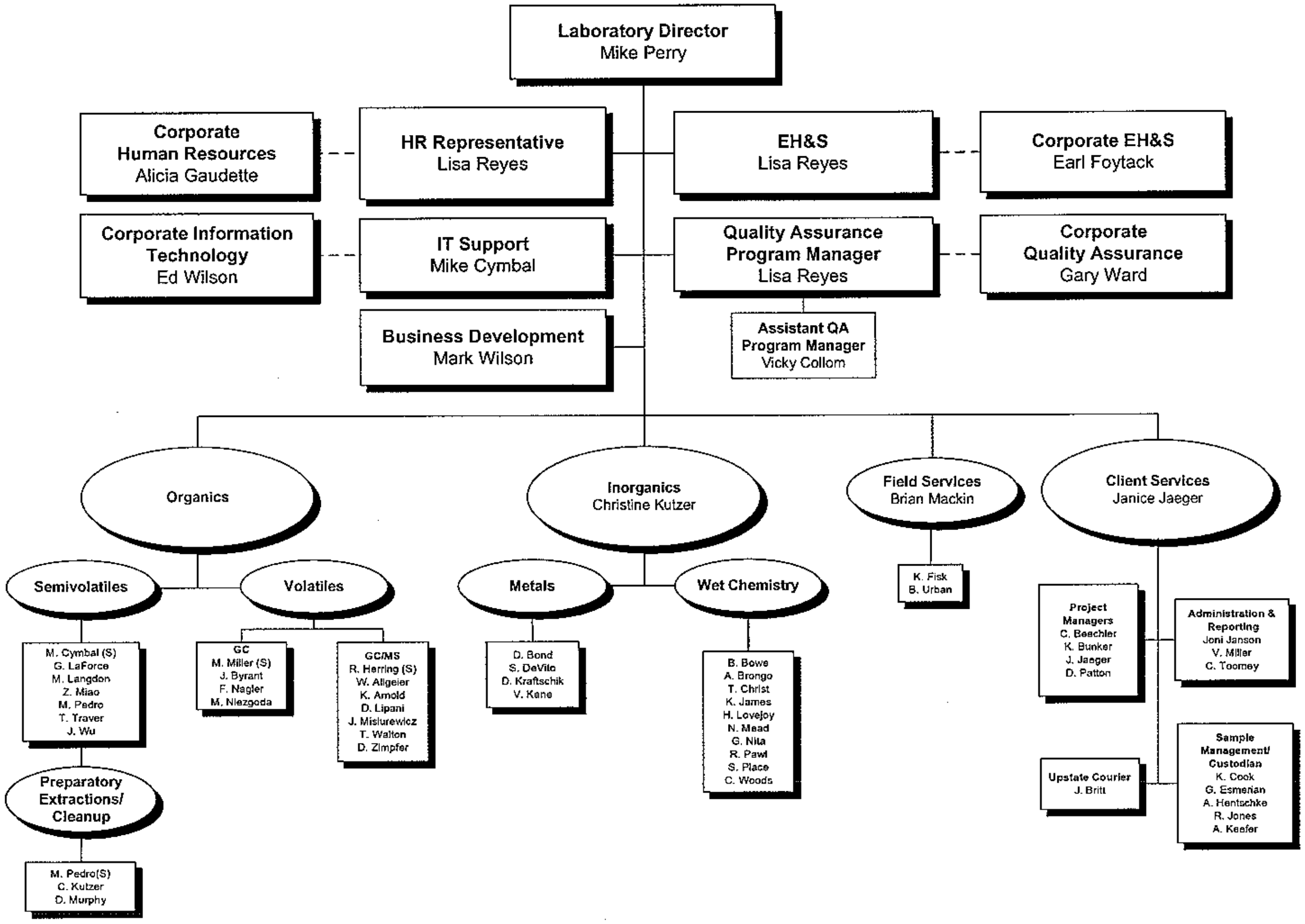
March 29, 2006

Columbia Analytical Services, Inc.
Laboratory Division Organization



Revised 5/31/07

Columbia Analytical Services, Inc.
Rochester, New York Laboratory Organization



Revised 9/12/07 dm

MICHAEL K. PERRY

1996 TO PRESENT

Columbia Analytical Services, Inc.
An Employee-Owned Company

Columbia Analytical Services, Inc., 1 Mustard St., Suite 250, Rochester, NY 14609 (585) 228-5380

Current Position

LABORATORY DIRECTOR – 1996 to Present

Responsibilities

Primary responsibilities include management of all laboratory departments, scheduling, productivity, reporting and evaluation of analytical methodologies, project planning and Quality Assurance/Quality Control protocols. In addition, other responsibilities include direct responsibility for contracts and consultants relating to the EPA SITE program, ACOE remediation program and the technical interface for the New York State ASP CLP program and other large national based clients.

Documentation of Demonstration of Capabilities is available for review.

Experience

Project Chemist, *General Testing Corporation, Rochester, New York,* 1995-1996. In addition to the duties of Laboratory Director listed below, responsibilities expanded to include the supervision of four teams of Project Chemists. Production management was shifted to the Laboratory Supervisors in order to increase client contact. Directly responsible for contracts and consultants relating to the EPA SITE program, ACOE remediation program and the New York State ASP CLP program.

Laboratory Director, *General Testing Corporation, Rochester, New York,* 1985-1995. Primary responsibilities included management of all laboratory departments, scheduling, productivity, reporting and evaluation of analytical methodologies and Quality Assurance/Quality Control protocols.

Instrument Manager, *General Testing Corporation, Rochester, New York,* 1979-1985. Responsibilities included operation and maintenance of all laboratory instruments and supervision of personnel associated with the instrumentation laboratory. Analyses included metals, volatile organics, pesticides/PCBs, and semi-volatile organics.

Senior Quality Assurance Technician, *Coca-Cola Corporation, Atlanta, Georgia,* 1976-1979. Responsible for analysis of raw materials and finished product using both wet chemistry and instrumentation techniques.

Laboratory Technician, *Penwalt Pharmaceutical Company, Rochester, New York,* 1975. Worked in the Quality Control Department.

Education

Coursework toward MS, Chemistry, *Rochester Institute of Technology, Rochester, New York,* 1983-1986
GC/MS, *ACS Short Course,* 1986
Effective Management of Chemical Analysis Laboratories, *ACS Short Course,* 1985
BS, Chemistry, *Georgia State University, Atlanta, Georgia,* 1979
AAS, Chemistry, *State University of New York at Alfred, Alfred, New York,* 1975

Affiliations

American Chemical Society

Columbia Analytical Services INC.
An Employee-Owned Company

LISA M. REYES

1997 TO PRESENT

Columbia Analytical Services, Inc., 1 Mustard St., Suite 250, Rochester, NY 14609 (585) 2285380

Current Position

QUALITY ASSURANCE/QUALITY CONTROL PROGRAM MANAGER – 1997 to Present

Responsibilities

Responsible for the overall coordination of the laboratory QA program and for ensuring that established quality objectives are met. Responsible for Quality Assurance functions including the Quality Assurance Manual, certifications, documenting standard operating procedures, and maintaining performance evaluation records. Oversees balance calibration and sample storage temperature control. Maintains certifications/accreditations for regulatory agencies and client certifications or approval programs. Acts as primary point of contact during laboratory audits. Provides audit responses and initiates any changes in procedures resulting from an audit. Coordinates the analysis of performance evaluation samples required for certification/accreditation programs. Reports and reviews results for these analyses. Conducts internal audits and makes recommendations for corrective action.

Provides technical assistance to laboratory staff on QA/QC issues, project feasibility, and methods interpretation/development.

Documentation of Demonstration of Capabilities is available for review.

Experience

Environmental Chemist, *TreaTek-CRA Company/Conestoga-Rovers & Associates, Niagara Falls, New York,* 1992-1997. Data quality, assessments and validations of ASP, CLP, and SW-846 organic and inorganic analytical data. Liaison with analytical contract laboratories, CRA field personnel, and state and federal agencies. Prepared QAPPs, laboratory bidding documents, and contracts. Also responsible for performance of laboratory audits

Manager of Quality Management Office, *Huntingdon Analytical Services, Middleport, New York,* 1989-1992. Manager of QA for Environmental, Agrochemical, Asbestos, and Engineering Soil laboratories. Responsible for in-house QA/QC programs, inspections, and instrument maintenance. Also responsible for employee safety and hazardous waste training, as well as manifesting hazardous waste. Routinely performed inorganic analyses, and reviewed analytical data, reports, and CLP packages.

Research Assistant, *Research Foundation, State University of New York College at Brockport, Brockport, New York,* 1986-1989. Performed routine sampling of surface water and lakes. Also did inorganic analyses on water and soil matrices. Assisted in graduate projects dealing with fish, plankton, water chemistry, and crayfish.

Education

CLP Inorganic Data Validation, *US EPA Region II, Westchester Community, Westchester, New York,* 1993.
CLP Organic Data Validation, *US EPA Region II, Westchester Community, Westchester, New York,* 1992.
BS, Biology, *State University of New York at Brockport, Brockport, New York,* 1988

Affiliations

American Chemical Society

MARK WILSON

1996 TO PRESENT

Current Position

DIRECTOR OF BUSINESS DEVELOPMENT II – 2004 to Present

Responsibilities

Responsible for sales maintenance for the Rochester laboratory territory including coordination of marketing and sales with national sales team.

Documentation of Demonstration of Capabilities is available for review.

Experience

Client Services Manager, *Columbia Analytical Services, Rochester, NY*, 1996-2004. Responsible for supervision of Project Chemists, sales staff, Sample Management Office (SMO) and reporting departments. Responsible for project management and client interface regarding analytical services.

Laboratory Manager, *Columbia Analytical Services, Rochester, New York*, 1996. Responsible for supervision of laboratory staff, scheduling of projects, evaluations of analytical QC procedures, and review of all analytical data.

Laboratory Manager, *General Testing Corporation, Rochester, New York*, 1992-1996. Responsibilities were primarily same as above.

Assistant Laboratory Director, *General Testing Corporation, Rochester, New York*, 1988-1992. Was responsible for assisting lab director with supervision of lab staff, scheduling of projects, evaluations of analytical and QC procedures, and review of all analytical data.

Organics Department Manager, *General Testing Corporation, Rochester, New York*, 1986-1996. Responsible for supervising all organics analyses including GC/MS, GC volatile organics, and GC extractables, and coordinating production and method development.

Organic Extractables Manager, *General Testing Corporation, Rochester, New York*, 1985-1992. Was responsible for GC operation and analysis, GC maintenance, trouble shooting, development, and GC/MS operation and start up.

Staff Technician II, *Medical Center University of Kentucky, Lexington, Kentucky*, 1979-1985. Was responsible for GC and AA analysis on biological fluids, drug screening and monitoring, heavy metals analysis, thin-layer chromatography, HPLC, and water testing.

Education

BS, Medical Technology with 32 hours of Chemistry, *State University of New York at Buffalo, Buffalo, New York*, 1978.

JANICE M. JAEGER

1996 TO PRESENT

Current Position	**CLIENT SERVICES MANAGER I**, 2004-Present
Responsibilities	Responsible for the supervision of Project Managers, Sample Management Office (SMO) and Reporting Departments. Assist clients to determine what analyses are required. Oversee projects from quote initiation to final report submission. Act as liaison between client requirements and laboratory capabilities for projects. Update clients on progress if their project and answer any questions they may have. Respond promptly to client requests and develop new client contacts within and outside of our current client base. **Documentation of Demonstration of Capabilities is available for review.**
Experience	**Project Manager III,** *Columbia Analytical Services, Rochester, NY.* 1996-2004. Assist clients to determine what analyses are required. Responsibilities primarily as above without the supervisory role. **Customer Service Representative/Sample Receiving,** *General Testing Corporation, Rochester, New York,* 1989-1996. Primary responsibilities included client services as listed above. Also responsible for sample receipt, log in and distribution as well as bottle preparation. **Surgical Assistant,** *Penfield Veterinary Hospital Rochester, New York,* 1984-1989. Primary responsibilities included preparation of instruments, surgical area, and animal for surgery. Also responsible for monitoring the animal before and after surgery.
Education	**BA, Pre-Veterinary Medicine and Pre-Professional Zoology (double Major),** *Ohio Wesleyan University, Delaware, Ohio,* 1983.

Columbia Analytical Services INC
An Employee-Owned Company

CHRISTINE M. KUTZER

1996 TO PRESENT

Columbia Analytical Services, Inc., 1 Mustard St., Suite 250, Rochester, NY 14609 (585) 288-5380

Current Position

TECHNICAL MANAGER II, INORGANICS LABORATORY – 2004 to Present

Responsibilities

Plans and manages all activities in the Inorganics Department, including Metals and General Chemistry. Responsible for coordinating the workload and scheduling employees' daily activities. Assist in the operation, troubleshooting, and maintenance of instrumentation. Responsible for scheduling samples. Accountable for analytical data entry, analytical data approval and High Level metals package generation through MARRS.

Documentation of Demonstration of Capabilities is available for review.

Experience

Technical Manager II, Metals and Organics Prep Laboratories, *Columbia Analytical Services, Inc., Rochester, New York,* 2002-2004. Duties as above for Metals Department. Responsible for coordinating the workload and scheduling employees' daily activities and troubleshooting in the organics preparation laboratory.

Technical Manager I, Metals Laboratory, *Columbia Analytical Services, Inc., Rochester, New York,* 1996-2002. Duties as above for Metals Department.

Analyst III, *Columbia Analytical Services, Rochester, New York,* 1996. Responsible for instrument troubleshooting and maintenance, digestion of samples, and TCLP extractions. Also responsible for data entry, approval, and package review.

Chemist, *General Testing Corporation, Rochester, New York,* 1992-1996. Duties were as listed above.

Education

BS, Chemistry, *St. Bonaventure University, Olean, New York,* 1992

MICHAEL W. CYMBAL

1996 TO PRESENT

Current Position

TECHNICAL MANAGER I – Information Technology 1998 to Present

- Extractables Department 2004 to Present

Responsibilities

Responsible for computer systems (Novel Lan, Starlims) and instrument analysis of software. Also responsible for client spreadsheets and disk deliverables, computer maintenance and upgrades.

Responsible for the oversight of the extractables department including extactions and instrumental analysis (HPLC, GC, and GC/MS).

Documentation of Demonstration of Capabilities is available for review.

Experience

Systems Analyst III, *Columbia Analytical Services, Inc., Rochester, New York,* 1997-1998. Duties primarily as above.

Systems Analyst I, *Columbia Analytical Services, Inc., Rochester, New York,* 1996-1997. Duties primarily as above.

Computer Administration, *General Testing Corporation, Rochester, New York,* 1995-1996. Oversaw computer systems (Novel Lan, StarLIMS, Seven Reporting Systems) and created client spreadsheets and disk deliverables.

Analyst, *General Testing Corporation, Rochester, New York,* 1990-1995. Responsible for Organic Analyses (Volatile and Semi-Volatile Pesticides) for GC and GC/MS. Also responsible for Instrument Maintenance and Sample Preparation.

Education

BS, Chemistry, *Robert's Wesleyan College, Rochester, New York,* 1990.

RODERICK "ROD" J. HERRING

1996 TO PRESENT

Columbia Analytical Services INC
An Employee - Owned Company

Columbia Analytical Services, Inc., 1 Mustard St., Suite 250, Rochester, NY 14609 (585) 288-5380

Current Position

TECHNICAL MANAGER II, MS VOLATILES – 2002 to Present

Responsibilities

Responsible for the daily operations of the GC/MS laboratory, including the scheduling of department analyses, instrument calibration, and troubleshooting/maintenance activities. Accountable for personnel training, data approval, quality program support.

Documentation of Demonstration of Capabilities is available for review.

Experience

Scientist I, GC/MS VOA Laboratory, *Columbia Analytical Services, Inc., Rochester, New York,* 1996-2002. Responsible for analysis of water, soil, and air samples for specific target contaminants using EPA methods by GC/MS technology. Also responsible for generation of analytical reports via Laboratory Information Management System (LIMS), monitoring activities for second shift, and helping in other laboratory areas as needed.

Scientist I, GC/MS VOA Laboratory, *General Testing Corporation, Rochester, New York,* 1991-1996. Responsibilities were as listed above.

GC VOAs/2nd Shift Supervisor, *General Testing Corporation, Rochester, New York,* 1998-1991. Was responsible for analysis of water, soil, and air samples via EPA methods, maintaining instrumentation, and helping with departmental organization.

TOX/TOC Operator, *General Testing Corporation, Rochester, New York,* 1988. Was responsible for analysis of water and soil for organic halogens and organic carbon, maintaining instrumentation, and organizing department and workload.

Wet Chemistry Technician, *General Testing Corporation, Rochester, New York,* 1987-1988. Was responsible for solids, grease and oils, MBAs, TKNs, alkalinities, other inorganic analyses, organizing daily workload, and reporting.

Education

BA, Natural Science and Biochemistry, *State University of New York, Utica, New York,* 1987.
AS, Biology, *Jamestown Community College, Olean, New York,* 1984.

Publications/ Presentations

The Effects of Phthalate Esters on Spinach and Pea Seedlings, FEBS Letters 1987 co-authored with Larry Bering, PhD and presented at ACS Conference, Rochester, New York, 1988.

APPENDIX C

DATA QUALITY CAPABILITIES

March 29, 2006

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
504.1		1,2-DIBROMOETHANE	WATER	0.06		UG/L	0.0060	30	60-140	50-150
504.1		1,2-DIBROMO-3-CHLOROPROPANE	WATER	0.06		UG/L	0.0040	30	60-140	50-150
524.2		1,1,1,2-TETRACHLOROETHANE	WATER	0.50		UG/L	0.12	20	70-130	70-130
524.2		1,1,1-TRICHLOROETHANE	WATER	0.50		UG/L	0.082	20	70-130	70-130
524.2		1,1,2,2-TETRACHLOROETHANE	WATER	0.50		UG/L	0.078	20	70-130	70-130
524.2		1,1,2-TRICHLOROETHANE	WATER	0.50		UG/L	0.12	20	70-130	70-130
524.2		1,1-DICHLOROETHANE	WATER	0.50		UG/L	0.11	20	70-130	70-130
524.2		1,1-DICHLOROETHENE	WATER	0.50		UG/L	0.094	20	70-130	70-130
524.2		1,1-DICHLOROPROPENE	WATER	0.50		UG/L	0.15	20	70-130	70-130
524.2		1,2,3-TRICHLOROBENZENE	WATER	0.50		UG/L	0.15	20	70-130	70-130
524.2		1,2,3-TRICHLOROPROPANE	WATER	0.50		UG/L	0.15	20	70-130	70-130
524.2		1,2,4-TRICHLOROBENZENE	WATER	0.50		UG/L	0.12	20	70-130	70-130
524.2		1,2,4-TRIMETHYLBENZENE	WATER	0.50		UG/L	0.13	20	70-130	70-130
524.2		1,2-DIBROMO-3-CHLOROPROPANE	WATER	0.50		UG/L	0.29	20	70-130	70-130
524.2		1,2-DIBROMOETHANE	WATER	0.50		UG/L	0.11	20	70-130	70-130
524.2		1,2-DICHLOROBENZENE	WATER	0.50		UG/L	0.14	20	70-130	70-130
524.2		1,2-DICHLOROETHANE	WATER	0.50		UG/L	0.13	20	70-130	70-130
524.2		1,2-DICHLOROPROPANE	WATER	0.50		UG/L	0.097	20	70-130	70-130
524.2		1,3,5-TRIMETHYLBENZENE	WATER	0.50		UG/L	0.12	20	70-130	70-130
524.2		1,3-DICHLOROBENZENE	WATER	0.50		UG/L	0.13	20	70-130	70-130
524.2		1,3-DICHLOROPROPANE	WATER	0.50		UG/L	0.12	20	70-130	70-130
524.2		1,4-DICHLOROBENZENE	WATER	0.50		UG/L	0.14	20	70-130	70-130
524.2		2,2-DICHLOROPROPANE	WATER	0.50		UG/L	0.075	20	70-130	70-130
524.2		2-CHLOROTOLUENE	WATER	0.50		UG/L	0.13	20	70-130	70-130
524.2		4-CHLOROTOLUENE	WATER	0.50		UG/L	0.11	20	70-130	70-130
524.2		BENZENE	WATER	0.50		UG/L	0.099	20	70-130	70-130
524.2		BROMOBENZENE	WATER	0.50		UG/L	0.13	20	70-130	70-130
524.2		BROMOCHLOROMETHANE	WATER	0.50		UG/L	0.15	20	70-130	70-130
524.2		BROMODICHLOROMETHANE	WATER	0.50		UG/L	0.085	20	70-130	70-130
524.2		BROMOFORM	WATER	0.50		UG/L	0.12	20	70-130	70-130
524.2		BROMOMETHANE	WATER	0.50		UG/L	0.14	20	70-130	70-130
524.2		CARBON TETRACHLORIDE	WATER	0.50		UG/L	0.19	20	70-130	70-130
524.2		CHLOROBENZENE	WATER	0.50		UG/L	0.13	20	70-130	70-130
524.2		CHLOROETHANE	WATER	0.50		UG/L	0.17	20	70-130	70-130
524.2		CHLOROFORM	WATER	0.50		UG/L	0.10	20	70-130	70-130
524.2		CHLOROMETHANE	WATER	0.50		UG/L	0.22	20	70-130	70-130
524.2		CIS-1,2-DICHLOROETHENE	WATER	0.50		UG/L	0.081	20	70-130	70-130
524.2		CIS-1,3-DICHLOROPROPENE	WATER	0.50		UG/L	0.077	20	70-130	70-130
524.2		DIBROMOCHLOROMETHANE	WATER	0.50		UG/L	0.14	20	70-130	70-130
524.2		DIBROMOMETHANE	WATER	0.50		UG/L	0.11	20	70-130	70-130
524.2		DICHLORODIFLUOROMETHANE	WATER	0.50		UG/L	0.13	20	70-130	70-130
524.2		ETHYLBENZENE	WATER	0.50		UG/L	0.089	20	70-130	70-130
524.2		HEXACHLOROBUTADIENE	WATER	0.50		UG/L	0.076	20	70-130	70-130
524.2		ISOPROPYLBENZENE	WATER	0.50		UG/L	0.16	20	70-130	70-130
524.2		M+P-XYLENE	WATER	1.0		UG/L	0.29	20	70-130	70-130
524.2		METHYLENE CHLORIDE	WATER	0.50		UG/L	0.15	20	70-130	70-130
524.2		NAPHTHALENE	WATER	0.50		UG/L	0.085	20	70-130	70-130

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
524.2	N-BUTYLBENZENE	WATER	0.50		UG/L	0.14	20	70-130	70-130
524.2	N-PROPYLBENZENE	WATER	0.50		UG/L	0.14	20	70-130	70-130
524.2	O-XYLENE	WATER	0.50		UG/L	0.16	20	70-130	70-130
524.2	P-ISOPROPYLTOLUENE	WATER	0.50		UG/L	0.14	20	70-130	70-130
524.2	SEC-BUTYLBENZENE	WATER	0.50		UG/L	0.14	20	70-130	70-130
524.2	STYRENE	WATER	0.50		UG/L	0.11	20	70-130	70-130
524.2	TERT-BUTYLBENZENE	WATER	0.50		UG/L	0.16	20	70-130	70-130
524.2	TETRACHLOROETHENE	WATER	0.50		UG/L	0.11	20	70-130	70-130
524.2	TOLUENE	WATER	0.50		UG/L	0.085	20	70-130	70-130
524.2	TRANS-1,2-DICHLOROETHENE	WATER	0.50		UG/L	0.11	20	70-130	70-130
524.2	TRANS-1,3-DICHLOROPROPENE	WATER	0.50		UG/L	0.14	20	70-130	70-130
524.2	TRICHLOROETHENE	WATER	0.50		UG/L	0.16	20	70-130	70-130
524.2	TRICHLOROFLUOROMETHANE	WATER	0.50		UG/L	0.14	20	70-130	70-130
524.2	VINYL CHLORIDE	WATER	0.50		UG/L	0.20	20	70-130	70-130
524.2	BROMOFLUOROBENZENE -SURR	WATER	NA		UG/L	NA	NA	70-130	70-130
524.2	1,2-DICHLOROBENZENE-D4 -SURR	WATER	NA		UG/L	NA	NA	70-130	70-130
524.2 ADDITIONAL COMPOUNDS BY REQUEST									
	TERT-BUTYL ALCOHOL	WATER	20		UG/L	3.7	20	70-130	70-130
	METHYL-TERT-BUTYL-ETHER	WATER	0.50		UG/L	0.097	20	70-130	70-130
	2-BUTANONE (MEK)	WATER	5.0		UG/L	1.7	20	70-130	70-130
	2-HEXANONE	WATER	5.0		UG/L	1.8	20	70-130	70-130
	4-METHYL-2-PENTANONE (MIBK)	WATER	5.0		UG/L	1.6	20	70-130	70-130
	ACETONE	WATER	5.0		UG/L	1.9	20	70-130	70-130

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
601	BROMODICHLOROMETHANE	WATER	1.0		UG/L	0.34	30	42-172	42-172
601	BROMOFORM	WATER	1.0		UG/L	0.18	30	13-159	13-159
601	BROMOMETHANE	WATER	1.0		UG/L	0.13	30	d-144	d-144
601	CARBON TETRACHLORIDE	WATER	1.0		UG/L	0.41	30	43-143	43-143
601	CHLOROBENZENE	WATER	1.0		UG/L	0.21	30	38-150	38-150
601	CHLOROETHANE	WATER	1.0		UG/L	0.47	30	46-137	46-137
601	2-CHLOROETHYLVINYL ETHER	WATER	1.0		UG/L	0.26	30	14-186	14-186
601	CHLOROFORM	WATER	1.0		UG/L	0.33	30	49-133	49-133
601	CHLOROMETHANE	WATER	1.0		UG/L	0.38	30	42-172	42-172
601	DIBROMOCHLOROMETHANE	WATER	1.0		UG/L	0.25	30	13-159	13-159
601	DICHLORODIFLUOROMETHANE	WATER	1.0		UG/L	0.31	30	70-130	50-150
601	1,2-DICHLOROBENZENE	WATER	1.0		UG/L	0.12	30	d-144	d-144
601	1,3-DICHLOROBENZENE	WATER	1.0		UG/L	0.15	30	43-143	43-143
601	1,4-DICHLOROBENZENE	WATER	1.0		UG/L	0.15	30	38-150	38-150
601	1,1-DICHLOROETHANE	WATER	1.0		UG/L	0.32	30	46-137	46-137
601	1,2-DICHLOROETHANE	WATER	1.0		UG/L	0.30	30	14-186	14-186
601	1,1-DICHLOROETHENE	WATER	1.0		UG/L	0.32	30	49-133	49-133
601	TRANS-1,2-DICHLOROETHENE	WATER	1.0		UG/L	0.36	30	d-193	d-193
601	1,2-DICHLOROPROPANE	WATER	1.0		UG/L	0.29	30	d-208	d-208
601	CIS-1,3-DICHLOROPROPENE	WATER	1.0		UG/L	0.27	30	7-187	7-187
601	TRANS-1,3-DICHLOROPROPENE	WATER	1.0		UG/L	0.19	30	42-143	42-143
601	METHYLENE CHLORIDE	WATER	1.0		UG/L	0.39	30	47-132	47-132
601	1,1,2,2-TETRACHLOROETHANE	WATER	1.0		UG/L	0.25	30	51-147	51-147
601	TETRACHLOROETHENE	WATER	1.0		UG/L	0.31	30	28-167	28-167
601	1,1,1-TRICHLOROETHANE	WATER	1.0		UG/L	0.50	30	38-155	38-155
601	1,1,2-TRICHLOROETHANE	WATER	1.0		UG/L	0.28	30	39-136	39-136
601	TRICHLOROETHENE	WATER	1.0		UG/L	0.45	30	35-146	35-146
601	TRICHLOROFLUOROMETHANE	WATER	1.0		UG/L	0.42	30	21-156	21-156
601	VINYL CHLORIDE	WATER	1.0		UG/L	0.40	30	28-163	28-163
601	BROMOCHLOROMETHANE -SURR	WATER	NA		UG/L	NA	NA	60-117	60-117
601	1,2,3 -TRICHLOROPROPANE -SURR	WATER	NA		UG/L	NA	NA	70-124	70-124
601	CHLOROFLUOROBENZENE -SURR	WATER	NA		UG/L	NA	NA	61-120	61-120
602	BENZENE	WATER	1.0		UG/L	0.20	30	39-150	39-150
602	CHLOROBENZENE	WATER	1.0		UG/L	0.21	30	55-135	55-135
602	1,3-DICHLOROBENZENE (M)	WATER	1.0		UG/L	0.36	30	50-141	50-141
602	1,2-DICHLOROBENZENE (O)	WATER	1.0		UG/L	0.15	30	37-154	37-154
602	1,4-DICHLOROBENZENE (P)	WATER	1.0		UG/L	0.39	30	42-143	42-143
602	ETHYLBENZENE	WATER	1.0		UG/L	0.23	30	32-160	32-160
602	TOLUENE	WATER	1.0		UG/L	0.18	30	46-148	46-148
602	M+P-XYLENE	WATER	2.0		UG/L	0.36	30	70-130	50-150
602	O-XYLENE	WATER	1.0		UG/L	0.17	30	70-130	50-150
602	CHLOROFLUOROBENZENE (PID) -SURR	WATER	NA		UG/L	NA	NA	73-110	73-110
601/602 ADDITIONAL COMPOUNDS BY REQUEST									
	CIS-1,2-DICHLOROETHENE	WATER	1.0		UG/L	0.30	30	24-191	24-191
	FREON 113	WATER	1.0		UG/L	0.36	30	70-130	50-150
	METHYL-TERT-BUTYL ETHER (MTBE)	WATER	1.0		UG/L	0.25	30	70-130	50-150
	TOTAL XYLENES	WATER	3.0		UG/L	0.52	30	70-130	50-150

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
624 PPL	ACROLEIN	WATER	10		UG/L	4.0	30	36-124	36-124
624 PPL	ACRYLONITRILE	WATER	10		UG/L	1.2	30	71-111	71-111
624 PPL	BENZENE	WATER	1.0		UG/L	0.18	30	37-151	37-151
624 PPL	BROMODICHLOROMETHANE	WATER	1.0		UG/L	0.24	30	35-155	35-155
624 PPL	BROMOFORM	WATER	1.0		UG/L	0.57	30	45-169	45-169
624 PPL	BROMOMETHANE	WATER	1.0		UG/L	0.75	30	d-242	d-242
624 PPL	CARBON TETRACHLORIDE	WATER	1.0		UG/L	0.44	30	70-140	70-140
624 PPL	CHLOROBENZENE	WATER	1.0		UG/L	0.20	30	37-160	37-160
624 PPL	CHLOROETHANE	WATER	1.0		UG/L	0.33	30	14-230	14-230
624 PPL	2-CHLOROETHYLVINYL ETHER	WATER	10		UG/L	0.31	30	d-305	d-305
624 PPL	CHLOROFORM	WATER	1.0		UG/L	0.17	30	51-138	51-138
624 PPL	CHLOROMETHANE	WATER	1.0		UG/L	0.33	30	d-273	d-273
624 PPL	DIBROMOCHLOROMETHANE	WATER	1.0		UG/L	0.26	30	53-149	53-149
624 PPL	1,1-DICHLOROETHANE	WATER	1.0		UG/L	0.30	30	59-155	59-155
624 PPL	1,2-DICHLOROETHANE	WATER	1.0		UG/L	0.14	30	49-155	49-155
624 PPL	1,1-DICHLOROETHENE	WATER	1.0		UG/L	0.31	30	d-234	d-234
624 PPL	TRANS-1,2-DICHLOROETHENE	WATER	1.0		UG/L	0.22	30	54-156	54-156
624 PPL	1,2-DICHLOROPROPANE	WATER	1.0		UG/L	0.25	30	d-210	d-210
624 PPL	CIS-1,3-DICHLOROPROPENE	WATER	1.0		UG/L	0.36	30	d-227	d-227
624 PPL	TRANS-1,3-DICHLOROPROPENE	WATER	1.0		UG/L	0.23	30	17-183	17-183
624 PPL	ETHYLBENZENE	WATER	1.0		UG/L	0.17	30	37-162	37-162
624 PPL	METHYLENE CHLORIDE	WATER	1.0		UG/L	0.20	30	d-221	d-221
624 PPL	1,1,2,2-TETRACHLOROETHANE	WATER	1.0		UG/L	0.27	30	46-157	46-157
624 PPL	TETRACHLOROETHENE	WATER	1.0		UG/L	0.27	30	64-148	64-148
624 PPL	TOLUENE	WATER	1.0		UG/L	0.11	30	47-150	47-150
624 PPL	1,1,1-TRICHLOROETHANE	WATER	1.0		UG/L	0.13	30	52-162	52-162
624 PPL	1,1,2-TRICHLOROETHANE	WATER	1.0		UG/L	0.47	30	52-150	52-150
624 PPL	TRICHLOROETHENE	WATER	1.0		UG/L	0.26	30	71-157	71-157
624 PPL	VINYL CHLORIDE	WATER	1.0		UG/L	0.18	30	d-251	d-251
624	4-BROMOFLUOROBENZENE -SURR	WATER	NA		UG/L	NA	NA	77-117	77-117
624	DIBROMOFLUOROMETHANE-SURR	WATER	NA		UG/L	NA	NA	86-126	86-126
624	1,2-DICHLOROETHANE-D4 -SURR	WATER	NA		UG/L	NA	NA	85-122	85-122
624	TOLUENE-D8 -SURR	WATER	NA		UG/L	NA	NA	85-115	85-115

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
624 ADDITIONAL COMPOUNDS BY REQUEST									
624	1,1,1,2-TETRACHLOROETHANE	WATER	1.0		UG/L	0.37	30	70-130	50-150
624	1,2,3-TRICHLOROPROPANE	WATER	5.0		UG/L	0.10	30	70-130	50-150
624	1,2-DIBROMO-3-CHLOROPROPANE	WATER	1.0		UG/L	0.17	30	70-130	50-150
624	1,2-DIBROMOETHANE	WATER	1.0		UG/L	0.27	30	70-130	50-150
624	1,2-DICHLOROBENZENE	WATER	1.0		UG/L	0.31	30	18-190	18-190
624	1,3-DICHLOROBENZENE	WATER	1.0		UG/L	0.35	30	59-156	59-156
624	1,4-DICHLOROBENZENE	WATER	1.0		UG/L	0.20	30	18-190	18-190
624	1-BROMO-2-CHLOROETHANE	WATER	10		UG/L	1.9	30	70-130	50-150
624	2-BUTANONE (MEK)	WATER	10		UG/L	0.75	30	70-130	50-150
624	2-HEXANONE	WATER	10		UG/L	0.73	30	70-130	50-150
624	4-CHLOROBENZOFLUORIDE	WATER	10		UG/L	1.80	30	50-150	50-150
624	4-METHYL-2-PENTANONE (MIBK)	WATER	10		UG/L	0.54	30	70-130	50-150
624	ACETONE	WATER	10		UG/L	1.3	30	50-150	50-150
624	BROMOCHLOROMETHANE	WATER	1.0		UG/L	0.082	30	70-130	50-150
624	CARBON DISULFIDE	WATER	10		UG/L	0.99	30	70-130	50-150
624	CIS-1,2-DICHLOROETHENE	WATER	1.0		UG/L	0.33	30	70-130	50-150
624	DIBROMOMETHANE	WATER	1.0		UG/L	0.10	30	70-130	50-150
624	DICHLORODIFLUOROMETHANE	WATER	1.0		UG/L	0.29	30	70-130	50-150
624	IODOMETHANE	WATER	5.0		UG/L	1.2	30	70-130	50-150
624	ISOBUTYL ALCOHOL	WATER	100		UG/L	18	30	70-130	50-150
624	M+P XYLENE	WATER	2.0		UG/L	0.25	30	70-130	50-150
624	METHYL-TERT-BUTYL ETHER	WATER	1.0		UG/L	0.17	30	70-130	50-150
624	NAPHTHALENE	WATER	5.0		UG/L	0.14	30	70-130	50-150
624	O-XYLENE	WATER	1.0		UG/L	0.27	30	70-130	50-150
624	STYRENE	WATER	1.0		UG/L	0.33	30	70-130	50-150
624	TERT-BUTYL ALCOHOL	WATER	100		UG/L	3.9	30	50-150	50-150
624	TETRAHYDROFURAN	WATER	10		UG/L	1.1	30	50-150	50-150
624	TRANS-1,4-DICHLORO-2-BUTENE	WATER	1.0		UG/L	0.17	30	70-130	50-150
624	TRICHLOROFLUOROMETHANE	WATER	1.0		UG/L	0.42	30	17-181	17-181
624	TRICHLOROTRIFLUOROETHANE	WATER	1.0		UG/L	0.35	30	70-130	50-150
624	VINYL ACETATE	WATER	5.0		UG/L	0.45	30	70-130	50-150

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
625 PPL	1,2,4-TRICHLOROBENZENE	WATER	5.0		UG/L	0.65	30	44-142	44-142
625 PPL	1,2-DICHLOROBENZENE	WATER	5.0		UG/L	0.67	30	32-129	32-129
625 PPL	1,2-DIPHENYLHYDRAZINE	WATER	5.0		UG/L	0.48	30	59-113	59-113
625 PPL	1,3-DICHLOROBENZENE	WATER	5.0		UG/L	0.50	30	d-172	d-172
625 PPL	1,4-DICHLOROBENZENE	WATER	5.0		UG/L	0.58	30	20-124	20-124
625 PPL	2,2-OXYBIS(1-CHLOROPROPANE)	WATER	5.0		UG/L	0.78	30	36-166	36-166
625 PPL	2,4,6-TRICHLOROPHENOL	WATER	5.0		UG/L	0.59	30	37-144	37-144
625 PPL	2,4-DICHLOROPHENOL	WATER	5.0		UG/L	0.37	30	39-135	39-135
625 PPL	2,4-DIMETHYLPHENOL	WATER	5.0		UG/L	1.8	30	39-135	39-135
625 PPL	2,4-DINITROPHENOL	WATER	50		UG/L	14	30	d-191	d-191
625 PPL	2,4-DINITROTOLUENE	WATER	5.0		UG/L	0.53	30	39-139	39-139
625 PPL	2,6-DINITROTOLUENE	WATER	5.0		UG/L	0.55	30	50-158	50-158
625 PPL	2-CHLORONAPHTHALENE	WATER	5.0		UG/L	0.55	30	60-118	60-118
625 PPL	2-CHLOROPHENOL	WATER	5.0		UG/L	0.69	30	23-134	23-134
625 PPL	2-NITROPHENOL	WATER	5.0		UG/L	0.61	30	29-182	29-182
625 PPL	3,3'-DICHLOROBENZIDINE	WATER	5.0		UG/L	0.73	30	d-262	d-262
625 PPL	4,6-DINITRO-2-METHYLPHENOL	WATER	50		UG/L	0.51	30	d-181	d-181
625 PPL	4-BROMOPHENYL-PHENYLETHER	WATER	5.0		UG/L	0.67	30	53-127	53-127
625 PPL	4-CHLORO-3-METHYLPHENOL	WATER	5.0		UG/L	0.50	30	22-147	22-147
625 PPL	4-CHLOROPHENYL-PHENYLETHER	WATER	5.0		UG/L	0.49	30	25-158	25-158
625 PPL	4-NITROPHENOL	WATER	50		UG/L	6.7	30	d-132	d-132
625 PPL	ACENAPHTHENE	WATER	5.0		UG/L	0.48	30	47-145	47-145
625 PPL	ACENAPHTHYLENE	WATER	5.0		UG/L	0.33	30	33-145	33-145
625 PPL	ANTHRACENE	WATER	5.0		UG/L	0.60	30	27-133	27-133
625 PPL	BENZIDINE	WATER	100		UG/L	43	30	10-113	10-113
625 PPL	BENZO(A)ANTHRACENE	WATER	5.0		UG/L	0.54	30	33-143	33-143
625 PPL	BENZO(A)PYRENE	WATER	5.0		UG/L	0.42	30	17-163	17-163
625 PPL	BENZO(B)FLUORANTHENE	WATER	5.0		UG/L	0.54	30	24-159	24-159
625 PPL	BENZO(G,H,I)PERYLENE	WATER	5.0		UG/L	0.62	30	d-219	d-219
625 PPL	BENZO(K)FLUORANTHENE	WATER	5.0		UG/L	0.53	30	11-162	11-162
625 PPL	BIS(-2-CHLOROETHOXY)METHANE	WATER	5.0		UG/L	0.86	30	33-184	33-184
625 PPL	BIS(2-CHLOROETHYL)ETHER	WATER	5.0		UG/L	0.74	30	12-158	12-158
625 PPL	BIS(2-ETHYLHEXYL)PHTHALATE	WATER	5.0		UG/L	0.48	30	8-158	8-158
625 PPL	BUTYL BENZYL PHTHALATE	WATER	5.0		UG/L	0.59	30	d-152	d-152
625 PPL	CHRYSENE	WATER	5.0		UG/L	0.53	30	17-168	17-168
625 PPL	DIBENZO(A,H)ANTHRACENE	WATER	5.0		UG/L	0.63	30	d-227	d-227
625 PPL	DIETHYLPHTHALATE	WATER	5.0		UG/L	0.31	30	d-114	d-114
625 PPL	DIMETHYL PHTHALATE	WATER	5.0		UG/L	0.53	30	d-112	d-112
625 PPL	DI-N-BUTYLPHTHALATE	WATER	5.0		UG/L	0.39	30	1-118	1-118
625 PPL	DI-N-OCTYL PHTHALATE	WATER	5.0		UG/L	0.45	30	4-146	4-146
625 PPL	FLUORANTHENE	WATER	5.0		UG/L	0.32	30	26-137	26-137
625 PPL	FLUORENE	WATER	5.0		UG/L	0.47	30	59-121	59-121
625 PPL	HEXACHLOROBENZENE	WATER	5.0		UG/L	0.43	30	d-152	d-152
625 PPL	HEXACHLOROBUTADIENE	WATER	5.0		UG/L	0.69	30	24-116	24-116
625 PPL	HEXACHLOROCYCLOPENTADIENE	WATER	5.0		UG/L	1.1	30	10-130	10-130
625 PPL	HEXACHLOROETHANE	WATER	5.0		UG/L	0.48	30	40-113	40-113
625 PPL	INDENO(1,2,3-CD)PYRENE	WATER	5.0		UG/L	0.49	30	d-171	d-171
625 PPL	ISOPHORONE	WATER	5.0		UG/L	0.61	30	21-196	21-196
625 PPL	NAPHTHALENE	WATER	5.0		UG/L	0.62	30	21-133	21-133
625 PPL	NITROBENZENE	WATER	5.0		UG/L	0.78	30	35-180	35-180
625 PPL	N-NITROSODIMETHYLAMINE	WATER	5.0		UG/L	0.79	30	27-130	27-130
625 PPL	N-NITROSO-DI-N-PROPYLAMINE	WATER	5.0		UG/L	1.19	30	d-230	d-230
625 PPL	N-NITROSODIPHENYLAMINE	WATER	5.0		UG/L	0.75	30	70-130	70-130
625 PPL	PENTACHLOROPHENOL	WATER	50		UG/L	0.60	30	14-176	14-176
625 PPL	PHENANTHRENE	WATER	5.0		UG/L	0.45	30	54-120	54-120
625 PPL	PHENOL	WATER	5.0		UG/L	0.54	30	5-112	5-112
625 PPL	PYRENE	WATER	5.0		UG/L	0.65	30	52-115	52-115
625	TERPHENYL-d14 -SURR	WATER	NA		UG/L	NA	NA	45-135	45-135
625	NITROBENZENE-d5 -SURR	WATER	NA		UG/L	NA	NA	41-129	41-129
625	PHENOL-d6 -SURR	WATER	NA		UG/L	NA	NA	15-58	15-58
625	2-FLUOROBIPHENYL -SURR	WATER	NA		UG/L	NA	NA	51-111	51-111
625	2-FLUOROPHENOL -SURR	WATER	NA		UG/L	NA	NA	27-78	27-78
625	2,4,6-TRIBROMOPHENOL -SURR	WATER	NA		UG/L	NA	NA	44-146	44-146
625 ADDITIONAL COMPOUNDS BY REQUEST									
625	1,1-BIPHENYL	WATER	5.0		UG/L	0.55	30	50-130	50-130

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
625		1-METHYLNAPHTHALENE	WATER	5.0		UG/L	0.62	30	50-130	50-130
625		2,4,5-TRICHLOROPHENOL	WATER	5.0		UG/L	0.84	30	40-110	40-110
625		2-CHLOROPYRIDINE	WATER	10		UG/L	0.42	30	58-130	50-130
625		2-METHYLNAPHTHALENE	WATER	5.0		UG/L	0.45	30	42-107	42-107
625		2-METHYLPHENOL	WATER	5.0		UG/L	0.79	30	16-102	16-102
625		2-NITROANILINE	WATER	50		UG/L	0.59	30	63-112	63-112
625		3-CHLOROPYRIDINE	WATER	10		UG/L	0.67	30	56-130	50-130
625		3-NITROANILINE	WATER	50		UG/L	0.43	30	56-111	56-111
625		4-CHLOROANILINE	WATER	5.0		UG/L	0.72	30	39-107	39-107
625		4-METHYLPHENOL	WATER	5.0		UG/L	1.5	30	26-99	26-99
625		4-NITROANILINE	WATER	50		UG/L	0.59	30	50-130	50-130
625		ACETOPHENONE	WATER	5.0		UG/L	1.35	30	40-130	40-130
625		ANILINE	WATER	5.0		UG/L	0.78	30	13-123	13-123
625		ATRAZINE	WATER	5.0		UG/L	1.3	30	50-130	50-130
625		BENZALDEHYDE	WATER	5.0		UG/L	1.3	30	50-130	50-130
625		BENZOIC ACID	WATER	50		UG/L	15	30	30-130	30-130
625		BENZYL ALCOHOL	WATER	5.0		UG/L	1.1	30	31-109	31-109
625		CAPROLACTAM	WATER	50		UG/L	1.0	30	50-130	50-130
625		CARBAZOLE	WATER	5.0		UG/L	0.47	30	70-130	70-130
625		DIBENZOFURAN	WATER	5.0		UG/L	0.41	30	70-130	70-130
625		PYRIDINE	WATER	5.0		UG/L	1.0	30	10-130	10-130
680		MONOCHLOROBIPHENYLS, TOTAL	WATER	0.005		UG/L	0.0017	30	50-125	50-125
680		DICHLOROBIPHENYLS, TOTAL	WATER	0.006		UG/L	0.0014	30	50-125	50-125
680		TRICHLOROBIPHENYLS, TOTAL	WATER	0.006		UG/L	0.0015	30	50-125	50-125
680		TETRACHLOROBIPHENYLS, TOTAL	WATER	0.010		UG/L	0.0023	30	50-125	50-125
680		PENTACHLOROBIPHENYLS, TOTAL	WATER	0.010		UG/L	0.0045	30	50-125	50-125
680		HEXACHLOROBIPHENYLS, TOTAL	WATER	0.020		UG/L	0.0032	30	50-125	50-125
680		HEPTACHLOROBIPHENYLS, TOTAL	WATER	0.020		UG/L	0.0033	30	50-125	50-125
680		OCTACHLOROBIPHENYLS, TOTAL	WATER	0.040		UG/L	0.0054	30	50-125	50-125
680		NONACHLOROBIPHENYLS, TOTAL	WATER	0.025		UG/L	0.0057	30	50-125	50-125
680		DECACHLOROBIPHENYLS, TOTAL	WATER	0.040		UG/L	0.0085	30	50-125	50-125
680		GAMMA-BHC -SURR	WATER	NA		UG/L	NA	30	59-128	59-128
680		4-4'-DDT -SURR	WATER	NA		UG/L	NA	30	45-155	45-155
8011		1,2-DIBROMOETHANE	WATER	0.06		UG/L	0.0062	30	70-130	50-150
8011		1,2-DIBROMO-3-CHLOROPROPANE	WATER	0.06		UG/L	0.0057	30	70-130	50-150
8011		TETRACHLORO-META-XYLENE (TCMX) -SU	WATER	NA		UG/L	NA	NA	70-130	50-150

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8015B-SVOA-SILOX	N,N-DIMETHYLFORAMIDE	WATER	2000		UG/L	411	30	50-150	50-150
8015B-SVOA-SILOX	HEXAMETHYLCYCLOTRISILOXANE	WATER	2000		UG/L	447	30	50-150	50-150
8015B-SVOA-SILOX	OCTAMETHYLCYCLOTRISILOXANE	WATER	2000		UG/L	460	30	50-150	50-150
8015B-SVOA-SILOX	OCTAMETHYLTETRASILOXANE	WATER	2000		UG/L	473	30	50-150	50-150
8015B-SVOA(WAPA)	1,4-DIOXANE	WATER	1000		UG/L	310	30	70-130	70-130
8015B-SVOA(WAPA)	2-PROPANOL (ISOPROPANOL)	WATER	1000		UG/L	339	30	70-130	70-130
8015B-SVOA(WAPA)	ETHYL ACETATE	WATER	1000		UG/L	320	30	70-130	70-130
8015B-SVOA(WAPA)	ISOBUTYL ALCOHOL (ISOBUTANOL)	WATER	1000		UG/L	275	30	50-150	50-150
8015B-SVOA(WAPA)	METHANOL	WATER	1000		UG/L	260	30	70-130	50-150
8015B-SVOA(WAPA)	N-BUTANOL (1-BUTANOL)	WATER	1000		UG/L	322	30	70-130	70-130
8015B-SVOA	1-BUTANOL (N-BUTANOL)	WATER	1000		UG/L	320	30	70-130	70-130
8015B-SVOA	1-METHOXY-2-PROPANOL	WATER	1000		UG/L	190	30	70-130	70-130
8015B-SVOA	1-PROPANOL (N-PROPANOL)	WATER	1000		UG/L	215	30	65-143	65-143
8015B-SVOA	2-ETHOXYETHANOL (CELLOSOLVE)	WATER	1000		UG/L	130	30	70-130	50-150
8015B-SVOA	2-ETHYLHEXANOL	WATER	1000		UG/L	464	30	70-130	50-150
8015B-SVOA	2-PROPANOL (ISOPROPANOL)	WATER	1000		UG/L	340	30	70-130	70-130
8015B-SVOA	DIMETHYLSULFOXIDE	WATER	1000		UG/L		30	50-150	50-150
8015B-SVOA	ETHANOL	WATER	1000		UG/L	440	30	70-130	50-150
8015B-SVOA	ETHER (DIETHYL ETHER)	WATER	1000		UG/L	296	30	50-150	50-150
8015B-SVOA	ETHYL ACETATE	WATER	1000		UG/L	320	30	70-130	70-130
8015B-SVOA	ISOPROPYL ETHER	WATER	1000		UG/L	135	30	50-150	50-150
8015B-SVOA	METHANOL	WATER	1000		UG/L	260	30	70-130	50-150
8015B-SVOA	METHYL CELLOSOLVE (2-METHOXYETHANO	WATER	1000		UG/L	79	30	50-150	70-130
8015B-SVOA	METHYL-TERT-BUTYL ETHER	WATER	1000		UG/L		30	70-130	70-130
8015B-SVOA	N-BUTYL ACETATE	WATER	1000		UG/L		30	40-150	40-150
8015B-SVOA	N-PROPYL ACETATE	WATER	1000		UG/L		30	40-150	40-150
8015B-SVOA	SEC-BUTANOL (2-BUTANOL)	WATER	1000		UG/L	260	30	70-130	50-150
8015B-SVOA	TETRAHYDROFURAN	WATER	1000		UG/L		30	50-150	50-150
8015B-SVOA	1-PROPANOL-OPTIONAL SURR	WATER	NA		UG/L	NA	NA	50-150	50-150
8015B-SVOA	2-HEXANONE-OPTIONAL SURR	WATER	NA		UG/L	NA	NA	50-150	50-150
8015B-SVOA	n-BUTANOL-OPTIONAL SURR	WATER	NA		UG/L	NA	NA	50-150	50-150
8015B -VOA	METHANOL	WATER	1000		UG/L	488	30	70-130	50-150
8015B -VOA	ETHANOL	WATER	1000		UG/L	267	30	70-130	50-150
8015B -VOA	ISOPROPANOL	WATER	1000		UG/L	164	30	70-130	50-150
8015B -VOA	N-PROPANOL	WATER	1000		UG/L	279	30	70-130	50-150
8015B -VOA	SEC-BUTANOL	WATER	1000		UG/L	214	30	70-130	50-150
8015B -VOA	N-BUTANOL	WATER	1000		UG/L	172	30	70-130	50-150
8015B -VOA	N-PROPANOL -SURR/TARGET	WATER	NA		UG/L	NA	NA	65-143	65-143
8015B -VOA	MINERAL SPIRITS	WATER	100		UG/L	35	30	41-145	41-145
8015B -VOA	1,4-DIFLUOROBENZENE -SURR	WATER	NA		UG/L	NA	NA	59-122	59-122
8015B -VOA	MINERAL SPIRITS	SOIL	100		UG/KG		30	70-130	50-150
8015B -VOA	1,4-DIFLUOROBENZENE -SURR	SOIL	NA		UG/KG	NA	NA	85-115	85-115
8015B	GASOLINE RANGE ORGANICS	WATER	50		UG/L	10	30	70-130	50-150
8015B	CHLOROFLUOROBENZENE (FID) -SURR	WATER	NA		UG/L	NA	NA	65-136	65-136
8015B	GASOLINE RANGE ORGANICS	SOIL	50		UG/KG	7.7	50	70-130	50-150
8015B	CHLOROFLUOROBENZENE (FID) -SURR	SOIL	NA		UG/KG	NA	NA	44-131	44-131
8015B	DIESEL RANGE ORGANICS	WATER	100		UG/L	61	30	10-154	10-154
8015B	O-TERPHENYL -SURR	WATER	NA		UG/L	NA	NA	56-128	56-128
8015B	DIESEL RANGE ORGANICS	SOIL	40000		UG/KG	13000	50	51-114	51-114
8015B	O-TERPHENYL -SURR	SOIL	NA		UG/KG	NA	NA	68-138	68-138

Columbia Analytical Services

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8015B ETPH-CT	ETPH	WATER	75		UG/L	14	30	50-150	50-150
8015B ETPH-CT	FUEL OIL #2	WATER	100		UG/L	11	30	50-150	50-150
8015B ETPH-CT	FUEL OIL #4	WATER	100		UG/L	NA	30	50-150	50-150
8015B ETPH-CT	FUEL OIL #6	WATER	100		UG/L	NA	30	50-150	50-150
8015B ETPH-CT	KEROSENE	WATER	100		UG/L	NA	30	50-150	50-150
8015B ETPH-CT	MOTOR OIL	WATER	1000		UG/L	NA	30	50-150	50-150
8015B ETPH-CT	O-TERPHENYL-SURR	WATER	NA		UG/L	NA	NA	44-148	44-148
8015B ETPH-CT	ETPH	SOIL	2500		UG/KG		30	50-150	50-150
8015B ETPH-CT	FUEL OIL #2	SOIL	3300		UG/KG		30	50-150	50-150
8015B ETPH-CT	FUEL OIL #4	SOIL	3300		UG/KG		30	50-150	50-150
8015B ETPH-CT	FUEL OIL #6	SOIL	3300		UG/KG		30	50-150	50-150
8015B ETPH-CT	KEROSENE	SOIL	3300		UG/KG		30	50-150	50-150
8015B ETPH-CT	MOTOR OIL	SOIL	33000		UG/KG		30	50-150	50-150
8015B ETPH-CT	O-TERPHENYL-SURR	SOIL	NA		UG/KG	NA	NA	25-148	25-148
8015B FINGERPRINT	FUEL OIL #2	WATER	1000		UG/L	220	30	50-150	50-150
8015B FINGERPRINT	GASOLINE	WATER	1000		UG/L	190	30	50-150	50-150
8015B FINGERPRINT	KEROSENE	WATER	1000		UG/L	290	30	50-150	50-150
8015B FINGERPRINT	MINERAL SPIRITS	WATER	1000		UG/L		30	50-150	50-150
8015B FINGERPRINT	MOTOR OIL	WATER	10000		UG/L		30	50-150	50-150
8015B FINGERPRINT	FUEL OIL #2	SOIL	100		MG/KG	29	30	50-150	50-150
8015B FINGERPRINT	GASOLINE	SOIL	100		MG/KG	23	30	50-150	50-150
8015B FINGERPRINT	KEROSENE	SOIL	100		MG/KG	66	30	50-150	50-150
8015B FINGERPRINT	MINERAL SPIRITS	SOIL	100		MG/KG		30	50-150	50-150
8015B FINGERPRINT	MOTOR OIL	SOIL	1000		MG/KG		30	50-150	50-150
8015B RSK	ETHANE	WATER	1.0		UG/L	0.11	30	50-150	50-150
8015B RSK	ETHYLENE	WATER	1.0		UG/L	0.11	30	50-150	50-150
8015B RSK	METHANE	WATER	1.0		UG/L	0.18	30	50-150	50-150
8015B RSK	PROPANE	WATER	1.0		UG/L	0.34	30	50-150	50-150
NY 310-13	FUEL OIL #2	WATER	1000		UG/L	220	30	46-150	46-150
NY 310-13	FUEL OIL #4	WATER	1000		UG/L	410	30	50-150	50-150
NY 310-13	FUEL OIL #6	WATER	1000		UG/L	400	30	50-150	50-150
NY 310-13	GASOLINE	WATER	1000		UG/L	190	30	50-150	50-150
NY 310-13	KEROSENE	WATER	1000		UG/L	290	30	50-150	50-150
NY 310-13	LUBE OIL	WATER	1000		UG/L	250	30	50-150	50-150
NY 310-13	N-DODECANE	WATER	1000		UG/L	120	30	50-150	50-150
NY 310-13	FUEL OIL #2	SOIL	100		MG/KG	29	30	70-155	70-155
NY 310-13	FUEL OIL #4	SOIL	100		MG/KG	22	30	50-150	50-150
NY 310-13	FUEL OIL #6	SOIL	100		MG/KG	26	30	50-150	50-150
NY 310-13	GASOLINE	SOIL	100		MG/KG	23	30	50-150	50-150
NY 310-13	KEROSENE	SOIL	100		MG/KG	66	30	50-150	50-150
NY 310-13	LUBE OIL	SOIL	100		MG/KG	29	30	50-150	50-150
NY 310-13	N-DODECANE	SOIL	100		MG/KG	8.5	30	50-150	50-150

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8021	1,1,2,2-TETRACHLOROETHANE	WATER	1.0		UG/L	0.25	30	70-130	70-130
8021	1,1,2-TRICHLOROETHANE	WATER	1.0		UG/L	0.17	30	70-130	70-130
8021	1,1-DICHLOROETHANE	WATER	1.0		UG/L	0.21	30	70-130	70-130
8021	1,1-DICHLOROETHENE	WATER	1.0		UG/L	0.27	30	70-130	70-130
8021	1,2-DICHLOROBENZENE	WATER	1.0		UG/L	0.17	30	70-130	70-130
8021	1,2-DICHLOROETHANE	WATER	1.0		UG/L	0.15	30	70-130	70-130
8021	1,2-DICHLOROPROPANE	WATER	1.0		UG/L	0.16	30	70-130	70-130
8021	1,3-DICHLOROBENZENE	WATER	1.0		UG/L	0.17	30	70-130	70-130
8021	1,4-DICHLOROBENZENE	WATER	1.0		UG/L	0.16	30	70-130	70-130
8021	2-CHLOROETHYLVINYL ETHER	WATER	1.0		UG/L	0.14	30	50-150	50-150
8021	BENZENE	WATER	1.0		UG/L	0.31	30	70-130	70-130
8021	BROMODICHLOROMETHANE	WATER	1.0		UG/L	0.34	30	70-130	70-130
8021	BROMOFORM	WATER	1.0		UG/L	0.17	30	70-130	70-130
8021	BROMOMETHANE	WATER	2.0		UG/L	0.12	30	50-150	50-150
8021	CARBON TETRACHLORIDE	WATER	1.0		UG/L	0.42	30	70-130	70-130
8021	CHLOROBENZENE	WATER	1.0		UG/L	0.22	30	70-130	70-130
8021	CHLOROETHANE	WATER	1.0		UG/L	0.48	30	50-150	50-150
8021	CHLOROFORM	WATER	1.0		UG/L	0.30	30	70-130	70-130
8021	CHLOROMETHANE	WATER	1.0		UG/L	0.39	30	50-150	50-150
8021	CIS-1,2-DICHLOROETHENE	WATER	1.0		UG/L	0.23	30	70-130	70-130
8021	CIS-1,3-DICHLOROPROPENE	WATER	1.0		UG/L	0.21	30	70-130	70-130
8021	DIBROMOCHLOROMETHANE	WATER	1.0		UG/L	0.11	30	70-130	70-130
8021	DICHLORODIFLUOROMETHANE	WATER	1.0		UG/L	0.29	30	50-150	50-150
8021	ETHYLBENZENE	WATER	1.0		UG/L	0.23	30	70-130	70-130
8021	FREON 113	WATER	1.0		UG/L	0.38	30	70-130	70-130
8021	M+P-XYLENE	WATER	2.0		UG/L	0.36	30	70-130	70-130
8021	METHYLENE CHLORIDE	WATER	1.0		UG/L	0.24	30	70-130	70-130
8021	O-XYLENE	WATER	1.0		UG/L	0.17	30	70-130	70-130
8021	TETRACHLOROETHENE	WATER	1.0		UG/L	0.30	30	70-130	70-130
8021	TOLUENE	WATER	1.0		UG/L	0.18	30	70-130	70-130
8021	TRANS-1,2-DICHLOROETHENE	WATER	1.0		UG/L	0.26	30	70-130	70-130
8021	TRANS-1,3-DICHLOROPROPENE	WATER	1.0		UG/L	0.19	30	70-130	70-130
8021	TRICHLOROETHENE	WATER	1.0		UG/L	0.15	30	70-130	70-130
8021	TRICHLOROFLUOROMETHANE	WATER	1.0		UG/L	0.42	30	50-150	50-150
8021	VINYL CHLORIDE	WATER	1.0		UG/L	0.41	30	50-150	50-150
8021	1,2,3 TRICHLOROPROPANE -SURR	WATER	NA		UG/L	NA	NA	61-117	61-117
8021	BROMOCHLOROMETHANE -SURR	WATER	NA		UG/L	NA	NA	70-114	70-114
8021	CHLOROFLUOROBENZENE-SURR	WATER	NA		UG/L	NA	NA	72-116	72-116
8021	CHLOROFLUOROBENZENE (PID) -SURR	WATER	NA		UG/L	NA	NA	77-113	77-113

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8021	1,1,1-TRICHLOROETHANE	SOIL	1.0		UG/KG	0.33	30	70-130	70-130
8021	1,1,2,2-TETRACHLOROETHANE	SOIL	1.0		UG/KG	0.10	30	70-130	70-130
8021	1,1,2-TRICHLOROETHANE	SOIL	1.0		UG/KG	0.25	30	70-130	70-130
8021	1,1-DICHLOROETHANE	SOIL	1.0		UG/KG	0.27	30	70-130	70-130
8021	1,1-DICHLOROETHENE	SOIL	1.0		UG/KG	0.29	30	70-130	70-130
8021	1,2-DICHLOROBENZENE	SOIL	1.0		UG/KG	0.22	30	70-130	70-130
8021	1,2-DICHLOROETHANE	SOIL	1.0		UG/KG	0.29	30	70-130	70-130
8021	1,2-DICHLOROPROPANE	SOIL	1.0		UG/KG	0.20	30	70-130	70-130
8021	1,3-DICHLOROBENZENE	SOIL	1.0		UG/KG	0.23	30	70-130	70-130
8021	1,4-DICHLOROBENZENE	SOIL	1.0		UG/KG	0.20	30	70-130	70-130
8021	2-CHLOROETHYLVINYL ETHER	SOIL	1.0		UG/KG	0.12	30	50-150	50-150
8021	BENZENE	SOIL	1.0		UG/KG	0.20	30	70-130	70-130
8021	BROMODICHLOROMETHANE	SOIL	1.0		UG/KG	0.20	30	70-130	70-130
8021	BROMOFORM	SOIL	1.0		UG/KG	0.12	30	70-130	70-130
8021	BROMOMETHANE	SOIL	2.0		UG/KG	0.26	30	50-150	50-150
8021	CARBON TETRACHLORIDE	SOIL	1.0		UG/KG	0.34	30	70-130	70-130
8021	CHLOROBENZENE	SOIL	1.0		UG/KG	0.23	30	70-130	70-130
8021	CHLOROETHANE	SOIL	1.0		UG/KG	0.29	30	50-150	50-150
8021	CHLOROFORM	SOIL	1.0		UG/KG	0.26	30	70-130	70-130
8021	CHLOROMETHANE	SOIL	1.0		UG/KG	0.64	30	50-150	50-150
8021	CIS-1,2-DICHLOROETHENE	SOIL	1.0		UG/KG	0.25	30	70-130	70-130
8021	CIS-1,3-DICHLOROPROPENE	SOIL	1.0		UG/KG	0.23	30	70-130	70-130
8021	DIBROMOCHLOROMETHANE	SOIL	1.0		UG/KG	0.23	30	70-130	70-130
8021	ETHYLBENZENE	SOIL	1.0		UG/KG	0.21	30	70-130	70-130
8021	FREON 113	SOIL	1.0		UG/KG	0.28	30	70-130	70-130
8021	M+P-XYLENE	SOIL	2.0		UG/KG	0.39	30	70-130	70-130
8021	METHYLENE CHLORIDE	SOIL	1.0		UG/KG	0.63	30	70-130	70-130
8021	O-XYLENE	SOIL	1.0		UG/KG	0.19	30	70-130	70-130
8021	TETRACHLOROETHENE	SOIL	1.0		UG/KG	0.27	30	70-130	70-130
8021	TOLUENE	SOIL	1.0		UG/KG	0.17	30	70-130	70-130
8021	TRANS-1,2-DICHLOROETHENE	SOIL	1.0		UG/KG	0.27	30	70-130	70-130
8021	TRANS-1,3-DICHLOROPROPENE	SOIL	1.0		UG/KG	0.21	30	70-130	70-130
8021	TRICHLOROETHENE	SOIL	1.0		UG/KG	0.25	30	70-130	70-130
8021	TRICHLOROFLUOROMETHANE	SOIL	1.0		UG/KG	0.26	30	50-150	50-150
8021	VINYL CHLORIDE	SOIL	1.0		UG/KG	0.80	30	50-150	50-150
8021	1,2,3-TRICHLOROPROPANE -SURR	SOIL	NA		UG/KG	NA	NA	57-141	57-141
8021	CHLOROFLUOROBENZENE -SURR	SOIL	NA		UG/KG	NA	NA	41-146	41-146
8021	CHLOROFLUOROBENZENE (PID) -SURR	SOIL	NA		UG/KG	NA	NA	20-155	20-155
8021	BROMOCHLOROMETHANE -SURR	SOIL	NA		UG/KG	NA	NA	64-130	64-130

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8021 STARS	1,2,4-TRIMETHYLBENZENE	WATER	1.0		UG/L	0.27	30	70-130	70-130
8021 STARS	1,3,5-TRIMETHYLBENZENE	WATER	1.0		UG/L	0.24	30	70-130	70-130
8021 STARS	BENZENE	WATER	0.7		UG/L	0.18	30	70-130	70-130
8021 STARS	ETHYLBENZENE	WATER	1.0		UG/L	0.21	30	70-130	70-130
8021 STARS	ISOPROPYLBENZENE	WATER	1.0		UG/L	0.18	30	70-130	70-130
8021 STARS	M+P-XYLENE	WATER	2.0		UG/L	0.41	30	70-130	70-130
8021 STARS	METHYL-TERT-BUTYLETHER	WATER	1.0		UG/L	0.29	30	70-130	70-130
8021 STARS	NAPHTHALENE	WATER	1.0		UG/L	0.73	30	70-130	70-130
8021 STARS	N-BUTYLBENZENE	WATER	1.0		UG/L	0.24	30	70-130	70-130
8021 STARS	N-PROPYLBENZENE	WATER	1.0		UG/L	0.21	30	70-130	70-130
8021 STARS	O-XYLENE	WATER	1.0		UG/L	0.28	30	70-130	70-130
8021 STARS	P-ISOPROPYLTOLUENE	WATER	1.0		UG/L	0.25	30	70-130	70-130
8021 STARS	SEC-BUTYLBENZENE	WATER	1.0		UG/L	0.20	30	70-130	70-130
8021 STARS	TERT-BUTYLBENZENE	WATER	1.0		UG/L	0.19	30	70-130	70-130
8021 STARS	TOLUENE	WATER	1.0		UG/L	0.20	30	70-130	70-130
8021 STARS	CHLOROFLUOROBENZENE (PID) -SURR	WATER	NA		UG/L	NA	NA	77-113	77-113
8021 STARS	1,2,4-TRIMETHYLBENZENE	SOIL	1.0		UG/KG	0.29	30	70-130	70-130
8021 STARS	1,3,5-TRIMETHYLBENZENE	SOIL	1.0		UG/KG	0.23	30	70-130	70-130
8021 STARS	BENZENE	SOIL	1.0		UG/KG	0.19	30	70-130	70-130
8021 STARS	ETHYLBENZENE	SOIL	1.0		UG/KG	0.19	30	70-130	70-130
8021 STARS	ISOPROPYLBENZENE	SOIL	1.0		UG/KG	0.21	30	70-130	70-130
8021 STARS	M+P-XYLENE	SOIL	2.0		UG/KG	0.44	30	70-130	70-130
8021 STARS	METHYL-TERT-BUTYLETHER	SOIL	1.0		UG/KG	0.25	30	70-130	70-130
8021 STARS	NAPHTHALENE	SOIL	1.0		UG/KG	0.27	30	70-130	70-130
8021 STARS	N-BUTYLBENZENE	SOIL	1.0		UG/KG	0.25	30	70-130	70-130
8021 STARS	N-PROPYLBENZENE	SOIL	1.0		UG/KG	0.23	30	70-130	70-130
8021 STARS	O-XYLENE	SOIL	1.0		UG/KG	0.19	30	70-130	70-130
8021 STARS	P-ISOPROPYLTOLUENE	SOIL	1.0		UG/KG	0.23	30	70-130	70-130
8021 STARS	SEC-BUTYLBENZENE	SOIL	1.0		UG/KG	0.20	30	70-130	70-130
8021 STARS	TERT-BUTYLBENZENE	SOIL	1.0		UG/KG	0.24	30	70-130	70-130
8021 STARS	TOLUENE	SOIL	1.0		UG/KG	0.17	30	70-130	70-130
8021 STARS	CHLOROFLUOROBENZENE (PID) -SURR	SOIL	NA		UG/KG	NA	NA	20-155	20-155

Columbia Analytical Services

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8081A TCL	4,4'-DDD	WATER	0.10		UG/L	0.0051	30	63-107	63-107
8081A TCL	4,4'-DDE	WATER	0.10		UG/L	0.0032	30	30-127	30-127
8081A TCL	4,4'-DDT	WATER	0.10		UG/L	0.0079	30	39-154	39-154
8081A TCL	ALDRIN	WATER	0.05		UG/L	0.0034	30	24-122	24-122
8081A TCL	ALPHA-BHC	WATER	0.05		UG/L	0.0023	30	70-130	50-150
8081A TCL	ALPHA-CHLORDANE	WATER	0.05		UG/L	0.0022	30	36-127	36-127
8081A TCL	ALPHA-ENDOSULFAN	WATER	0.05		UG/L	0.0019	30	39-125	39-125
8081A TCL	BETA-BHC	WATER	0.05		UG/L	0.0046	30	63-107	63-107
8081A TCL	BETA-ENDOSULFAN	WATER	0.10		UG/L	0.0049	30	64-107	64-107
8081A TCL	DELTA-BHC	WATER	0.05		UG/L	0.0026	30	49-116	49-116
8081A TCL	DIELDRIN	WATER	0.10		UG/L	0.0051	30	37-151	37-151
8081A TCL	ENDOSULFAN SULFATE	WATER	0.10		UG/L	0.0022	30	17-134	17-134
8081A TCL	ENDRIN	WATER	0.10		UG/L	0.0052	30	39-146	39-146
8081A TCL	ENDRIN ALDEHYDE	WATER	0.10		UG/L	0.0033	30	10-115	10-115
8081A TCL	ENDRIN KETONE	WATER	0.10		UG/L	0.0021	30	70-110	70-130
8081A TCL	GAMMA-BHC (LINDANE)	WATER	0.05		UG/L	0.0018	30	44-131	44-131
8081A TCL	GAMMA-CHLORDANE	WATER	0.05		UG/L	0.0039	30	48-122	48-122
8081A TCL	HEPTACHLOR	WATER	0.05		UG/L	0.0037	30	37-123	37-123
8081A TCL	HEPTACHLOR EPOXIDE	WATER	0.05		UG/L	0.0049	30	74-104	70-130
8081A TCL	METHOXYCHLOR	WATER	0.50		UG/L	0.0046	30	62-130	62-130
8081A TCL	TOXAPHENE	WATER	1.00		UG/L	0.20	30	46-84	46-84
8081A TCL	DECACHLOROBIPHENYL (DCB) -SURR	WATER	NA		UG/L	NA	NA	11-131	11-131
8081A TCL	TETRACHLORO-META-XYLENE (TCMX) -SU	WATER	NA		UG/L	NA	NA	13-125	13-125
8081A ADDITIONAL COMPOUNDS BY REQUEST									
8081A	CHLORDANE, TECHNICAL	WATER	0.25		UG/L	0.045	30	50-150	50-150
8081A	FAMPHUR	WATER	1.0		UG/L	0.240	30	50-150	50-150
8081A	HEXACHLOROBENZENE	WATER	0.05		UG/L	0.008	30	70-130	50-150
8081A	KEPONE	WATER	5.0		UG/L	3.5	30	50-150	50-150

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8081A TCL	4,4'-DDD	SOIL	3.3		UG/KG	0.19	30	65-106	65-106
8081A TCL	4,4'-DDE	SOIL	3.3		UG/KG	0.078	30	33-124	33-124
8081A TCL	4,4'-DDT	SOIL	3.3		UG/KG	0.17	30	45-159	45-159
8081A TCL	ALDRIN	SOIL	1.7		UG/KG	0.070	30	53-115	53-115
8081A TCL	ALPHA-BHC	SOIL	1.7		UG/KG	0.31	30	38-108	38-108
8081A TCL	ALPHA-CHLORDANE	SOIL	1.7		UG/KG	0.15	30	27-130	27-130
8081A TCL	ALPHA-ENDOSULFAN	SOIL	1.7		UG/KG	0.10	30	34-127	34-127
8081A TCL	BETA-BHC	SOIL	1.7		UG/KG	0.25	30	61-106	61-106
8081A TCL	BETA-ENDOSULFAN	SOIL	3.3		UG/KG	0.091	30	66-105	66-105
8081A TCL	DELTA-BHC	SOIL	1.7		UG/KG	0.089	30	44-119	44-119
8081A TCL	DIELDRIN	SOIL	3.3		UG/KG	0.26	30	26-174	26-174
8081A TCL	ENDOSULFAN SULFATE	SOIL	3.3		UG/KG	0.09	30	37-122	10-138
8081A TCL	ENDRIN	SOIL	3.3		UG/KG	0.11	30	45-143	45-143
8081A TCL	ENDRIN ALDEHYDE	SOIL	3.3		UG/KG	0.83	30	10-110	10-110
8081A TCL	ENDRIN KETONE	SOIL	3.3		UG/KG	0.12	30	70-130	50-150
8081A TCL	GAMMA-BHC (LINDANE)	SOIL	1.7		UG/KG	0.12	30	47-133	47-133
8081A TCL	GAMMA-CHLORDANE	SOIL	1.7		UG/KG	0.12	30	38-127	38-127
8081A TCL	HEPTACHLOR	SOIL	1.7		UG/KG	0.088	30	50-120	50-120
8081A TCL	HEPTACHLOR EPOXIDE	SOIL	1.7		UG/KG	0.11	30	77-106	77-106
8081A TCL	METHOXYCHLOR	SOIL	17		UG/KG	0.26	30	73-125	73-125
8081A TCL	TOXAPHENE	SOIL	33		UG/KG	9.7	30	46-130	46-130
8081A TCL	DECACHLOROBIPHENYL (DCB) -SURR	SOIL	NA		UG/KG	NA	NA	18-176	18-176
8081A TCL	TETRACHLORO-META-XYLENE (TCMX) -SU	SOIL	NA		UG/KG	NA	NA	24-136	24-136
8081A ADDITIONAL COMPOUNDS BY REQUEST									
8081A	CHLORDANE, TECHNICAL	SOIL	8.3		UG/KG	1.9	30	50-150	50-150
8081A	FAMPHUR	SOIL	33		UG/KG	6.8	30	50-150	50-150
8081A	HEXACHLOROBENZENE	SOIL	1.67		UG/KG	0.48	30	70-130	50-150
8081A	KEPONE	SOIL	167		UG/KG	57	30	50-150	50-150
8081A	MIREX	SOIL	1.67		UG/KG	0.27	30	70-130	31-134

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8082	PCB 1016	WATER	1.0	2.0	UG/L	0.39	30	53-118	53-118
8082	PCB 1221	WATER	2.0	3.0	UG/L	0.96	30	70-130	50-150
8082	PCB 1232	WATER	1.0	2.0	UG/L	0.58	30	70-130	50-150
8082	PCB 1242	WATER	1.0	2.0	UG/L	0.59	30	70-130	50-150
8082	PCB 1248	WATER	1.0	2.0	UG/L	0.41	30	56-119	56-119
8082	PCB 1254	WATER	1.0	2.0	UG/L	0.46	30	60-143	60-143
8082	PCB 1260	WATER	1.0	2.0	UG/L	0.44	30	57-129	42-132
8082	PCB 1268	WATER	1.0	2.0	UG/L	0.32	30	70-130	50-150
8082	DECACHLOROBIPHENYL -SURR	WATER	NA		UG/L	NA	NA	10-129	10-129
8082	TETRACHLORO-META-XYLENE -SURR	WATER	NA		UG/L	NA	NA	34-113	34-113
8082	PCB 1016	SOIL	33	67	UG/KG	9.1	30	34-130	33-132
8082	PCB 1221	SOIL	67	133	UG/KG	28	30	70-130	50-150
8082	PCB 1232	SOIL	33	67	UG/KG	11	30	70-130	50-150
8082	PCB 1242	SOIL	33	67	UG/KG	18	30	70-130	50-150
8082	PCB 1248	SOIL	33	67	UG/KG	19	30	49-140	49-140
8082	PCB 1254	SOIL	33	67	UG/KG	9.8	30	32-159	32-159
8082	PCB 1260	SOIL	33	67	UG/KG	8.6	30	57-141	24-178
8082	PCB 1268	SOIL	33	67	UG/KG	14	30	70-130	50-150
8082	DECACHLOROBIPHENYL -SURR	SOIL	NA		UG/KG	NA	NA	29-153	29-153
8082	TETRACHLORO-META-XYLENE -SURR	SOIL	NA		UG/KG	NA	NA	27-134	27-134
8082	PCB 1016	WIPES	33		UG/WIPE	9.1	30	70-130	50-150
8082	PCB 1221	WIPES	67		UG/WIPE	28	30	70-130	50-150
8082	PCB 1232	WIPES	33		UG/WIPE	11	30	70-130	50-150
8082	PCB 1242	WIPES	33		UG/WIPE	18	30	70-130	50-150
8082	PCB 1248	WIPES	33		UG/WIPE	19	30	70-130	50-150
8082	PCB 1254	WIPES	33		UG/WIPE	9.8	30	70-130	50-150
8082	PCB 1260	WIPES	33		UG/WIPE	8.6	30	70-130	50-150
8082	DECACHLOROBIPHENYL -SURR	WIPES	NA		UG/WIPE	NA	30	75-150	75-150
8082	TETRACHLORO-META-XYLENE -SURR	WIPES	NA		UG/WIPE	NA	30	73-139	73-139
8151A	2,4-D	WATER	0.5	1.0	UG/L	0.19	30	23-141	23-141
8151A	DICAMBA	WATER	0.5	1.0	UG/L	0.18	30	11-116	11-116
8151A	DINOSEB	WATER	0.5	1.0	UG/L	0.14	30	17-103	17-103
8151A	2,4,5-T	WATER	0.5	1.0	UG/L	0.24	30	18-140	18-140
8151A	2,4,5-TP (SILVEX)	WATER	0.5	1.0	UG/L	0.15	30	18-127	18-127
8151A	PENTACHLOROPHENOL	WATER	1.0		UG/L	0.14	30	40-115	40-115
8151A	DCAA -SURR	WATER	NA		UG/L	NA	NA	24-127	21-132
8151A	2,4-D	SOIL	100		UG/KG	26	30	45-134	45-134
8151A	DICAMBA	SOIL	100		UG/KG	20	30	50-150	50-150
8151A	2,4,5-T	SOIL	100		UG/KG	22	30	55-119	55-119
8151A	2,4,5-TP (SILVEX)	SOIL	100		UG/KG	22	30	45-112	45-112
8151A	PENTACHLOROPHENOL	SOIL	200		UG/KG	15	30	50-150	50-150
8151A	DCAA -SURR	SOIL	NA		UG/KG	NA	NA	20-150	20-150
METACIDS -HPLC	ACETIC ACID	WATER	1.0		MG/L	0.31	30	50-150	50-150
METACIDS -HPLC	BUTYRIC ACID	WATER	1.0		MG/L	0.18	30	50-150	50-150
METACIDS -HPLC	LACTIC ACID	WATER	1.0		MG/L	0.018	30	50-150	50-150
METACIDS -HPLC	PROPIONIC ACID	WATER	1.0		MG/L	0.17	30	50-150	50-150
METACIDS -HPLC	PYRUVIC ACID	WATER	0.1		MG/L	0.15	30	50-150	50-150

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8260B TCL	*	1,1,1-TRICHLOROETHANE	WATER	5.0		UG/L	0.67	30	70-130	70-130
8260B TCL		1,1,2,2-TETRACHLOROETHANE	WATER	5.0		UG/L	0.76	30	70-130	70-130
8260B TCL		1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE (FREON 113)	WATER	5.0		UG/L	0.71	30	70-130	70-130
8260B TCL		1,1,2-TRICHLOROETHANE	WATER	5.0		UG/L	0.77	30	70-130	70-130
8260B TCL	*	1,1-DICHLOROETHANE	WATER	5.0		UG/L	0.57	30	70-130	70-130
8260B TCL	*	1,1-DICHLOROETHENE	WATER	5.0		UG/L	0.65	30	70-130	70-130
8260B TCL		1,2,4-TRICHLOROBENZENE	WATER	5.0		UG/L	0.95	30	70-130	70-130
8260B TCL		1,2-DIBROMO-3-CHLOROPROPANE	WATER	5.0		UG/L	1.1	30	50-150	50-150
8260B TCL		1,2-DIBROMOETHANE	WATER	5.0		UG/L	0.77	30	70-130	70-130
8260B TCL	*	1,2-DICHLOROBENZENE	WATER	5.0		UG/L	0.69	30	70-130	70-130
8260B TCL	*	1,2-DICHLOROETHANE	WATER	5.0		UG/L	0.71	30	70-130	70-130
8260B TCL		1,2-DICHLOROPROPANE	WATER	5.0		UG/L	0.82	30	70-130	70-130
8260B TCL		1,3-DICHLOROBENZENE	WATER	5.0		UG/L	0.79	30	70-130	70-130
8260B TCL		1,4-DICHLOROBENZENE	WATER	5.0		UG/L	0.84	30	70-130	70-130
8260B TCL		2-BUTANONE (MEK)	WATER	10		UG/L	1.0	30	50-150	50-150
8260B TCL		2-HEXANONE	WATER	10		UG/L	0.80	30	70-130	70-130
8260B TCL		4-METHYL-2-PENTANONE (MIBK)	WATER	10		UG/L	0.66	30	70-130	70-130
8260B TCL		ACETONE	WATER	20		UG/L	2.0	30	50-150	50-150
8260B TCL	*	BENZENE	WATER	5.0		UG/L	0.69	30	70-130	70-130
8260B TCL		BROMODICHLOROMETHANE	WATER	5.0		UG/L	0.69	30	70-130	70-130
8260B TCL		BROMOFORM	WATER	5.0		UG/L	0.78	30	70-130	70-130
8260B TCL		BROMOMETHANE	WATER	5.0		UG/L	1.0	30	50-150	50-150
8260B TCL		CARBON DISULFIDE	WATER	10		UG/L	1.2	30	70-130	70-130
8260B TCL		CARBON TETRACHLORIDE	WATER	5.0		UG/L	0.66	30	70-130	70-130
8260B TCL	*	CHLOROBENZENE	WATER	5.0		UG/L	0.69	30	70-130	70-130
8260B TCL		CHLOROETHANE	WATER	5.0		UG/L	0.73	30	70-130	70-130
8260B TCL	*	CHLOROFORM	WATER	5.0		UG/L	0.60	30	70-130	70-130
8260B TCL		CHLOROMETHANE	WATER	5.0		UG/L	0.68	30	70-130	70-130
8260B TCL	*	CIS-1,2-DICHLOROETHENE	WATER	5.0		UG/L	0.76	30	70-130	70-130
8260B TCL		CIS-1,3-DICHLOROPROPENE	WATER	5.0		UG/L	0.52	30	70-130	70-130
8260B TCL		CYCLOHEXANE	WATER	10		UG/L	0.60	30	50-150	50-150
8260B TCL		DIBROMOCHLOROMETHANE	WATER	5.0		UG/L	0.67	30	70-130	70-130
8260B TCL		DICHLORODIFLUOROMETHANE (FREON 12)	WATER	5.0		UG/L	0.72	30	70-130	70-130
8260B TCL	*	ETHYLBENZENE	WATER	5.0		UG/L	0.81	30	70-130	70-130
8260B TCL		ISOPROPYLBENZENE	WATER	5.0		UG/L	0.74	30	70-130	70-130
8260B TCL		M+P-XYLENE	WATER	5.0		UG/L	1.4	30	70-130	70-130
8260B TCL		METHYL ACETATE	WATER	10		UG/L	0.79	30	50-150	50-150
8260B TCL		METHYLCYCLOHEXANE	WATER	10		UG/L	0.88	30	50-150	50-150
8260B TCL		METHYLENE CHLORIDE	WATER	5.0		UG/L	0.61	30	70-130	70-130
8260B TCL		METHYL-TERT-BUTYL ETHER (MTBE)	WATER	5.0		UG/L	0.82	30	70-130	70-130
8260B TCL	*	O-XYLENE	WATER	5.0		UG/L	0.75	30	70-130	70-130
8260B TCL		STYRENE	WATER	5.0		UG/L	0.75	30	70-130	70-130
8260B TCL	*	TETRACHLOROETHENE	WATER	5.0		UG/L	0.71	30	70-130	70-130
8260B TCL	*	TOLUENE	WATER	5.0		UG/L	0.72	30	70-130	70-130
8260B TCL	*	TRANS-1,2-DICHLOROETHENE	WATER	5.0		UG/L	0.51	30	70-130	70-130
8260B TCL		TRANS-1,3-DICHLOROPROPENE	WATER	5.0		UG/L	0.74	30	70-130	70-130
8260B TCL	*	TRICHLOROETHENE	WATER	5.0		UG/L	0.74	30	70-130	70-130
8260B TCL		TRICHLOROFLUOROMETHANE (FREON 11)	WATER	5.0		UG/L	0.94	30	70-130	70-130
8260B TCL	*	VINYL CHLORIDE	WATER	5.0		UG/L	0.64	30	70-130	70-130
8260B TCL		4-BROMOFLUOROBENZENE -SURR	WATER	NA		UG/L	NA	NA	80-123	80-123
8260B TCL		DIBROMOFLUOROMETHANE -SURR	WATER	NA		UG/L	NA	NA	89-115	89-115
8260B TCL		DICHLOROETHANE-D4 -SURR	WATER	NA		UG/L	NA	NA	80-120	80-120
8260B TCL		TOLUENE-D8 -SURR	WATER	NA		UG/L	NA	NA	88-124	88-124

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8260B ADDITIONAL COMPOUNDS BY REQUEST									
8260B	1,1,1,2-TETRACHLOROETHANE	WATER	5.0		UG/L	0.59	30	70-130	70-130
8260B	1,1-DICHLOROPROPENE	WATER	5.0		UG/L	0.76	30	70-130	70-130
8260B	1,2,3-TRICHLOROBENZENE	WATER	5.0		UG/L	0.92	30	70-130	70-130
8260B	1,2,3-TRICHLOROPROPANE	WATER	5.0		UG/L	1.70	30	70-130	70-130
8260B	1,2,4-TRIMETHYLBENZENE	WATER	5.0		UG/L	0.80	30	70-130	70-130
8260B	1,2-DICHLORO-1,1,2-TRIFLUOROETHANE (FREON 123A)	WATER	5.0		UG/L	0.77	30	70-130	70-150
8260B	1,3,5-TRIMETHYLBENZENE	WATER	5.0		UG/L	0.76	30	70-130	70-130
8260B	1,3-DICHLOROPROPANE	WATER	5.0		UG/L	0.61	30	70-130	70-130
8260B	1,4-DIOXANE	WATER	100		UG/L	28	30	50-150	50-150
8260B	2,2-DICHLORO-1,1,1-TRIFLUOROETHANE (FREON 123)	WATER	5.0		UG/L	0.45	30	70-130	70-130
8260B	2,2-DICHLOROPROPANE	WATER	5.0		UG/L	0.70	30	70-130	70-130
8260B	2-CHLORO-1,3-BUTADIENE	WATER	5.0		UG/L	0.75	30	70-130	70-130
8260B	2-CHLOROETHYLVINYL ETHER	WATER	5.0		UG/L	0.68	30	50-150	50-150
8260B	2-CHLOROTOLUENE	WATER	5.0		UG/L	0.75	30	70-130	70-130
8260B	2-NITROPROPANE	WATER	5.0		UG/L	1.8	30	50-150	50-150
8260B	2-PROPANOL	WATER	100		UG/L	12	30	70-130	70-130
8260B	3-CHLOROPROPENE (ALLYL CHLORIDE)	WATER	5.0		UG/L	1.1	30	70-130	70-130
8260B	4-CHLOROTOLUENE	WATER	5.0		UG/L	0.72	30	70-130	70-130
8260B	ACETONITRILE	WATER	100		UG/L	5.4	30	50-150	50-150
8260B	ACROLEIN	WATER	100		UG/L	13	30	50-150	50-150
8260B	ACRYLONITRILE	WATER	100		UG/L	8.1	30	50-150	50-150
8260B	ALLYL CHLORIDE	WATER	5.0		UG/L	1.1	30	70-130	70-130
8260B	BROMOBENZENE	WATER	5.0		UG/L	0.63	30	70-130	70-130
8260B	BROMOCHLOROMETHANE	WATER	5.0		UG/L	0.72	30	70-130	70-130
8260B	CYCLOHEXANONE	WATER	100		UG/L	10	30	50-150	50-150
8260B	DIBROMOMETHANE	WATER	5.0		UG/L	0.74	30	70-130	70-130
8260B	DICHLOROFLUOROMETHANE (FREON 21)	WATER	5.0		UG/L	0.74	30	50-150	50-150
8260B	DIETHYL ETHER	WATER	5.0		UG/L	0.74	30	70-130	70-130
8260B	ETHYL METHACRYLATE	WATER	10		UG/L	0.73	30	70-130	70-130
8260B	HEXACHLOROBUTADIENE	WATER	5.0		UG/L	1.5	30	70-130	70-130
8260B	IODOMETHANE	WATER	10		UG/L	0.73	30	50-150	50-150
8260B	ISOBUTYL ALCOHOL	WATER	100		UG/L	13	30	50-150	50-150
8260B	METHACRYLONITRILE	WATER	20		UG/L	0.52	30	50-150	50-150
8260B	METHYL METHACRYLATE	WATER	10		UG/L	0.71	30	70-130	70-130
8260B	NAPTHALENE	WATER	5.0		UG/L	0.66	30	50-150	50-150
8260B	N-BUTYLBENZENE	WATER	5.0		UG/L	0.82	30	70-130	70-130
8260B	N-HEPTANE	WATER	5.0		UG/L	1.4	30	70-130	70-130
8260B	N-PROPYLBENZENE	WATER	5.0		UG/L	0.79	30	70-130	70-130
8260B	P-ISOPROPYLTOLUENE	WATER	5.0		UG/L	0.84	30	70-130	70-130
8260B	PROPIONITRILE	WATER	100		UG/L	3.2	30	50-150	50-150
8260B	SEC-BUTYLBENZENE	WATER	5.0		UG/L	0.80	30	70-130	70-130
8260B	TERT-BUTYL ALCOHOL	WATER	100		UG/L	15	30	50-150	50-150
8260B	TERT-BUTYLBENZENE	WATER	5.0		UG/L	0.80	30	70-130	70-130
8260B	TETRA HYDROFURAN	WATER	5.0		UG/L	0.89	30	50-150	50-150
8260B	TRANS-1,4-DICHLORO-2-BUTENE	WATER	5.0		UG/L	0.54	30	50-150	50-150
8260B	VINYL ACETATE	WATER	10		UG/L	1.9	30	50-150	50-150

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8260B TCL	*	1,1,1-TRICHLOROETHANE	SOIL	5.0		UG/KG	0.60	30	70-130	70-130
8260B TCL		1,1,2,2-TETRACHLOROETHANE	SOIL	5.0		UG/KG	0.51	30	70-130	70-130
8260B TCL		1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE (FREON 113)	SOIL	5.0		UG/KG	0.39	30	70-130	70-130
8260B TCL		1,1,2-TRICHLOROETHANE	SOIL	5.0		UG/KG	0.22	30	70-130	70-130
8260B TCL	*	1,1-DICHLOROETHANE	SOIL	5.0		UG/KG	0.24	30	70-130	70-130
8260B TCL	*	1,1-DICHLOROETHENE	SOIL	5.0		UG/KG	0.48	30	70-130	70-130
8260B TCL		1,2,4-TRICHLOROBENZENE	SOIL	5.0		UG/KG	0.94	30	70-130	70-130
8260B TCL		1,2-DIBROMO-3-CHLOROPROPANE	SOIL	5.0		UG/KG	0.70	30	50-150	50-150
8260B TCL		1,2-DIBROMOETHANE	SOIL	5.0		UG/KG	0.40	30	70-130	70-130
8260B TCL	*	1,2-DICHLOROBENZENE	SOIL	5.0		UG/KG	0.23	30	70-130	70-130
8260B TCL	*	1,2-DICHLOROETHANE	SOIL	5.0		UG/KG	0.30	30	70-130	70-130
8260B TCL		1,2-DICHLOROPROPANE	SOIL	5.0		UG/KG	0.47	30	70-130	70-130
8260B TCL		1,3-DICHLOROBENZENE	SOIL	5.0		UG/KG	0.53	30	70-130	70-130
8260B TCL		1,4-DICHLOROBENZENE	SOIL	5.0		UG/KG	0.57	30	70-130	70-130
8260B TCL		2-BUTANONE (MEK)	SOIL	10		UG/KG	1.0	30	50-150	50-150
8260B TCL		2-HEXANONE	SOIL	10		UG/KG	0.72	30	70-130	70-130
8260B TCL		4-METHYL-2-PENTANONE (MIBK)	SOIL	10		UG/KG	0.95	30	70-130	70-130
8260B TCL		ACETONE	SOIL	20		UG/KG	1.5	30	50-150	50-150
8260B TCL	*	BENZENE	SOIL	5.0		UG/KG	0.19	30	70-130	70-130
8260B TCL		BROMODICHLOROMETHANE	SOIL	5.0		UG/KG	0.39	30	70-130	70-130
8260B TCL		BROMOFORM	SOIL	5.0		UG/KG	0.46	30	70-130	70-130
8260B TCL		BROMOMETHANE	SOIL	5.0		UG/KG	0.50	30	50-150	50-150
8260B TCL		CARBON DISULFIDE	SOIL	10		UG/KG	0.19	30	70-130	70-130
8260B TCL		CARBON TETRACHLORIDE	SOIL	5.0		UG/KG	0.35	30	70-130	70-130
8260B TCL	*	CHLOROBENZENE	SOIL	5.0		UG/KG	0.24	30	70-130	70-130
8260B TCL		CHLOROETHANE	SOIL	5.0		UG/KG	0.21	30	70-130	70-130
8260B TCL	*	CHLOROFORM	SOIL	5.0		UG/KG	0.15	30	70-130	70-130
8260B TCL		CHLOROMETHANE	SOIL	5.0		UG/KG	0.44	30	70-130	70-130
8260B TCL	*	CIS-1,2-DICHLOROETHENE	SOIL	5.0		UG/KG	0.55	30	70-130	70-130
8260B TCL		CIS-1,3-DICHLOROPROPENE	SOIL	5.0		UG/KG	0.20	30	70-130	70-130
8260B TCL		CYCLOHEXANE	SOIL	10		UG/KG	0.36	30	70-130	70-130
8260B TCL		DIBROMOCHLOROMETHANE	SOIL	5.0		UG/KG	0.32	30	70-130	70-130
8260B TCL		DICHLORODIFLUOROMETHANE (FREON 12)	SOIL	5.0		UG/KG	0.35	30	70-130	70-130
8260B TCL	*	ETHYLBENZENE	SOIL	5.0		UG/KG	0.37	30	70-130	70-130
8260B TCL		ISOPROPYLBENZENE	SOIL	5.0		UG/KG	0.40	30	70-130	70-130
8260B TCL		M+P-XYLENE	SOIL	5.0		UG/KG	0.78	30	70-130	70-130
8260B TCL		METHYLCYCLOHEXANE	SOIL	10		UG/KG	0.34	30	50-150	50-150
8260B TCL		METHYLENE CHLORIDE	SOIL	5.0		UG/KG	0.32	30	70-130	70-130
8260B TCL		METHYL-TERT-BUTYL ETHER (MTBE)	SOIL	5.0		UG/KG	0.19	30	70-130	70-130
8260B TCL	*	O-XYLENE	SOIL	5.0		UG/KG	0.31	30	70-130	70-130
8260B TCL		STYRENE	SOIL	5.0		UG/KG	0.16	30	70-130	70-130
8260B TCL	*	TETRACHLOROETHENE	SOIL	5.0		UG/KG	0.24	30	70-130	70-130
8260B TCL	*	TOLUENE	SOIL	5.0		UG/KG	0.30	30	70-130	70-130
8260B TCL	*	TRANS-1,2-DICHLOROETHENE	SOIL	5.0		UG/KG	0.30	30	70-130	70-130
8260B TCL		TRANS-1,3-DICHLOROPROPENE	SOIL	5.0		UG/KG	0.33	30	70-130	70-130
8260B TCL	*	TRICHLOROETHENE	SOIL	5.0		UG/KG	0.28	30	70-130	70-130
8260B TCL		TRICHLOROFLUOROMETHANE (FREON 11)	SOIL	5.0		UG/KG	0.32	30	70-130	70-130
8260B TCL	*	VINYL CHLORIDE	SOIL	5.0		UG/KG	0.68	30	70-130	70-130
8260B TCL		4-BROMOFLUOROBENZENE -SURR	SOIL	NA		UG/KG	NA	NA	50-135	50-135
8260B TCL		DIBROMOFLUOROMETHANE -SURR	SOIL	NA		UG/KG	NA	NA	58-133	58-133
8260B TCL		DICHLOROETHANE-D4	SOIL	NA		UG/KG	NA	NA	80-120	80-120
8260B TCL		TOLUENE-D8 -SURR	SOIL	NA		UG/KG	NA	NA	75-128	75-128

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8260B ADDITIONAL COMPOUNDS BY REQUEST									
8260B	1,1,1,2-TETRACHLOROETHANE	SOIL	5.0		UG/KG	0.44	30	70-130	70-130
8260B	1,1-DICHLOROPROPENE	SOIL	5.0		UG/KG	0.43	30	70-130	70-130
8260B	1,2,3-TRICHLOROBENZENE	SOIL	5.0		UG/KG	1.1	30	70-130	70-130
8260B	1,2,3-TRICHLOROPROPANE	SOIL	5.0		UG/KG	0.95	30	70-130	70-130
8260B	1,2,4-TRIMETHYLBENZENE	SOIL	5.0		UG/KG	0.42	30	70-130	70-130
8260B	1,3,5-TRIMETHYLBENZENE	SOIL	5.0		UG/KG	0.51	30	70-130	70-130
8260B	1,3-DICHLOROPROPANE	SOIL	5.0		UG/KG	0.38	30	70-130	70-130
8260B	1,4-DIOXANE	SOIL	100		UG/KG	21	30	50-150	50-150
8260B	2,2-DICHLOROPROPANE	SOIL	5.0		UG/KG	0.21	30	70-130	70-130
8260B	2-CHLORO-1,3-BUTADIENE	SOIL	5.0		UG/KG	0.53	30	70-130	70-130
8260B	2-CHLOROETHYLVINYL ETHER	SOIL	5.0		UG/KG	2.7	30	50-150	50-150
8260B	2-CHLOROTOLUENE	SOIL	5.0		UG/KG	0.28	30	70-130	70-130
8260B	2-NITROPROPANE	SOIL	5.0		UG/KG	1.5	30	50-150	50-150
8260B	2-PROPANOL	SOIL	100		UG/KG	39	30	70-130	70-130
8260B	3-CHLOROPROPENE (ALLYL CHLORIDE)	SOIL	5.0		UG/KG	1.0	30	70-130	70-130
8260B	4-CHLOROTOLUENE	SOIL	5.0		UG/KG	0.37	30	70-130	70-130
8260B	ACETONITRILE	SOIL	100		UG/KG	13	30	50-150	50-150
8260B	ACROLEIN	SOIL	100		UG/KG	5.4	30	50-150	50-150
8260B	ACRYLONITRILE	SOIL	100		UG/KG	3.6	30	50-150	50-150
8260B	ALLYL CHLORIDE	SOIL	5.0		UG/KG	1.0	30	70-130	70-130
8260B	BROMOBENZENE	SOIL	5.0		UG/KG	0.42	30	70-130	70-130
8260B	BROMOCHLOROMETHANE	SOIL	5.0		UG/KG	0.34	30	70-130	70-130
8260B	DIBROMOMETHANE	SOIL	5.0		UG/KG	0.35	30	70-130	70-130
8260B	DIETHYL ETHER	SOIL	5.0		UG/KG	0.49	30	70-130	70-130
8260B	ETHYL METHACRYLATE	SOIL	10.0		UG/KG	0.26	30	70-130	70-130
8260B	HEXACHLOROBUTADIENE	SOIL	5.0		UG/KG	0.60	30	70-130	70-130
8260B	IODOMETHANE	SOIL	10		UG/KG	0.35	30	50-150	50-150
8260B	ISOBUTYL ALCOHOL	SOIL	100		UG/KG	14	30	50-150	50-150
8260B	METHACRYLONITRILE	SOIL	20		UG/KG	1.7	30	50-150	50-150
8260B	METHYL METHACRYLATE	SOIL	10		UG/KG	1.2	30	70-130	70-130
8260B	NAPTHALENE	SOIL	5.0		UG/KG	1.1	30	50-150	50-150
8260B	N-BUTYLBENZENE	SOIL	5.0		UG/KG	0.61	30	70-130	70-130
8260B	N-HEPTANE	SOIL	5.0		UG/KG	0.36	30	70-130	70-130
8260B	N-PROPYLBENZENE	SOIL	5.0		UG/KG	0.36	30	70-130	70-130
8260B	P-ISOPROPYLTOLUENE	SOIL	5.0		UG/KG	0.41	30	70-130	70-130
8260B	PROPIONITRILE	SOIL	100		UG/KG	8.9	30	50-150	50-150
8260B	SEC-BUTYLBENZENE	SOIL	5.0		UG/KG	0.32	30	70-130	70-130
8260B	TERT-BUTYL ALCOHOL	SOIL	100		UG/KG	10	30	50-150	50-150
8260B	TERT-BUTYLBENZENE	SOIL	5.0		UG/KG	0.29	30	70-130	70-130
8260B	TETRA HYDROFURAN	SOIL	5.0		UG/KG	1.1	30	50-150	50-150
8260B	TRANS-1,4-DICHLORO-2-BUTENE	SOIL	5.0		UG/KG	0.98	30	50-150	50-150
8260B	VINYL ACETATE	SOIL	10		UG/KG	1.2	30	50-150	50-150

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8270C TCL		1,1'-BIPHENYL	WATER	10		UG/L	0.55	30	40-150	40-150
8270C TCL		2,2'-OXYBIS(1-CHLOROPROPANE)	WATER	10		UG/L	0.78	30	10-140	10-140
8270C TCL	*	2,4,5-TRICHLOROPHENOL	WATER	10		UG/L	0.84	30	40-110	40-110
8270C TCL	*	2,4,6-TRICHLOROPHENOL	WATER	10		UG/L	0.59	30	40-110	40-110
8270C TCL		2,4-DICHLOROPHENOL	WATER	10		UG/L	0.37	30	66-104	66-104
8270C TCL		2,4-DIMETHYLPHENOL	WATER	10		UG/L	1.8	30	31-92	31-92
8270C TCL	*	2,4-DINITROPHENOL	WATER	50		UG/L	14	30	21-123	21-123
8270C TCL		2,4-DINITROTOLUENE	WATER	10		UG/L	0.53	30	68-113	58-114
8270C TCL		2,6-DINITROTOLUENE	WATER	10		UG/L	0.55	30	70-130	70-130
8270C TCL	*	2-CHLORONAPHTHALENE	WATER	10		UG/L	0.55	30	52-111	52-111
8270C TCL		2-CHLOROPHENOL	WATER	10		UG/L	0.69	30	16-116	37-105
8270C TCL	*	2-METHYLNAPHTHALENE	WATER	10		UG/L	0.45	30	42-107	42-107
8270C TCL		2-METHYLPHENOL	WATER	10		UG/L	0.79	30	16-102	16-102
8270C TCL		2-NITROANILINE	WATER	50		UG/L	0.59	30	63-130	63-130
8270C TCL		2-NITROPHENOL	WATER	10		UG/L	0.61	30	63-130	63-130
8270C TCL		3,3'-DICHLOROBENZIDINE	WATER	10		UG/L	0.73	30	48-119	48-119
8270C TCL		3-NITROANILINE	WATER	50		UG/L	0.43	30	56-111	56-111
8270C TCL	*	4,6-DINITRO-2-METHYLPHENOL	WATER	50		UG/L	0.51	30	47-130	47-130
8270C TCL	*	4-BROMOPHENYL-PHENYLETHER	WATER	10		UG/L	0.67	30	64-130	64-130
8270C TCL		4-CHLORO-3-METHYLPHENOL	WATER	10		UG/L	0.50	30	21-131	21-131
8270C TCL		4-CHLOROANILINE	WATER	10		UG/L	0.70	30	39-107	39-107
8270C TCL		4-CHLOROPHENYL-PHENYLETHER	WATER	10		UG/L	0.49	30	55-106	55-106
8270C TCL		4-METHYLPHENOL	WATER	10		UG/L	1.5	30	26-99	26-99
8270C TCL	*	4-NITROANILINE	WATER	50		UG/L	0.59	30	70-130	70-130
8270C TCL	*	4-NITROPHENOL	WATER	50		UG/L	6.7	30	11-130	10-130
8270C TCL	*	ACENAPHTHENE	WATER	10		UG/L	0.48	30	41-121	41-121
8270C TCL		ACENAPHTHYLENE	WATER	10		UG/L	0.33	30	36-125	36-125
8270C TCL		ACETOPHENONE	WATER	10		UG/L	1.4	30	40-150	40-150
8270C TCL		ANTHRACENE	WATER	10		UG/L	0.60	30	73-130	73-130
8270C TCL		ATRAZINE	WATER	10		UG/L	1.3	30	40-150	40-150
8270C TCL		BENZALDEHYDE	WATER	10		UG/L	1.3	30	40-150	40-150
8270C TCL		BENZO(A)ANTHRACENE	WATER	10		UG/L	0.54	30	71-130	40-130
8270C TCL		BENZO(A)PYRENE	WATER	10		UG/L	0.42	30	61-119	38-118
8270C TCL		BENZO(B)FLUORANTHENE	WATER	10		UG/L	0.54	30	68-130	39-130
8270C TCL		BENZO(G,H,I)PERYLENE	WATER	10		UG/L	0.62	30	50-125	50-125
8270C TCL		BENZO(K)FLUORANTHENE	WATER	10		UG/L	0.53	30	68-113	41-112
8270C TCL		BIS(-2-CHLOROETHOXY)METHANE	WATER	10		UG/L	0.86	30	61-130	61-130
8270C TCL		BIS(2-CHLOROETHYL)ETHER	WATER	10		UG/L	0.74	30	55-130	55-130
8270C TCL		BIS(2-ETHYLHEXYL)PHTHALATE	WATER	10		UG/L	0.48	30	70-130	70-130
8270C TCL		BUTYL BENZYL PHTHALATE	WATER	10		UG/L	0.59	30	22-141	22-141
8270C TCL		CAPROLACTAM	WATER	10		UG/L	1.0	30	8-100	8-100
8270C TCL		CARBAZOLE	WATER	10		UG/L	0.47	30	70-130	70-130
8270C TCL		CHRYSENE	WATER	10		UG/L	0.53	30	61-119	61-119
8270C TCL		DIBENZO(A,H)ANTHRACENE	WATER	10		UG/L	0.63	30	70-130	70-130
8270C TCL		DIBENZOFURAN	WATER	10		UG/L	0.41	30	70-130	70-130
8270C TCL		DIETHYLPHTHALATE	WATER	10		UG/L	0.31	30	31-124	31-124
8270C TCL		DIMETHYL PHTHALATE	WATER	10		UG/L	0.53	30	10-121	10-121
8270C TCL		DI-N-BUTYLPHTHALATE	WATER	10		UG/L	0.39	30	46-130	46-130
8270C TCL		DI-N-OCTYL PHTHALATE	WATER	10		UG/L	0.45	30	65-130	65-130
8270C TCL		FLUORANTHENE	WATER	10		UG/L	0.32	30	75-130	62-130
8270C TCL		FLUORENE	WATER	10		UG/L	0.47	30	60-111	27-113
8270C TCL	*	HEXACHLOROBENZENE	WATER	10		UG/L	0.43	30	58-130	58-130
8270C TCL		HEXACHLOROBUTADIENE	WATER	10		UG/L	0.69	30	13-130	13-130
8270C TCL		HEXACHLOROCYCLOPENTADIENE	WATER	10		UG/L	1.1	30	10-130	10-130
8270C TCL		HEXACHLOROETHANE	WATER	10		UG/L	0.48	30	11-130	11-130
8270C TCL		INDENO(1,2,3-CD)PYRENE	WATER	10		UG/L	0.49	30	70-130	70-130
8270C TCL		ISOPHORONE	WATER	10		UG/L	0.61	30	58-130	58-130
8270C TCL	*	NAPHTHALENE	WATER	10		UG/L	0.62	30	26-109	26-109
8270C TCL	*	NITROBENZENE	WATER	10		UG/L	0.78	30	49-130	49-130
8270C TCL	*	N-NITROSO-DI-N-PROPYLAMINE	WATER	10		UG/L	1.2	30	25-120	25-120
8270C TCL		N-NITROSODIPHENYLAMINE	WATER	10		UG/L	0.75	30	70-130	70-130
8270C TCL	*	PENTACHLOROPHENOL	WATER	50		UG/L	0.60	30	16-131	16-131
8270C TCL	*	PHENANTHRENE	WATER	10		UG/L	0.45	30	68-130	38-130
8270C TCL	*	PHENOL	WATER	10		UG/L	0.54	30	10-65	10-71
8270C TCL	*	PYRENE	WATER	10		UG/L	0.65	30	60-130	52-130

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8270C TCL		2,4,6-TRIBROMOPHENOL -SURR	WATER	NA		UG/L	NA	NA	41-135	41-135
8270C TCL		2-FLUOROBIPHENYL -SURR	WATER	NA		UG/L	NA	NA	38-100	38-100
8270C TCL		2-FLUOROPHENOL -SURR	WATER	NA		UG/L	NA	NA	17-74	17-74
8270C TCL		NITROBENZENE-d5 -SURR	WATER	NA		UG/L	NA	NA	38-105	38-105
8270C TCL		PHENOL-d6 -SURR	WATER	NA		UG/L	NA	NA	10-69	10-69
8270C TCL		TERPHENYL-d14 -SURR	WATER	NA		UG/L	NA	NA	40-137	40-137
8270C ADDITIONAL COMPOUNDS BY REQUEST										
8270C		1,2,4,5-TETRACHLOROBENZENE	WATER	10		UG/L	0.74	30	40-150	40-150
8270C	*	1,2,4-TRICHLOROBENZENE	WATER	10		UG/L	0.65	30	17-99	27-104
8270C		1,2-DICHLOROBENZENE	WATER	10		UG/L	0.67	30	23-130	23-130
8270C		1,2-DIPHENYLHYDRAZINE	WATER	10		UG/L	0.48	30	10-142	10-142
8270C		1,3,5-TRINITROBENZENE	WATER	10		UG/L	1.1	30	40-150	40-150
8270C		1,3-DICHLOROBENZENE	WATER	10		UG/L	0.50	30	17-130	17-130
8270C	*	1,4-DICHLOROBENZENE	WATER	10		UG/L	0.58	30	16-83	23-85
8270C		1,4-NAPHTHOQUINONE	WATER	50		UG/L	12	30	40-150	40-150
8270C		1-METHYLNAPHTHALENE	WATER	10		UG/L	0.62	30	40-150	40-150
8270C		1-NAPHTHYLAMINE	WATER	50		UG/L	4.5	30	40-150	40-150
8270C		2,3,4,6-TETRACHLOROPHENOL	WATER	10		UG/L	0.60	30	40-150	40-150
8270C		2,6-DICHLOROPHENOL	WATER	10		UG/L	0.82	30	40-150	40-150
8270C		2-ACETYLAMINOFLUORENE	WATER	10		UG/L	0.59	30	40-150	40-150
8270C		2-NAPHTHYLAMINE	WATER	50		UG/L	3.6	30	40-150	40-150
8270C		2-PICOLINE	WATER	10		UG/L	2.5	30	40-150	40-150
8270C		3,3'-DIMETHYLBENZIDINE	WATER	50		UG/L	24	30	40-150	40-150
8270C		3-METHYLCHOLANTHRENE	WATER	10		UG/L	2.2	30	40-150	40-150
8270C		4-AMINOBIPHENYL	WATER	50		UG/L	3.1	30	40-150	40-150
8270C		4-NITROQUINOLINE-1-OXIDE	WATER	50		UG/L	24	30	40-150	40-150
8270C		5-NITRO-O-TOLUIDINE	WATER	10		UG/L	1.4	30	40-150	40-150
8270C		7,12-DIMETHYLBENZ(a)ANTHRACENE	WATER	10		UG/L	2.4	30	40-150	40-150
8270C		aa-DIMETHYLPHENETHYLAMINE	WATER	50		UG/L	46	30	40-150	40-150
8270C		ANILINE	WATER	10		UG/L	0.78	30	13-123	13-123
8270C		ARAMITE	WATER	50		UG/L	6.3	30	40-150	40-150
8270C		BENZIDINE	WATER	100	200	UG/L	43	30	10-130	10-130
8270C		BENZOIC ACID	WATER	50	100	UG/L	15	30	30-130	30-130
8270C		BENZYL ALCOHOL	WATER	10		UG/L	1.1	30	31-109	31-109
8270C		CHLOROBENZILATE	WATER	10		UG/L	0.78	30	40-150	40-150
8270C		DIALLATE	WATER	10		UG/L	1.4	30	40-150	40-150
8270C		DIMETHOATE	WATER	50		UG/L	1.1	30	40-150	40-150
8270C		DINOSEB	WATER	50		UG/L	1.0	30	40-150	40-150
8270C		DIPHENYLAMINE	WATER	10		UG/L	0.64	30	40-150	40-150
8270C		DISULFOTON	WATER	10		UG/L	2.7	30	40-150	40-150
8270C		ETHYL METHANESULFONATE	WATER	10		UG/L	1.0	30	40-150	40-150
8270C		ETHYL PARATHION	WATER	10		UG/L	1.1	30	40-150	40-150
8270C		HEXACHLOROPHENE	WATER	500		UG/L	310	30	40-150	40-150
8270C		HEXACHLOROPROPENE	WATER	10		UG/L	1.4	30	40-150	40-150
8270C		ISODRIN	WATER	10		UG/L	1.1	30	40-150	40-150
8270C		ISOSAFROLE	WATER	10		UG/L	1.8	30	40-150	40-150
8270C		m-DINITROBENZENE	WATER	10		UG/L	0.69	30	40-150	40-150
8270C		METHAPYRILENE	WATER	50		UG/L	36	30	40-150	40-150
8270C		METHYL METHANESULFONATE	WATER	10		UG/L	1.1	30	40-150	40-150
8270C		METHYL PARATHION	WATER	10		UG/L	0.90	30	40-150	40-150
8270C		N-NITROSODIETHYLAMINE	WATER	10		UG/L	2.0	30	40-150	40-150
8270C		N-NITROSODIMETHYLAMINE	WATER	10		UG/L	0.79	30	27-130	27-130
8270C		N-NITROSODI-N-BUTYLAMINE	WATER	10		UG/L	2.7	30	40-150	40-150
8270C		N-NITROSOMETHYLETHYLAMINE	WATER	10		UG/L	1.8	30	40-150	40-150
8270C		N-NITROSOMORPHOLINE	WATER	10		UG/L	2.2	30	40-150	40-150
8270C		N-NITROSOPIPERIDINE	WATER	10		UG/L	2.6	30	40-150	40-150
8270C		N-NITROSOPYRROLIDINE	WATER	10		UG/L	2.2	30	40-150	40-150
8270C		ooo-TRIETHYL PHOSPHOROTHIOATE	WATER	10		UG/L	0.99	30	40-150	40-150
8270C		o-TOLUIDINE	WATER	10		UG/L	1.5	30	40-150	40-150
8270C		p-DIMETHYLAMINOAZOBENZENE	WATER	10		UG/L	1.0	30	40-150	40-150
8270C		PENTACHLOROBENZENE	WATER	10		UG/L	0.88	30	40-150	40-150
8270C		PENTACHLOROETHANE	WATER	10		UG/L	1.5	30	40-150	40-150
8270C		PENTACHLORONITROBENZENE	WATER	10		UG/L	0.89	30	40-150	40-150
8270C		PHENACETIN	WATER	10		UG/L	0.73	30	40-150	40-150
8270C		PHORATE	WATER	10		UG/L	1.2	30	40-150	40-150

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8270C		p-PHENYLENEDIAMINE	WATER	50		UG/L		30	40-150	40-150
8270C		PRONAMIDE	WATER	10		UG/L	1.0	30	40-150	40-150
8270C		PYRIDINE	WATER	50		UG/L	0.020	30	10-130	10-130
8270C		SAFROLE	WATER	10		UG/L	1.5	30	40-150	40-150
8270C		SULFOTEPP	WATER	10		UG/L	1.1	30	40-150	40-150
8270C		THIONAZIN	WATER	10		UG/L	0.98	30	40-150	40-150

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8270C TCL		1'1-BIPHENYL	SOIL	330		UG/KG	23	30	40-150	40-150
8270C TCL		2,2'-OXYBIS(1-CHLOROPROPANE)	SOIL	330		UG/KG	25	30	10-126	10-126
8270C TCL		2,4,5-TRICHLOROPHENOL	SOIL	330		UG/KG	24	30	34-121	34-121
8270C TCL	*	2,4,6-TRICHLOROPHENOL	SOIL	330		UG/KG	24	30	33-120	33-120
8270C TCL	*	2,4-DICHLOROPHENOL	SOIL	330		UG/KG	24	30	57-130	57-130
8270C TCL		2,4-DIMETHYLPHENOL	SOIL	330		UG/KG	19	30	45-130	45-130
8270C TCL		2,4-DINITROPHENOL	SOIL	1700		UG/KG	420	30	23-130	23-130
8270C TCL	*	2,4-DINITROTOLUENE	SOIL	330		UG/KG	32	30	46-124	46-124
8270C TCL		2,6-DINITROTOLUENE	SOIL	330		UG/KG	33	30	62-130	62-130
8270C TCL		2-CHLORONAPHTHALENE	SOIL	330		UG/KG	21	30	55-130	55-130
8270C TCL	*	2-CHLOROPHENOL	SOIL	330		UG/KG	18	30	36-116	18-126
8270C TCL		2-METHYLNAPHTHALENE	SOIL	330		UG/KG	22	30	52-130	13-130
8270C TCL	*	2-METHYLPHENOL	SOIL	330		UG/KG	27	30	26-105	26-105
8270C TCL		2-NITROANILINE	SOIL	1700		UG/KG	32	30	51-111	51-111
8270C TCL		2-NITROPHENOL	SOIL	330		UG/KG	26	30	55-130	55-130
8270C TCL		3,3'-DICHLOROBENZIDINE	SOIL	330		UG/KG	46	30	10-121	10-121
8270C TCL		3-NITROANILINE	SOIL	1700		UG/KG	25	30	10-130	10-130
8270C TCL		4,6-DINITRO-2-METHYLPHENOL	SOIL	1700		UG/KG	22	30	38-119	38-119
8270C TCL	*	4-BROMOPHENYL-PHENYLETHER	SOIL	330		UG/KG	36	30	61-113	61-113
8270C TCL	*	4-CHLORO-3-METHYLPHENOL	SOIL	330		UG/KG	26	30	40-125	28-130
8270C TCL		4-CHLOROANILINE	SOIL	330		UG/KG	33	30	10-130	10-130
8270C TCL		4-CHLOROPHENYL-PHENYLETHER	SOIL	330		UG/KG	27	30	60-130	60-130
8270C TCL		4-METHYLPHENOL	SOIL	330		UG/KG	52	30	22-108	22-108
8270C TCL		4-NITROANILINE	SOIL	1700		UG/KG	24	30	31-105	31-105
8270C TCL	*	4-NITROPHENOL	SOIL	1700	3300	UG/KG	710	30	25-132	12-128
8270C TCL	*	ACENAPHTHENE	SOIL	330		UG/KG	28	30	47-123	39-124
8270C TCL	*	ACENAPHTHYLENE	SOIL	330		UG/KG	22	30	44-124	31-124
8270C TCL		ACETOPHENONE	SOIL	330		UG/KG	60	30	40-150	40-150
8270C TCL		ANTHRACENE	SOIL	330		UG/KG	29	30	44-125	39-122
8270C TCL		ATRAZINE	SOIL	330		UG/KG	74	30	40-150	40-150
8270C TCL		BENZALDEHYDE	SOIL	330	670	UG/KG	130	30	40-150	40-150
8270C TCL		BENZO(A)ANTHRACENE	SOIL	330		UG/KG	28	30	48-122	35-129
8270C TCL		BENZO(A)PYRENE	SOIL	330		UG/KG	68	30	49-126	36-130
8270C TCL		BENZO(B)FLUORANTHENE	SOIL	330		UG/KG	32	30	42-128	37-124
8270C TCL		BENZO(G,H,I)PERYLENE	SOIL	330		UG/KG	35	30	42-126	34-129
8270C TCL		BENZO(K)FLUORANTHENE	SOIL	330		UG/KG	27	30	48-124	36-124
8270C TCL		BIS(-2-CHLOROETHOXY)METHANE	SOIL	330		UG/KG	43	30	48-130	48-130
8270C TCL		BIS(2-CHLOROETHYL)ETHER	SOIL	330		UG/KG	27	30	43-130	43-130
8270C TCL		BIS(2-ETHYLHEXYL)PHTHALATE	SOIL	330		UG/KG	38	30	60-130	60-130
8270C TCL		BUTYL BENZYL PHTHALATE	SOIL	330		UG/KG	30	30	56-130	56-130
8270C TCL		CAPROLACTAM	SOIL	330		UG/KG	26	30	40-150	40-150
8270C TCL		CARBAZOLE	SOIL	330		UG/KG	25	30	51-130	51-130
8270C TCL		CHRYSENE	SOIL	330		UG/KG	28	30	49-122	32-131
8270C TCL		DIBENZO(A,H)ANTHRACENE	SOIL	330		UG/KG	29	30	23-140	23-140
8270C TCL		DIBENZOFURAN	SOIL	330		UG/KG	27	30	42-130	42-130
8270C TCL		DIETHYLPHTHALATE	SOIL	330		UG/KG	29	30	62-130	62-130
8270C TCL		DIMETHYL PHTHALATE	SOIL	330		UG/KG	32	30	61-130	61-130
8270C TCL		DI-N-BUTYLPHTHALATE	SOIL	330		UG/KG	33	30	62-130	62-130
8270C TCL		DI-N-OCTYL PHTHALATE	SOIL	330		UG/KG	40	30	59-130	59-130
8270C TCL		FLUORANTHENE	SOIL	330		UG/KG	36	30	42-124	33-125
8270C TCL		FLUORENE	SOIL	330		UG/KG	34	30	36-128	33-121
8270C TCL	*	HEXACHLOROBENZENE	SOIL	330		UG/KG	21	30	56-116	56-116
8270C TCL		HEXACHLOROBUTADIENE	SOIL	330		UG/KG	23	30	10-104	10-104
8270C TCL		HEXACHLOROCYCLOPENTADIENE	SOIL	330		UG/KG	18	30	9-102	9-102
8270C TCL		HEXACHLOROETHANE	SOIL	330		UG/KG	28	30	10-107	10-107
8270C TCL		INDENO(1,2,3-CD)PYRENE	SOIL	330		UG/KG	28	30	41-127	35-129
8270C TCL		ISOPHORONE	SOIL	330		UG/KG	27	30	50-130	50-130
8270C TCL	*	NAPHTHALENE	SOIL	330		UG/KG	20	30	38-116	25-120
8270C TCL	*	NITROBENZENE	SOIL	330		UG/KG	21	30	32-130	32-130
8270C TCL	*	N-NITROSO-DI-N-PROPYLAMINE	SOIL	330		UG/KG	26	30	45-117	34-122
8270C TCL		N-NITROSODIPHENYLAMINE	SOIL	330		UG/KG	24	30	54-116	54-116
8270C TCL	*	PENTACHLOROPHENOL	SOIL	1700		UG/KG	340	30	21-131	13-128
8270C TCL	*	PHENANTHRENE	SOIL	330		UG/KG	43	30	48-130	28-130
8270C TCL	*	PHENOL	SOIL	330	670	UG/KG	160	30	34-118	26-122
8270C TCL	*	PYRENE	SOIL	330		UG/KG	41	30	53-130	34-130

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8270C TCL		2,4,6-TRIBROMOPHENOL -SURR	SOIL	NA		UG/KG	NA	NA	33-139	33-139
8270C TCL		2-FLUOROBIPHENYL -SURR	SOIL	NA		UG/KG	NA	NA	32-130	32-130
8270C TCL		2-FLUOROPHENOL -SURR	SOIL	NA		UG/KG	NA	NA	10-130	10-130
8270C TCL		NITROBENZENE-d5 -SURR	SOIL	NA		UG/KG	NA	NA	27-130	27-130
8270C TCL		PHENOL-d6 -SURR	SOIL	NA		UG/KG	NA	NA	10-133	10-133
8270C TCL		TERPHENYL-d14 -SURR	SOIL	NA		UG/KG	NA	NA	48-131	48-131
8270C ADDITIONAL COMPOUNDS BY REQUEST										
8270C		1,2,4,5-TETRACHLOROBENZENE	SOIL	330		UG/KG	35	30	40-150	40-150
8270C	*	1,2,4-TRICHLOROBENZENE	SOIL	330		UG/KG	22	30	42-130	34-130
8270C		1,2-DICHLOROBENZENE	SOIL	330		UG/KG	19	30	45-130	45-130
8270C		1,2-DIPHENYLHYDRAZINE	SOIL	330		UG/KG	34	30	10-136	10-136
8270C		1,3,5-TRINITROBENZENE	SOIL	330		UG/KG	62	30	40-150	40-150
8270C		1,3-DICHLOROBENZENE	SOIL	330		UG/KG	18	30	43-130	43-130
8270C	*	1,4-DICHLOROBENZENE	SOIL	330		UG/KG	16	30	20-112	18-107
8270C		1,4-NAPHTHOQUINONE	SOIL	1700		UG/KG	160	30	40-150	40-150
8270C		1-METHYLNAPHTHALENE	SOIL	330		UG/KG	26	30	40-150	40-150
8270C		1-NAPHTHYLAMINE	SOIL	1700		UG/KG	110	30	40-150	40-150
8270C		2,3,4,6-TETRACHLOROPHENOL	SOIL	330		UG/KG	38	30	40-150	40-150
8270C		2,6-DICHLOROPHENOL	SOIL	330		UG/KG	40	30	40-150	40-150
8270C		2-ACETYLAMINOFLUORENE	SOIL	330		UG/KG	60	30	40-150	40-150
8270C		2-NAPHTHYLAMINE	SOIL	1700		UG/KG	110	30	40-150	40-150
8270C		2-PICOLINE	SOIL	330		UG/KG	140	30	40-150	40-150
8270C		3,3'-DIMETHYLBENZINE	SOIL	1700		UG/KG	400	30	40-150	40-150
8270C		3-METHYLCHOLANTHRENE	SOIL	330		UG/KG	64	30	40-150	40-150
8270C		4-AMINOBIPHENYL	SOIL	1700		UG/KG	71	30	40-150	40-150
8270C		4-NITROQUINOLINE-1-OXIDE	SOIL	1700		UG/KG	590	30	40-150	40-150
8270C		5-NITRO-O-TOLUIDINE	SOIL	330		UG/KG	62	30	40-150	40-150
8270C		7,12-DIMETHYLBENZ(a)ANTHRACENE	SOIL	330		UG/KG	51	30	40-150	40-150
8270C		aa-DIMETHYLPHENETHYLAMINE	SOIL	1700		UG/KG	850	30	40-150	40-150
8270C		ANILINE	SOIL	330		UG/KG	42	30	10-130	10-130
8270C		ARAMITE	SOIL	1700		UG/KG	85	30	40-150	40-150
8270C		BENZIDINE	SOIL	3300	6700	UG/KG	1,200	30	30-130	30-130
8270C		BENZOIC ACID	SOIL	1700	3300	UG/KG	880	30	30-130	30-130
8270C		BENZYL ALCOHOL	SOIL	330		UG/KG	31	30	38-106	38-106
8270C		CHLOROBENZILATE	SOIL	330		UG/KG	52	30	40-150	40-150
8270C		DIALLATE	SOIL	330		UG/KG	55	30	40-150	40-150
8270C		DIMETHOATE	SOIL	1700		UG/KG	49	30	40-150	40-150
8270C		DINOSEB	SOIL	1700		UG/KG	44	30	40-150	40-150
8270C		DIPHENYLAMINE	SOIL	330		UG/KG	24	30	40-150	40-150
8270C		DISULFOTON	SOIL	330		UG/KG	190	30	40-150	40-150
8270C		ETHYL METHANESULFONATE	SOIL	330		UG/KG	46	30	40-150	40-150
8270C		ETHYL PARATHION	SOIL	330		UG/KG	49	30	40-150	40-150
8270C		HEXACHLOROPHENE	SOIL	17000		UG/KG	6,800	30	40-150	40-150
8270C		HEXACHLOROPROPENE	SOIL	330		UG/KG	36	30	40-150	40-150
8270C		ISODRIN	SOIL	330		UG/KG	50	30	40-150	40-150
8270C		ISOSAFROLE	SOIL	330		UG/KG	42	30	40-150	40-150
8270C		m-DINITROBENZINE	SOIL	330		UG/KG	37	30	40-150	40-150
8270C		METHAPYRILENE	SOIL	1700		UG/KG	680	30	40-150	40-150
8270C		METHYL METHANESULFONATE	SOIL	330		UG/KG	44	30	40-150	40-150
8270C		METHYL PARATHION	SOIL	330		UG/KG	47	30	40-150	40-150
8270C		N-NITROSODIETHYLAMINE	SOIL	330		UG/KG	37	30	40-150	40-150
8270C		N-NITROSODIMETHYLAMINE	SOIL	330		UG/KG	29	30	38-130	38-130
8270C		N-NITROSODI-N-BUTYLAMINE	SOIL	330		UG/KG	72	30	40-150	40-150
8270C		N-NITROSOMETHYLETHYLAMINE	SOIL	330		UG/KG	89	30	40-150	40-150
8270C		N-NITROSOMORPHOLINE	SOIL	330		UG/KG	56	30	40-150	40-150
8270C		N-NITROSOPIPERIDINE	SOIL	330		UG/KG	53	30	40-150	40-150
8270C		N-NITROSOPYRROLIDINE	SOIL	330		UG/KG	70	30	40-150	40-150
8270C		ooo-TRIETHYL PHOSPHOROTHIOATE	SOIL	330		UG/KG	57	30	40-150	40-150
8270C		o-TOLUIDINE	SOIL	330		UG/KG	76	30	40-150	40-150
8270C		p-DIMETHYLAMINOAZOBENZENE	SOIL	330		UG/KG	55	30	40-150	40-150
8270C		PENTACHLOROBENZENE	SOIL	330		UG/KG	48	30	40-150	40-150
8270C		PENTACHLOROETHANE	SOIL	330		UG/KG	26	30	40-150	40-150
8270C		PENTACHLORONITROBENZENE	SOIL	330		UG/KG	59	30	40-150	40-150
8270C		PHENACETIN	SOIL	330		UG/KG	45	30	40-150	40-150
8270C		PHORATE	SOIL	330		UG/KG	120	30	40-150	40-150

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8270C		p-PHENYLENEDIAMINE	SOIL	1700		UG/KG	590	30	40-150	40-150
8270C		PRONAMIDE	SOIL	330		UG/KG	51	30	40-150	40-150
8270C		PYRIDINE	SOIL	1700		UG/KG	50	30	28-130	28-130
8270C		SAFROLE	SOIL	330		UG/KG	40	30	40-150	40-150
8270C		SULFOTEPP	SOIL	330		UG/KG	73	30	40-150	40-150
8270C		THIONAZIN	SOIL	330		UG/KG	50	30	40-150	40-150

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8270C LVI	ACENAPHTHENE	WATER	0.20		UG/L	0.022	30	44-112	44-112
8270C LVI	ACENAPHTHYLENE	WATER	0.20		UG/L	0.025	30	51-115	51-115
8270C LVI	ANTHRACENE	WATER	0.20		UG/L	0.019	30	51-119	51-119
8270C LVI	BENZO(A)ANTHRACENE	WATER	0.10		UG/L	0.028	30	58-115	58-115
8270C LVI	BENZO(A)PYRENE	WATER	0.20		UG/L	0.016	30	36-119	36-119
8270C LVI	BENZO(B)FLUORANTHENE	WATER	0.20		UG/L	0.027	30	45-121	45-121
8270C LVI	BENZO(G,H,I)PERYLENE	WATER	0.20		UG/L	0.023	30	39-122	39-122
8270C LVI	BENZO(K)FLUORANTHENE	WATER	0.20		UG/L	0.019	30	47-119	47-119
8270C LVI	CHRYSENE	WATER	0.20		UG/L	0.022	30	55-113	55-113
8270C LVI	DIBENZO(A,H)ANTHRACENE	WATER	0.20		UG/L	0.025	30	47-116	47-116
8270C LVI	FLUORANTHENE	WATER	0.20		UG/L	0.035	30	59-117	59-117
8270C LVI	FLUORENE	WATER	0.20		UG/L	0.021	30	38-121	38-121
8270C LVI	INDENO(1,2,3-CD)PYRENE	WATER	0.20		UG/L	0.016	30	47-119	47-119
8270C LVI	NAPHTHALENE	WATER	0.20		UG/L	0.042	30	33-121	33-121
8270C LVI	PHENANTHRENE	WATER	0.20		UG/L	0.025	30	54-114	54-114
8270C LVI	PYRENE	WATER	0.20		UG/L	0.011	30	55-115	55-115
8270C LVI	2-FLUOROBIPHENYL -SURR	WATER	NA		UG/L	NA	NA	27-114	27-114
8270C LVI	NITROBENZENE-d5 -SURR	WATER	NA		UG/L	NA	NA	22-124	22-124
8270C LVI	TERPHENYL-d14 -SURR	WATER	NA		UG/L	NA	NA	23-139	23-139
8270C LVI ADDITIONAL COMPOUNDS BY REQUEST									
8270C LVI	1,4-DIOXANE	WATER	0.20		UG/L	0.075	30	31-80	31-80
8270C LVI	1-METHYLNAPHTHALENE	WATER	0.20		UG/L	0.031	30	62-102	50-150
8270C LVI	2-METHYLNAPHTHALENE	WATER	0.10		UG/L	0.023	30	42-130	42-130
8270C LVI	BIS(2-ETHYLHEXYL)PHTHALATE	WATER	2.0		UG/L	0.19	30	55-130	55-130
8270C LVI	CARBAZOLE	WATER	1.0		UG/L	0.032	30	40-150	40-150
8270C LVI	DIBENZOFURAN	WATER	0.20		UG/L	0.027	30	50-150	50-150
8270C LVI	HEXACHLOROBENZENE	WATER	0.20		UG/L	0.027	30	47-108	47-108
8270C LVI	NITROBENZENE	WATER	0.20		UG/L	0.032	30	50-150	50-150

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8270C LVI	2,6-DIMETHYLNAPHTHALENE	SOIL	6.6		UG/KG	0.78	30	50-150	50-150
8270C LVI	ACENAPHTHENE	SOIL	6.6		UG/KG	1.8	30	39-130	39-130
8270C LVI	ACENAPHTHYLENE	SOIL	6.6		UG/KG	2.0	30	44-130	44-130
8270C LVI	ANTHRACENE	SOIL	6.6		UG/KG	2.5	30	49-130	49-130
8270C LVI	BENZO(A)ANTHRACENE	SOIL	3.3		UG/KG	2.7	30	47-116	47-116
8270C LVI	BENZO(A)PYRENE	SOIL	6.6		UG/KG	2.5	30	27-124	27-124
8270C LVI	BENZO(B)FLUORANTHENE	SOIL	6.6		UG/KG	2.5	30	19-132	19-132
8270C LVI	BENZO(G,H,I)PERYLENE	SOIL	6.6		UG/KG	2.4	30	24-128	24-128
8270C LVI	BENZO(K)FLUORANTHENE	SOIL	6.6		UG/KG	2.9	30	41-123	41-123
8270C LVI	CHRYSENE	SOIL	6.6		UG/KG	2.1	30	45-117	45-117
8270C LVI	DIBENZO(A,H)ANTHRACENE	SOIL	6.6		UG/KG	1.9	30	29-129	29-129
8270C LVI	FLUORANTHENE	SOIL	6.6		UG/KG	4.0	30	51-124	51-124
8270C LVI	FLUORENE	SOIL	6.6		UG/KG	1.8	30	40-130	40-130
8270C LVI	INDENO(1,2,3-CD)PYRENE	SOIL	6.6		UG/KG	2.3	30	40-122	40-122
8270C LVI	NAPHTHALENE	SOIL	6.6		UG/KG	2.7	30	44-130	44-130
8270C LVI	PHENANTHRENE	SOIL	6.6		UG/KG	5.0	30	51-130	51-130
8270C LVI	PYRENE	SOIL	6.6		UG/KG	3.5	30	33-123	33-123
8270C LVI	2-FLUOROBIPHENYL -SURR	SOIL	NA		UG/KG	NA	NA	23-120	23-120
8270C LVI	NITROBENZENE-d5 -SURR	SOIL	NA		UG/KG	NA	NA	18-125	18-125
8270C LVI	TERPHENYL-d14 -SURR	SOIL	NA		UG/KG	NA	NA	19-145	19-145
8270C LVI ADDITIONAL COMPOUNDS BY REQUEST									
8270C LVI	1,4-DIOXANE	SOIL	67		UG/KG	1.4	30	31-80	31-80
8270C LVI	1-METHYLNAPHTHALENE	SOIL	6.6		UG/KG	2.0	30	50-150	50-150
8270C LVI	2-METHYLNAPHTHALENE	SOIL	3.3		UG/KG	2.8	30	42-130	50-150
8270C LVI	BIS(2-ETHYLHEXYL)PHTHALATE	SOIL	67		UG/KG	7.8	30	50-150	50-150
8270C LVI	CARBAZOLE	SOIL	33		UG/KG	1.8	30	40-150	40-150
8270C LVI	DIBENZOFURAN	SOIL	6.6		UG/KG	1.9	30	50-150	50-150
8270C LVI	HEXACHLOROBENZENE	SOIL	6.6		UG/KG	2.6	30	50-150	50-150
8270C LVI	NITROBENZENE	SOIL	6.6		UG/KG	1.8	30	50-150	50-150
8310	NAPHTHALENE	WATER	0.080		UG/L	0.020	30	50-150	50-150
8310	ACENAPHTHYLENE	WATER	0.080		UG/L	0.048	30	50-150	50-150
8310	FLUORENE	WATER	0.080		UG/L	0.013	30	50-150	50-150
8310	ACENAPHTHENE	WATER	0.080		UG/L	0.029	30	50-150	50-150
8310	PHENANTHRENE	WATER	0.080		UG/L	0.017	30	50-150	50-150
8310	ANTHRACENE	WATER	0.080		UG/L	0.016	30	50-150	50-150
8310	FLUORANTHENE	WATER	0.080		UG/L	0.015	30	50-150	50-150
8310	PYRENE	WATER	0.080		UG/L	0.016	30	50-150	50-150
8310	BENZO(A)ANTRACENE	WATER	0.080		UG/L	0.013	30	50-150	50-150
8310	CHRYSENE	WATER	0.080		UG/L	0.015	30	50-150	50-150
8310	BENZO(B)FLUORANTHENE	WATER	0.080		UG/L	0.016	30	50-150	50-150
8310	BENZO(K)FLUORANTHENE	WATER	0.080		UG/L	0.017	30	50-150	50-150
8310	BENZO(A)PYRENE	WATER	0.080		UG/L	0.024	30	50-150	50-150
8310	DIBENZO(A,H)ANTHRACENE	WATER	0.080		UG/L	0.019	30	50-150	50-150
8310	INDENO(1,2,3-CD)PYRENE	WATER	0.080		UG/L	0.011	30	50-150	50-150
8310	BENZO(G,H,I)PERYLENE	WATER	0.080		UG/L	0.022	30	50-150	50-150
8310	O-TERPHENYL -SURR	WATER	NA		UG/L	NA	NA	50-150	50-150

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
8315A		FORMALDEHYDE	WATER	8.0		UG/L	1.1	30	59-136	59-153
8315A		FORMALDEHYDE	SOIL	1000		UG/KG	230	30	70-130	50-150
8330		1,3,5-TRINITROBENZENE	SOIL	2000		UG/KG	160	30	70-130	70-130
8330		1,3-DINITROBENZENE	SOIL	2000		UG/KG	150	30	70-130	70-130
8330		2,4,6-TRINITROTOLUENE (TNT)	SOIL	2000		UG/KG	170	30	70-130	70-130
8330		2,4-DINITROTOLUENE	SOIL	2000		UG/KG	150	30	70-130	70-130
8330		2,6-DINITROTOLUENE	SOIL	2000		UG/KG	160	30	70-130	70-130
8330		2-AMINO-4,6-DINITROTOLUENE	SOIL	2000		UG/KG	180	30	70-130	70-130
8330		2-NITROTOLUENE	SOIL	2000		UG/KG	150	30	70-130	70-130
8330		3-NITROTOLUENE	SOIL	2000		UG/KG	150	30	70-130	70-130
8330		4-AMINO-2,6-DINITROTOLUENE	SOIL	2000		UG/KG	190	30	70-130	70-130
8330		4-NITROTOLUENE	SOIL	2000		UG/KG	160	30	70-130	70-130
8330		HMX (OCTAHYDRO-1,3,5,7-TETRANITRO-	SOIL	2000		UG/KG	180	30	70-130	70-130
8330		NITROBENZENE	SOIL	2000		UG/KG	150	30	70-130	70-130
8330		NITROGLYCERIN	SOIL	2000		UG/KG	860	30	70-130	70-130
8330		PETN	SOIL	2000		UG/KG	420	30	70-130	70-130
8330		RDX (HEXAHYDRO-1,3,5-TRINITRO-1,3,	SOIL	2000		UG/KG	170	30	70-130	70-130
8330		TETRYL (METHYL-2,4,6-TRINITROPHENY	SOIL	2000		UG/KG	530	30	70-130	70-130
8330		1,2-DINITROBENZENE - SURR	SOIL	NA		UG/KG	NA	NA	50-150	50-150
HPLC-DoDPerchlorate		PERCHLORATE	WATER	0.2		UG/L	0.051	15	80-120	80-120
HPLC-DoDPerchlorate		PERCHLORATE	SOIL	2.0		UG/KG	0.031	15	85-115	75-125

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
VOA OLM4.2/4.3		1,1,1-TRICHLOROETHANE	WATER	10		UG/L	0.35			
VOA OLM4.2/4.3		1,1,2,2-TETRACHLOROETHANE	WATER	10		UG/L	0.56			
VOA OLM4.2/4.3		1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE (FREON 113)	WATER	10		UG/L	0.79			
VOA OLM4.2/4.3		1,1,2-TRICHLOROETHANE	WATER	10		UG/L	0.31			
VOA OLM4.2/4.3		1,1-DICHLOROETHANE	WATER	10		UG/L	0.49			
VOA OLM4.2/4.3	*	1,1-DICHLOROETHENE	WATER	10		UG/L	0.80	14	61-145	61-145
VOA OLM4.2/4.3		1,2,4-TRICHLOROBENZENE	WATER	10		UG/L	0.41			
VOA OLM4.2/4.3		1,2-DIBROMO-3-CHLOROPROPANE	WATER	10		UG/L	0.40			
VOA OLM4.2/4.3		1,2-DIBROMOETHANE	WATER	10		UG/L	0.57			
VOA OLM4.2/4.3		1,2-DICHLOROBENZENE	WATER	10		UG/L	0.39			
VOA OLM4.2/4.3		1,2-DICHLOROETHANE	WATER	10		UG/L	0.32			
VOA OLM4.2/4.3		1,2-DICHLOROPROPANE	WATER	10		UG/L	0.58			
VOA OLM4.2/4.3		1,3-DICHLOROBENZENE	WATER	10		UG/L	0.35			
VOA OLM4.2/4.3		1,4-DICHLOROBENZENE	WATER	10		UG/L	0.41			
VOA OLM4.2/4.3		2-BUTANONE	WATER	10		UG/L	0.72			
VOA OLM4.2/4.3		2-HEXANONE	WATER	10		UG/L	1.4			
VOA OLM4.2/4.3		4-METHYL-2-PENTANONE	WATER	10		UG/L	1.2			
VOA OLM4.2/4.3		ACETONE	WATER	10		UG/L	2.3			
VOA OLM4.2/4.3	*	BENZENE	WATER	10		UG/L	0.45	11	76-127	76-127
VOA OLM4.2/4.3		BROMODICHLOROMETHANE	WATER	10		UG/L	0.36			
VOA OLM4.2/4.3		BROMOFORM	WATER	10		UG/L	0.44			
VOA OLM4.2/4.3		BROMOMETHANE	WATER	10		UG/L	0.53			
VOA OLM4.2/4.3		CARBON DISULFIDE	WATER	10		UG/L	0.34			
VOA OLM4.2/4.3		CARBON TETRACHLORIDE	WATER	10		UG/L	0.42			
VOA OLM4.2/4.3	*	CHLOROBENZENE	WATER	10		UG/L	0.36	13	75-130	75-130
VOA OLM4.2/4.3		CHLOROETHANE	WATER	10		UG/L	0.41			
VOA OLM4.2/4.3		CHLOROFORM	WATER	10		UG/L	0.37			
VOA OLM4.2/4.3		CHLOROMETHANE	WATER	10		UG/L	0.72			
VOA OLM4.2/4.3		CIS-1,2-DICHLOROETHENE	WATER	10		UG/L	0.59			
VOA OLM4.2/4.3		CIS-1,3-DICHLOROPROPENE	WATER	10		UG/L	0.50			
VOA OLM4.2/4.3		CYCLOHEXANE	WATER	10		UG/L	0.46			
VOA OLM4.2/4.3		DIBROMOCHLOROMETHANE	WATER	10		UG/L	0.56			
VOA OLM4.2/4.3		DICHLORODIFLUOROMETHANE	WATER	10		UG/L	0.43			
VOA OLM4.2/4.3		ETHYLBENZENE	WATER	10		UG/L	0.46			
VOA OLM4.2/4.3		ISOPROPYLBENZENE	WATER	10		UG/L	0.44			
VOA OLM4.2/4.3		M+P-XYLENE	WATER	10		UG/L	0.60			
VOA OLM4.2/4.3		METHYL ACETATE	WATER	10		UG/L	0.49			
VOA OLM4.2/4.3		METHYL TERT-BUTYL ETHER	WATER	10		UG/L	0.31			
VOA OLM4.2/4.3		METHYLCYCLOHEXANE	WATER	10		UG/L	0.71			
VOA OLM4.2/4.3		METHYLENE CHLORIDE	WATER	10		UG/L	0.48			
VOA OLM4.2/4.3		O-XYLENE	WATER	10		UG/L	0.37			
VOA OLM4.2/4.3		STYRENE	WATER	10		UG/L	0.27			
VOA OLM4.2/4.3		TETRACHLOROETHENE	WATER	10		UG/L	0.60			
VOA OLM4.2/4.3	*	TOLUENE	WATER	10		UG/L	0.54	13	76-125	76-125
VOA OLM4.2/4.3		TRANS-1,2-DICHLOROETHENE	WATER	10		UG/L	0.41			
VOA OLM4.2/4.3		TRANS-1,3-DICHLOROPROPENE	WATER	10		UG/L	0.26			
VOA OLM4.2/4.3	*	TRICHLOROETHENE	WATER	10		UG/L	0.57	14	71-120	71-120
VOA OLM4.2/4.3		TRICHLOROFLUOROMETHANE	WATER	10		UG/L	0.44			
VOA OLM4.2/4.3		VINYL CHLORIDE	WATER	10		UG/L	0.42			
VOA OLM4.2/4.3		BROMOFLUOROBENZENE -SURR	WATER	NA		UG/L	NA	NA	86-115	86-115
VOA OLM4.2/4.3		1,2-DICHLOROETHANE-D4 -SURR	WATER	NA		UG/L	NA	NA	76-114	76-114
VOA OLM4.2/4.3		TOLUENE-D8 -SURR	WATER	NA		UG/L	NA	NA	88-110	88-110

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
VOA OLM4.2/4.3		1,1,1-TRICHLOROETHANE	SOIL	10		UG/KG	0.53			
VOA OLM4.2/4.3		1,1,2,2-TETRACHLOROETHANE	SOIL	10		UG/KG	0.27			
VOA OLM4.2/4.3		1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE (	SOIL	10		UG/KG	0.62			
VOA OLM4.2/4.3		1,1,2-TRICHLOROETHANE	SOIL	10		UG/KG	0.45			
VOA OLM4.2/4.3		1,1-DICHLOROETHANE	SOIL	10		UG/KG	0.41			
VOA OLM4.2/4.3	*	1,1-DICHLOROETHENE	SOIL	10		UG/KG	0.72	22	59-172	59-172
VOA OLM4.2/4.3		1,2,4-TRICHLOROBENZENE	SOIL	10		UG/KG	0.94			
VOA OLM4.2/4.3		1,2-DIBROMO-3-CHLOROPROPANE	SOIL	10		UG/KG	0.85			
VOA OLM4.2/4.3		1,2-DIBROMOETHANE	SOIL	10		UG/KG	0.45			
VOA OLM4.2/4.3		1,2-DICHLOROBENZENE	SOIL	10		UG/KG	0.52			
VOA OLM4.2/4.3		1,2-DICHLOROETHANE	SOIL	10		UG/KG	0.66			
VOA OLM4.2/4.3		1,2-DICHLOROPROPANE	SOIL	10		UG/KG	0.46			
VOA OLM4.2/4.3		1,3-DICHLOROBENZENE	SOIL	10		UG/KG	0.50			
VOA OLM4.2/4.3		1,4-DICHLOROBENZENE	SOIL	10		UG/KG	0.73			
VOA OLM4.2/4.3		2-BUTANONE	SOIL	10		UG/KG	2.2			
VOA OLM4.2/4.3		2-HEXANONE	SOIL	10		UG/KG	1.3			
VOA OLM4.2/4.3		4-METHYL-2-PENTANONE	SOIL	10		UG/KG	1.4			
VOA OLM4.2/4.3		ACETONE	SOIL	10		UG/KG	3.1			
VOA OLM4.2/4.3	*	BENZENE	SOIL	10		UG/KG	0.38	21	66-142	66-142
VOA OLM4.2/4.3		BROMODICHLOROMETHANE	SOIL	10		UG/KG	0.37			
VOA OLM4.2/4.3		BROMOFORM	SOIL	10		UG/KG	0.37			
VOA OLM4.2/4.3		BROMOMETHANE	SOIL	10		UG/KG	0.59			
VOA OLM4.2/4.3		CARBON DISULFIDE	SOIL	10		UG/KG	0.51			
VOA OLM4.2/4.3		CARBON TETRACHLORIDE	SOIL	10		UG/KG	0.33			
VOA OLM4.2/4.3	*	CHLOROBENZENE	SOIL	10		UG/KG	0.33	21	60-133	60-133
VOA OLM4.2/4.3		CHLOROETHANE	SOIL	10		UG/KG	0.23			
VOA OLM4.2/4.3		CHLOROFORM	SOIL	10		UG/KG	0.50			
VOA OLM4.2/4.3		CHLOROMETHANE	SOIL	10		UG/KG	0.55			
VOA OLM4.2/4.3		CIS-1,2-DICHLOROETHENE	SOIL	10		UG/KG	0.69			
VOA OLM4.2/4.3		CIS-1,3-DICHLOROPROPENE	SOIL	10		UG/KG	0.35			
VOA OLM4.2/4.3		CYCLOHEXANE	SOIL	10		UG/KG	0.91			
VOA OLM4.2/4.3		DIBROMOCHLOROMETHANE	SOIL	10		UG/KG	0.20			
VOA OLM4.2/4.3		DICHLORODIFLUOROMETHANE	SOIL	10		UG/KG	0.83			
VOA OLM4.2/4.3		ETHYLBENZENE	SOIL	10		UG/KG	1.7			
VOA OLM4.2/4.3		ISOPROPYLBENZENE	SOIL	10		UG/KG	0.77			
VOA OLM4.2/4.3		M+P-XYLENE	SOIL	10		UG/KG	1.6			
VOA OLM4.2/4.3		METHYL ACETATE	SOIL	10		UG/KG	0.81			
VOA OLM4.2/4.3		METHYL TERT-BUTYL ETHER	SOIL	10		UG/KG	0.44			
VOA OLM4.2/4.3		METHYLCYCLOHEXANE	SOIL	10		UG/KG	0.80			
VOA OLM4.2/4.3		METHYLENE CHLORIDE	SOIL	10		UG/KG	1.0			
VOA OLM4.2/4.3		O-XYLENE	SOIL	10		UG/KG	0.53			
VOA OLM4.2/4.3		STYRENE	SOIL	10		UG/KG	0.36			
VOA OLM4.2/4.3		TETRACHLOROETHENE	SOIL	10		UG/KG	0.62			
VOA OLM4.2/4.3	*	TOLUENE	SOIL	10		UG/KG	0.40	21	59-139	59-139
VOA OLM4.2/4.3		TRANS-1,2-DICHLOROETHENE	SOIL	10		UG/KG	0.42			
VOA OLM4.2/4.3		TRANS-1,3-DICHLOROPROPENE	SOIL	10		UG/KG	0.41			
VOA OLM4.2/4.3	*	TRICHLOROETHENE	SOIL	10		UG/KG	0.68	24	62-137	62-137
VOA OLM4.2/4.3		TRICHLOROFLUOROMETHANE	SOIL	10		UG/KG	0.53			
VOA OLM4.2/4.3		VINYL CHLORIDE	SOIL	10		UG/KG	0.65			
VOA OLM4.2/4.3		BROMOFLUOROBENZENE -SURR	SOIL	NA		UG/KG	NA	NA	59-113	59-113
VOA OLM4.2/4.3		1,2-DICHLOROETHANE-D4 -SURR	SOIL	NA		UG/KG	NA	NA	70-121	70-121
VOA OLM4.2/4.3		TOLUENE-D8 -SURR	SOIL	NA		UG/KG	NA	NA	84-138	84-138

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
BNA OLM4.2/4.3		1,1'-BIPHENYL	WATER	10		UG/L	0.28			
BNA OLM4.2/4.3		2,2'-OXYBIS(1-CHLOROPROPANE)	WATER	10		UG/L	1.2			
BNA OLM4.2/4.3		2,4,5-TRICHLOROPHENOL	WATER	25		UG/L	1.8			
BNA OLM4.2/4.3		2,4,6-TRICHLOROPHENOL	WATER	10		UG/L	1.2			
BNA OLM4.2/4.3		2,4-DICHLOROPHENOL	WATER	10		UG/L	0.73			
BNA OLM4.2/4.3		2,4-DIMETHYLPHENOL	WATER	10		UG/L	0.36			
BNA OLM4.2/4.3		2,4-DINITROPHENOL	WATER	25		UG/L	2.0			
BNA OLM4.2/4.3	*	2,4-DINITROTOLUENE	WATER	10		UG/L	1.8	38	24-96	24-96
BNA OLM4.2/4.3		2,6-DINITROTOLUENE	WATER	10		UG/L	1.3			
BNA OLM4.2/4.3		2-CHLORONAPHTHALENE	WATER	10		UG/L	0.18			
BNA OLM4.2/4.3	*	2-CHLOROPHENOL	WATER	10		UG/L	0.53	40	27-123	27-123
BNA OLM4.2/4.3		2-METHYLNAPHTHALENE	WATER	10		UG/L	0.33			
BNA OLM4.2/4.3		2-METHYLPHENOL	WATER	10		UG/L	2.2			
BNA OLM4.2/4.3		2-NITROANILINE	WATER	25		UG/L	1.5			
BNA OLM4.2/4.3		2-NITROPHENOL	WATER	10		UG/L	1.3			
BNA OLM4.2/4.3		3,3'-DICHLOROBENZIDINE	WATER	10		UG/L	0.86			
BNA OLM4.2/4.3		3-NITROANILINE	WATER	25		UG/L	0.78			
BNA OLM4.2/4.3		4,6-DINITRO-2-METHYLPHENOL	WATER	25		UG/L	1.4			
BNA OLM4.2/4.3		4-BROMOPHENYL-PHENYLETHER	WATER	10		UG/L	0.11			
BNA OLM4.2/4.3	*	4-CHLORO-3-METHYLPHENOL	WATER	10		UG/L	0.36	42	23-97	23-97
BNA OLM4.2/4.3		4-CHLOROANILINE	WATER	10		UG/L	0.46			
BNA OLM4.2/4.3		4-CHLOROPHENYL-PHENYLETHER	WATER	10		UG/L	0.75			
BNA OLM4.2/4.3		4-METHYLPHENOL	WATER	10		UG/L	0.85			
BNA OLM4.2/4.3		4-NITROANILINE	WATER	25		UG/L	0.94			
BNA OLM4.2/4.3	*	4-NITROPHENOL	WATER	25		UG/L	1.6	50	10-80	10-80
BNA OLM4.2/4.3	*	ACENAPHTHENE	WATER	10		UG/L	0.53	31	46-118	46-118
BNA OLM4.2/4.3		ACENAPHTHYLENE	WATER	10		UG/L	0.74			
BNA OLM4.2/4.3		ACETOPHENONE	WATER	10		UG/L	0.96			
BNA OLM4.2/4.3		ANTHRACENE	WATER	10		UG/L	0.46			
BNA OLM4.2/4.3		ATRAZINE	WATER	10		UG/L	1.3			
BNA OLM4.2/4.3		BENZALDEHYDE	WATER	10		UG/L	0.86			
BNA OLM4.2/4.3		BENZO(A)ANTHRACENE	WATER	10		UG/L	0.16			
BNA OLM4.2/4.3		BENZO(A)PYRENE	WATER	10		UG/L	0.53			
BNA OLM4.2/4.3		BENZO(B)FLUORANTHENE	WATER	10		UG/L	2.7			
BNA OLM4.2/4.3		BENZO(G,H,I)PERYLENE	WATER	10		UG/L	2.5			
BNA OLM4.2/4.3		BENZO(K)FLUORANTHENE	WATER	10		UG/L	0.66			
BNA OLM4.2/4.3		BIS(-2-CHLOROETHOXY)METHANE	WATER	10		UG/L	0.69			
BNA OLM4.2/4.3		BIS(-2-CHLOROETHYL)ETHER	WATER	10		UG/L	1.1			
BNA OLM4.2/4.3		BIS(2-ETHYLHEXYL)PHTHALATE	WATER	10		UG/L	0.40			
BNA OLM4.2/4.3		BUTYL BENZYL PHTHALATE	WATER	10		UG/L	1.4			
BNA OLM4.2/4.3		CAPROLACTAM	WATER	10		UG/L	0.91			
BNA OLM4.2/4.3		CARBAZOLE	WATER	10		UG/L	0.56			
BNA OLM4.2/4.3		CHRYSENE	WATER	10		UG/L	0.07			
BNA OLM4.2/4.3		DIBENZ(A,H)ANTHRACENE	WATER	10		UG/L	2.09			
BNA OLM4.2/4.3		DIBENZOFURAN	WATER	10		UG/L	0.21			
BNA OLM4.2/4.3		DIETHYLPHTHALATE	WATER	10		UG/L	0.38			
BNA OLM4.2/4.3		DIMETHYL PHTHALATE	WATER	10		UG/L	0.54			
BNA OLM4.2/4.3		DI-N-BUTYLPHTHALATE	WATER	10		UG/L	0.35			
BNA OLM4.2/4.3		DI-N-OCTYL PHTHALATE	WATER	10		UG/L	2.5			
BNA OLM4.2/4.3		FLUORANTHENE	WATER	10		UG/L	0.76			
BNA OLM4.2/4.3		FLUORENE	WATER	10		UG/L	0.63			
BNA OLM4.2/4.3		HEXACHLOROBENZENE	WATER	10		UG/L	1.4			
BNA OLM4.2/4.3		HEXACHLOROBUTADIENE	WATER	10		UG/L	0.48			
BNA OLM4.2/4.3		HEXACHLOROCYCLOPENTADIENE	WATER	10		UG/L	1.6			
BNA OLM4.2/4.3		HEXACHLOROETHANE	WATER	10		UG/L	0.74			
BNA OLM4.2/4.3		INDENO(1,2,3-CD)PYRENE	WATER	10		UG/L	2.5			
BNA OLM4.2/4.3		ISOPHORONE	WATER	10		UG/L	0.45			
BNA OLM4.2/4.3		NAPHTHALENE	WATER	10		UG/L	0.14			
BNA OLM4.2/4.3		NITROBENZENE	WATER	10		UG/L	0.90			
BNA OLM4.2/4.3	*	N-NITROSO-DI-N-PROPYLAMINE	WATER	10		UG/L	0.64	38	41-116	41-116
BNA OLM4.2/4.3		N-NITROSODIPHENYLAMINE	WATER	10		UG/L	1.1			
BNA OLM4.2/4.3	*	PENTACHLOROPHENOL	WATER	25		UG/L	3.0	50	9-103	9-103
BNA OLM4.2/4.3		PHENANTHRENE	WATER	10		UG/L	0.56			
BNA OLM4.2/4.3	*	PHENOL	WATER	10		UG/L	0.37	42	12-110	12-110
BNA OLM4.2/4.3	*	PYRENE	WATER	10		UG/L	1.6	31	26-127	26-127

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
BNA OLM4.2/4.3		TERPHENYL-D14 -SURR	WATER	NA		UG/L	NA	NA	33-141	33-141
BNA OLM4.2/4.3		2-CHLOROPHENOL-D4 -SURR (adviso	WATER	NA		UG/L	NA	NA	33-110	33-110
BNA OLM4.2/4.3		1,2-DICHLOROBENZENE-D4 -SURR (ad	WATER	NA		UG/L	NA	NA	16-110	16-110
BNA OLM4.2/4.3		NITROBENZENE-D5 -SURR	WATER	NA		UG/L	NA	NA	35-114	35-114
BNA OLM4.2/4.3		PHENOL-D6 -SURR	WATER	NA		UG/L	NA	NA	10-110	10-110
BNA OLM4.2/4.3		2-FLUOROBIPHENYL -SURR	WATER	NA		UG/L	NA	NA	43-116	43-116
BNA OLM4.2/4.3		2-FLUOROPHENOL -SURR	WATER	NA		UG/L	NA	NA	21-110	21-110
BNA OLM4.2/4.3		2,4,6-TRIBROMOPHENOL -SURR	WATER	NA		UG/L	NA	NA	10-123	10-123
BNA OLM4.2/4.3 additional compounds upon request										
BNA OLM4.2/4.3		1,3-DICHLOROBENZENE	WATER	10		UG/L	0.51			
BNA OLM4.2/4.3		1,2-DICHLOROBENZENE	WATER	10		UG/L	0.86			
BNA OLM4.2/4.3		1,4-DICHLOROBENZENE	WATER	10		UG/L	0.53			
BNA OLM4.2/4.3		1,1'-BIPHENYL	SOIL	330		UG/KG	9.3			
BNA OLM4.2/4.3		2,2'-OXYBIS(1-CHLOROPROPANE)	SOIL	330		UG/KG	41			
BNA OLM4.2/4.3		2,4,5-TRICHLOROPHENOL	SOIL	800		UG/KG	61			
BNA OLM4.2/4.3		2,4,6-TRICHLOROPHENOL	SOIL	330		UG/KG	41			
BNA OLM4.2/4.3		2,4-DICHLOROPHENOL	SOIL	330		UG/KG	24			
BNA OLM4.2/4.3		2,4-DIMETHYLPHENOL	SOIL	330		UG/KG	12			
BNA OLM4.2/4.3		2,4-DINITROPHENOL	SOIL	800		UG/KG	66			
BNA OLM4.2/4.3	*	2,4-DINITROTOLUENE	SOIL	330		UG/KG	59	47	28-89	28-89
BNA OLM4.2/4.3		2,6-DINITROTOLUENE	SOIL	330		UG/KG	44			
BNA OLM4.2/4.3		2-CHLORONAPHTHALENE	SOIL	330		UG/KG	6.0			
BNA OLM4.2/4.3	*	2-CHLOROPHENOL	SOIL	330		UG/KG	18	50	25-102	25-102
BNA OLM4.2/4.3		2-METHYLNAPHTHALENE	SOIL	330		UG/KG	11			
BNA OLM4.2/4.3		2-METHYLPHENOL	SOIL	330		UG/KG	73			
BNA OLM4.2/4.3		2-NITROANILINE	SOIL	800		UG/KG	50			
BNA OLM4.2/4.3		2-NITROPHENOL	SOIL	330		UG/KG	42			
BNA OLM4.2/4.3		3,3'-DICHLOROBENZIDINE	SOIL	330		UG/KG	29			
BNA OLM4.2/4.3		3-NITROANILINE	SOIL	800		UG/KG	26			
BNA OLM4.2/4.3		4,6-DINITRO-2-METHYLPHENOL	SOIL	800		UG/KG	47			
BNA OLM4.2/4.3		4-BROMOPHENYL-PHENYLETHER	SOIL	330		UG/KG	3.7			
BNA OLM4.2/4.3	*	4-CHLORO-3-METHYLPHENOL	SOIL	330		UG/KG	12	33	26-103	26-103
BNA OLM4.2/4.3		4-CHLOROANILINE	SOIL	330		UG/KG	15			
BNA OLM4.2/4.3		4-CHLOROPHENYL-PHENYLETHER	SOIL	330		UG/KG	25			
BNA OLM4.2/4.3		4-METHYLPHENOL	SOIL	330		UG/KG	28			
BNA OLM4.2/4.3		4-NITROANILINE	SOIL	800		UG/KG	31			
BNA OLM4.2/4.3	*	4-NITROPHENOL	SOIL	800		UG/KG	54	50	11-114	11-114
BNA OLM4.2/4.3	*	ACENAPHTHENE	SOIL	330		UG/KG	18	19	31-137	31-137
BNA OLM4.2/4.3		ACENAPHTHYLENE	SOIL	330		UG/KG	25			
BNA OLM4.2/4.3		ACETOPHENONE	SOIL	330		UG/KG	32			
BNA OLM4.2/4.3		ANTHRACENE	SOIL	330		UG/KG	15			
BNA OLM4.2/4.3		ATRAZINE	SOIL	330		UG/KG	42			
BNA OLM4.2/4.3		BENZALDEHYDE	SOIL	330		UG/KG	29			
BNA OLM4.2/4.3		BENZO(A)ANTHRACENE	SOIL	330		UG/KG	5.3			
BNA OLM4.2/4.3		BENZO(A)PYRENE	SOIL	330		UG/KG	18			
BNA OLM4.2/4.3		BENZO(B)FLUORANTHENE	SOIL	330		UG/KG	88			
BNA OLM4.2/4.3		BENZO(G,H,I)PERYLENE	SOIL	330		UG/KG	82			
BNA OLM4.2/4.3		BENZO(K)FLUORANTHENE	SOIL	330		UG/KG	22			
BNA OLM4.2/4.3		BIS(-2-CHLOROETHOXY)METHANE	SOIL	330		UG/KG	23			
BNA OLM4.2/4.3		BIS(-2-CHLOROETHYL)ETHER	SOIL	330		UG/KG	37			
BNA OLM4.2/4.3		BIS(2-ETHYLHEXYL)PHTHALATE	SOIL	330		UG/KG	13			
BNA OLM4.2/4.3		BUTYL BENZYL PHTHALATE	SOIL	330		UG/KG	46			
BNA OLM4.2/4.3		CAPROLACTAM	SOIL	330		UG/KG	30			
BNA OLM4.2/4.3		CARBAZOLE	SOIL	330		UG/KG	19			
BNA OLM4.2/4.3		CHRYSENE	SOIL	330		UG/KG	2.3			
BNA OLM4.2/4.3		DIBENZ(A,H)ANTHRACENE	SOIL	330		UG/KG	70			
BNA OLM4.2/4.3		DIBENZOFURAN	SOIL	330		UG/KG	7.0			
BNA OLM4.2/4.3		DIETHYLPHTHALATE	SOIL	330		UG/KG	13			
BNA OLM4.2/4.3		DIMETHYL PHTHALATE	SOIL	330		UG/KG	18			
BNA OLM4.2/4.3		DI-N-BUTYLPHTHALATE	SOIL	330		UG/KG	12			
BNA OLM4.2/4.3		DI-N-OCTYL PHTHALATE	SOIL	330		UG/KG	82			
BNA OLM4.2/4.3		FLUORANTHENE	SOIL	330		UG/KG	25			
BNA OLM4.2/4.3		FLUORENE	SOIL	330		UG/KG	21			
BNA OLM4.2/4.3		HEXACHLOROBENZENE	SOIL	330		UG/KG	45			
BNA OLM4.2/4.3		HEXACHLOROBUTADIENE	SOIL	330		UG/KG	16			

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
BNA OLM4.2/4.3		HEXACHLOROCYCLOPENTADIENE	SOIL	330		UG/KG	53			
BNA OLM4.2/4.3		HEXACHLOROETHANE	SOIL	330		UG/KG	25			
BNA OLM4.2/4.3		INDENO(1,2,3-CD)PYRENE	SOIL	330		UG/KG	82			
BNA OLM4.2/4.3		ISOPHORONE	SOIL	330		UG/KG	15			
BNA OLM4.2/4.3		NAPHTHALENE	SOIL	330		UG/KG	4.7			
BNA OLM4.2/4.3		NITROBENZENE	SOIL	330		UG/KG	30			
BNA OLM4.2/4.3	*	N-NITROSO-DI-N-PROPYLAMINE	SOIL	330		UG/KG	21	38	41-126	41-126
BNA OLM4.2/4.3		N-NITROSODIPHENYLAMINE	SOIL	330		UG/KG	35			
BNA OLM4.2/4.3	*	PENTACHLOROPHENOL	SOIL	800		UG/KG	99	47	17-109	17-109
BNA OLM4.2/4.3		PHENANTHRENE	SOIL	330		UG/KG	19			
BNA OLM4.2/4.3	*	PHENOL	SOIL	330		UG/KG	12	35	26-90	26-90
BNA OLM4.2/4.3	*	PYRENE	SOIL	330		UG/KG	53	36	35-142	35-142
BNA OLM4.2/4.3		TERPHENYL-D14 -SURR	SOIL	NA		UG/KG	NA	NA	18-137	18-137
BNA OLM4.2/4.3		2-CHLOROPHENOL-D4 -SURR (advisor	SOIL	NA		UG/KG	NA	NA	20-130	20-130
BNA OLM4.2/4.3		1,2-DICHLOROBENZENE-D4 -SURR (a	SOIL	NA		UG/KG	NA	NA	20-130	20-130
BNA OLM4.2/4.3		NITROBENZENE-D5 -SURR	SOIL	NA		UG/KG	NA	NA	23-120	23-120
BNA OLM4.2/4.3		PHENOL-D6 -SURR	SOIL	NA		UG/KG	NA	NA	24-113	24-113
BNA OLM4.2/4.3		2-FLUOROBIPHENYL -SURR	SOIL	NA		UG/KG	NA	NA	30-115	30-115
BNA OLM4.2/4.3		2-FLUOROPHENOL -SURR	SOIL	NA		UG/KG	NA	NA	25-121	25-121
BNA OLM4.2/4.3		2,4,6-TRIBROMOPHENOL -SURR	SOIL	NA		UG/KG	NA	NA	19-122	19-122
BNA OLM4.2/4.3 additional compounds by request										
BNA OLM4.2/4.3		1,3-DICHLOROBENZENE	SOIL	330		UG/KG	17			
BNA OLM4.2/4.3		1,2-DICHLOROBENZENE	SOIL	330		UG/KG	29			
BNA OLM4.2/4.3		1,4-DICHLOROBENZENE	SOIL	330		UG/KG	18			

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
P/PCB OLM4.2/4.3		AROCLOR-1016	WATER	1.0		UG/L	0.48			
P/PCB OLM4.2/4.3		AROCLOR-1221	WATER	2.0		UG/L	0.68			
P/PCB OLM4.2/4.3		AROCLOR-1232	WATER	1.0		UG/L	0.79			
P/PCB OLM4.2/4.3		AROCLOR-1242	WATER	1.0		UG/L	0.36			
P/PCB OLM4.2/4.3		AROCLOR-1248	WATER	1.0		UG/L	0.27			
P/PCB OLM4.2/4.3		AROCLOR-1254	WATER	1.0		UG/L	0.073			
P/PCB OLM4.2/4.3		AROCLOR-1260	WATER	1.0		UG/L	0.19			
P/PCB OLM4.2/4.3	*	ALDRIN	WATER	0.050		UG/L	0.0026	22	40-120	40-120
P/PCB OLM4.2/4.3		ALPHA-BHC	WATER	0.050		UG/L	0.0084			
P/PCB OLM4.2/4.3		BETA-BHC	WATER	0.050		UG/L	0.0041			
P/PCB OLM4.2/4.3		DELTA-BHC	WATER	0.050		UG/L	0.0035			
P/PCB OLM4.2/4.3	*	GAMMA-BHC (LINDANE)	WATER	0.050		UG/L	0.0076	15	56-123	56-123
P/PCB OLM4.2/4.3		ALPHA-CHLORDANE	WATER	0.050		UG/L	0.0057			
P/PCB OLM4.2/4.3		GAMMA-CHLORDANE	WATER	0.050		UG/L	0.0025			
P/PCB OLM4.2/4.3		4,4'-DDD	WATER	0.10		UG/L	0.0091			
P/PCB OLM4.2/4.3		4,4'-DDE	WATER	0.10		UG/L	0.0049			
P/PCB OLM4.2/4.3	*	4,4'-DDT	WATER	0.10		UG/L	0.0034	27	38-127	38-127
P/PCB OLM4.2/4.3	*	DIELDRIN	WATER	0.10		UG/L	0.014	18	52-126	52-126
P/PCB OLM4.2/4.3		ENDOSULFAN I	WATER	0.050		UG/L	0.0056			
P/PCB OLM4.2/4.3		ENDOSULFAN II	WATER	0.10		UG/L	0.011			
P/PCB OLM4.2/4.3		ENDOSULFAN SULFATE	WATER	0.10		UG/L	0.0074			
P/PCB OLM4.2/4.3	*	ENDRIN	WATER	0.10		UG/L	0.014	21	56-121	56-121
P/PCB OLM4.2/4.3		ENDRIN ALDEHYDE	WATER	0.10		UG/L	0.006			
P/PCB OLM4.2/4.3		ENDRIN KETONE	WATER	0.10		UG/L	0.009			
P/PCB OLM4.2/4.3	*	HEPTACHLOR	WATER	0.050		UG/L	0.0081	20	40-131	40-131
P/PCB OLM4.2/4.3		HEPTACHLOR EPOXIDE	WATER	0.050		UG/L	0.0024			
P/PCB OLM4.2/4.3		METHOXYCHLOR	WATER	0.50		UG/L	0.031			
P/PCB OLM4.2/4.3		TOXAPHENE	WATER	5.0		UG/L	1.0			
P/PCB OLM4.2/4.3		DECACHLOROBIPHENYL (DCB) -SURR	WATER	NA		UG/L	NA	NA	30-150	30-150
P/PCB OLM4.2/4.3		TETRACHLORO-META-XYLENE (TCMX) -SU	WATER	NA		UG/L	NA	NA	30-150	30-150
P/PCB OLM4.2/4.3		AROCLOR-1016	SOIL	33		UG/KG	16			
P/PCB OLM4.2/4.3		AROCLOR-1221	SOIL	67		UG/KG	23			
P/PCB OLM4.2/4.3		AROCLOR-1232	SOIL	33		UG/KG	26			
P/PCB OLM4.2/4.3		AROCLOR-1242	SOIL	33		UG/KG	12			
P/PCB OLM4.2/4.3		AROCLOR-1248	SOIL	33		UG/KG	9.2			
P/PCB OLM4.2/4.3		AROCLOR-1254	SOIL	33		UG/KG	2.4			
P/PCB OLM4.2/4.3		AROCLOR-1260	SOIL	33		UG/KG	6.3			
P/PCB OLM4.2/4.3	*	ALDRIN	SOIL	1.7		UG/KG	0.10	43	40-120	34-132
P/PCB OLM4.2/4.3		ALPHA-BHC	SOIL	1.7		UG/KG	0.27			
P/PCB OLM4.2/4.3		BETA-BHC	SOIL	1.7		UG/KG	0.13			
P/PCB OLM4.2/4.3		DELTA-BHC	SOIL	1.7		UG/KG	0.13			
P/PCB OLM4.2/4.3	*	GAMMA-BHC (LINDANE)	SOIL	1.7		UG/KG	0.27	50	56-123	46-127
P/PCB OLM4.2/4.3		ALPHA-CHLORDANE	SOIL	1.7		UG/KG	0.20			
P/PCB OLM4.2/4.3		GAMMA-CHLORDANE	SOIL	1.7		UG/KG	0.10			
P/PCB OLM4.2/4.3		4,4'-DDD	SOIL	3.3		UG/KG	0.30			
P/PCB OLM4.2/4.3		4,4'-DDE	SOIL	3.3		UG/KG	0.17			
P/PCB OLM4.2/4.3	*	4,4'-DDT	SOIL	3.3		UG/KG	0.10	50	38-127	23-134
P/PCB OLM4.2/4.3	*	DIELDRIN	SOIL	3.3		UG/KG	0.47	38	52-126	31-134
P/PCB OLM4.2/4.3		ENDOSULFAN I	SOIL	1.7		UG/KG	0.20			
P/PCB OLM4.2/4.3		ENDOSULFAN II	SOIL	3.3		UG/KG	0.37			
P/PCB OLM4.2/4.3		ENDOSULFAN SULFATE	SOIL	3.3		UG/KG	0.23			
P/PCB OLM4.2/4.3	*	ENDRIN	SOIL	3.3		UG/KG	0.47	45	56-121	42-139
P/PCB OLM4.2/4.3		ENDRIN ALDEHYDE	SOIL	3.3		UG/KG	0.20			
P/PCB OLM4.2/4.3		ENDRIN KETONE	SOIL	3.3		UG/KG	0.30			
P/PCB OLM4.2/4.3	*	HEPTACHLOR	SOIL	1.7		UG/KG	0.27	31	40-131	35-130
P/PCB OLM4.2/4.3		HEPTACHLOR EPOXIDE	SOIL	1.7		UG/KG	0.070			
P/PCB OLM4.2/4.3		METHOXYCHLOR	SOIL	17		UG/KG	1.0			
P/PCB OLM4.2/4.3		TOXAPHENE	SOIL	170		UG/KG	34			
P/PCB OLM4.2/4.3		DECACHLOROBIPHENYL (DCB) -SURR	SOIL	NA		UG/KG	NA	NA	30-150	30-150
P/PCB OLM4.2/4.3		TETRACHLORO-META-XYLENE (TCMX) -SU	SOIL	NA		UG/KG	NA	NA	30-150	30-150

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
MAVPH	BENZENE	WATER	0.5		UG/L	0.17	50	70-130	70-130
MAVPH	METHYL-TERT-BUTYL ETHER	WATER	5.0		UG/L	0.64	50	70-130	70-130
MAVPH	C9-C10 AROMATICS	WATER	10		UG/L	1.7	50	70-130	70-130
MAVPH	C9-C12 ALIPHATICS	WATER	20		UG/L	4.8	50	70-130	70-130
MAVPH	C5-C8 ALIPHATICS	WATER	15		UG/L	8.8	50	70-130	70-130
MAVPH	ETHYLBENZENE	WATER	1.0		UG/L	0.19	50	70-130	70-130
MAVPH	NAPHTHALENE	WATER	5.0		UG/L	0.51	50	70-130	70-130
MAVPH	TOLUENE	WATER	1.0		UG/L	0.46	50	70-130	70-130
MAVPH	M+P-XYLENE	WATER	1.0		UG/L	0.70	50	70-130	70-130
MAVPH	O-XYLENE	WATER	1.0		UG/L	0.50	50	70-130	70-130
MAVPH	1,4-DIFLUOROBENZENE (FID) -SURR	WATER	NA		UG/L	NA	NA	70-130	70-130
MAVPH	1,4-DIFLUOROBENZENE (PID) -SURR	WATER	NA		UG/L	NA	NA	70-130	70-130
MAVPH	BENZENE	SOIL	25		UG/KG	8.6	50	70-130	70-130
MAVPH	METHYL-TERT-BUTYL ETHER	SOIL	250		UG/KG	32	50	70-130	70-130
MAVPH	C9-C10 AROMATICS	SOIL	500		UG/KG	85	50	70-130	70-130
MAVPH	C9-C12 ALIPHATICS	SOIL	1000		UG/KG	240	50	70-130	70-130
MAVPH	C5-C8 ALIPHATICS	SOIL	750		UG/KG	440	50	70-130	70-130
MAVPH	ETHYLBENZENE	SOIL	50		UG/KG	9.7	50	70-130	70-130
MAVPH	NAPHTHALENE	SOIL	250		UG/KG	26	50	70-130	70-130
MAVPH	TOLUENE	SOIL	50		UG/KG	23	50	70-130	70-130
MAVPH	M+P-XYLENE	SOIL	50		UG/KG	35	50	70-130	70-130
MAVPH	O-XYLENE	SOIL	50		UG/KG	25	50	70-130	70-130
MAVPH	1,4-DIFLUOROBENZENE (FID) -SURR	SOIL	NA		UG/KG	NA	NA	70-130	70-130
MAVPH	1,4-DIFLUOROBENZENE (PID) -SURR	SOIL	NA		UG/KG	NA	NA	70-130	70-130
MAEPH	ACENAPHTHENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	ACENAPHTHYLENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	ANTHRACENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	BENZO(A)ANTHRACENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	BENZO(A)PYRENE	WATER	0.20		UG/L		50	40-140	40-140
MAEPH	BENZO(B)FLUORANTHENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	BENZO(G,H,I)PERYLENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	BENZO(K)FLUORANTHENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	C9-C18 ALIPHATIC HYDROCARBONS	WATER	100		UG/L	NA	50	40-140	40-140
MAEPH	UNADJUSTED C11-C22 AROMATIC HYDROC	WATER	100		UG/L	NA	50	40-140	40-140
MAEPH	C11-C22 AROMATICS	WATER	100		UG/L	NA	50	40-140	40-140
MAEPH	C19-C36 ALIPHATIC HYDROCARBONS	WATER	100		UG/L	NA	50	40-140	40-140
MAEPH	INDENO(1,2,3-CD)PYRENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	CHRYSENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	DIBENZ(A,H)ANTHRACENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	FLUORANTHENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	FLUORENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	2-METHYLNAPHTHALENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	NAPHTHALENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	PHENANTHRENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	PYRENE	WATER	0.50		UG/L		50	40-140	40-140
MAEPH	2-BROMONAPHTHALENE -SURR	WATER	NA		UG/L	NA	NA	40-140	40-140
MAEPH	2-FLUOROBIPHENYL -SURR	WATER	NA		UG/L	NA	NA	40-140	40-140
MAEPH	1-CHLORO-OCTADECANE -SURR	WATER	NA		UG/L	NA	NA	40-140	40-140
MAEPH	O-TERPHENYL -SURR	WATER	NA		UG/L	NA	NA	40-140	40-140

ROCHESTER ORGANIC QC LIMITS

METHOD	ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
MAEPH	ACENAPHTHENE	SOIL	330		UG/KG	29	50	40-140	40-140
MAEPH	ACENAPHTHYLENE	SOIL	330		UG/KG	28	50	40-140	40-140
MAEPH	ANTHRACENE	SOIL	330		UG/KG	195	50	40-140	40-140
MAEPH	BENZO(A)ANTHRACENE	SOIL	330		UG/KG	43	50	40-140	40-140
MAEPH	BENZO(A)PYRENE	SOIL	330		UG/KG	79	50	40-140	40-140
MAEPH	BENZO(B)FLUORANTHENE	SOIL	330		UG/KG	44	50	40-140	40-140
MAEPH	BENZO(G,H,I)PERYLENE	SOIL	330		UG/KG	39	50	40-140	40-140
MAEPH	BENZO(K)FLUORANTHENE	SOIL	330		UG/KG	67	50	40-140	40-140
MAEPH	C9-C18 ALIPHATIC HYDROCARBONS	SOIL	660		UG/KG	NA	50	40-140	40-140
MAEPH	UNADJUSTED C11-C22 AROMATIC HYDROC	SOIL	660		UG/KG	NA	50	40-140	40-140
MAEPH	C11-C22 AROMATICS	SOIL	660		UG/KG	NA	50	40-140	40-140
MAEPH	C19-C36 ALIPHATIC HYDROCARBONS	SOIL	660		UG/KG	NA	50	40-140	40-140
MAEPH	INDENO(1,2,3-CD)PYRENE	SOIL	330		UG/KG	54	50	40-140	40-140
MAEPH	CHRYSENE	SOIL	330		UG/KG	93	50	40-140	40-140
MAEPH	DIBENZ(A,H)ANTHRACENE	SOIL	330		UG/KG	81	50	40-140	40-140
MAEPH	FLUORANTHENE	SOIL	330		UG/KG	83	50	40-140	40-140
MAEPH	FLUORENE	SOIL	330		UG/KG	28	50	40-140	40-140
MAEPH	2-METHYLNAPHTHALENE	SOIL	660		UG/KG	33	50	40-140	40-140
MAEPH	NAPHTHALENE	SOIL	330		UG/KG	41	50	40-140	40-140
MAEPH	PHENANTHRENE	SOIL	330		UG/KG	162	50	40-140	40-140
MAEPH	PYRENE	SOIL	330		UG/KG	50	50	40-140	40-140
MAEPH	2-BROMONAPHTHALENE -SURR	SOIL	NA		UG/KG	NA	NA	40-140	40-140
MAEPH	2-FLUOROBIPHENYL -SURR	SOIL	NA		UG/KG	NA	NA	40-140	40-140
MAEPH	1-CHLORO-OCTADECANE -SURR	SOIL	NA		UG/KG	NA	NA	40-140	40-140
MAEPH	O-TERPHENYL -SURR	SOIL	NA		UG/KG	NA	NA	40-140	40-140
TO-15	1,1,1-TRICHLOROETHANE	AIR	0.50		ppbv	0.013	25	70-130	NA
TO-15	1,1,2,2-TETRACHLOROETHANE	AIR	0.50		ppbv	0.023	25	70-130	NA
TO-15	FREON-113	AIR	0.50		ppbv	0.015	25	70-130	NA
TO-15	1,1,2-TRICHLOROETHANE	AIR	0.50		ppbv	0.017	25	70-130	NA
TO-15	1,1-DICHLOROETHANE	AIR	0.50		ppbv	0.026	25	70-130	NA
TO-15	1,1-DICHLOROETHENE	AIR	0.50		ppbv	0.028	25	70-130	NA
TO-15	1,2,4-TRICHLOROBENZENE	AIR	0.50		ppbv	0.046	25	70-130	NA
TO-15	1,2,4-TRIMETHYLBENZENE	AIR	0.50		ppbv	0.013	25	70-130	NA
TO-15	1,2-DIBROMOETHANE	AIR	0.50		ppbv	0.024	25	70-130	NA
TO-15	1,2-DICHLOROBENZENE	AIR	0.50		ppbv	0.025	25	70-130	NA
TO-15	DICHLORODIFLUOROMETHANE	AIR	0.50		ppbv	0.015	25	70-130	NA
TO-15	1,2-DICHLOROETHANE	AIR	0.50		ppbv	0.021	25	70-130	NA
TO-15	1,2-DICHLOROPROPANE	AIR	0.50		ppbv	0.019	25	70-130	NA
TO-15	1,3,5-TRIMETHYLBENZENE	AIR	0.50		ppbv	0.015	25	70-130	NA
TO-15	1,3-BUTADIENE	AIR	0.50		ppbv	0.029	25	70-130	NA
TO-15	1,3-DICHLOROBENZENE	AIR	0.50		ppbv	0.026	25	70-130	NA
TO-15	1,4-DICHLOROBENZENE	AIR	0.50		ppbv	0.024	25	70-130	NA
TO-15	4-ETHYLTOLUENE	AIR	0.50		ppbv	0.021	25	70-130	NA
TO-15	ACETONE	AIR	1.00		ppbv	0.45	25	70-130	NA
TO-15	BENZENE	AIR	0.50		ppbv	0.013	25	70-130	NA
TO-15	BENZYL CHLORIDE	AIR	0.50		ppbv	0.031	25	70-130	NA
TO-15	BROMODICHLOROMETHANE	AIR	0.50		ppbv	0.015	25	70-130	NA
TO-15	BROMOFORM	AIR	0.50		ppbv	0.021	25	70-130	NA
TO-15	BROMOMETHANE	AIR	0.50		ppbv	0.025	25	70-130	NA
TO-15	CARBON DISULFIDE	AIR	0.50		ppbv	0.010	25	70-130	NA
TO-15	CARBON TETRACHLORIDE	AIR	0.50		ppbv	0.017	25	70-130	NA
TO-15	CHLOROBENZENE	AIR	0.50		ppbv	0.013	25	70-130	NA
TO-15	CHLOROETHANE	AIR	0.50		ppbv	0.032	25	70-130	NA
TO-15	CHLOROFORM	AIR	0.50		ppbv	0.025	25	70-130	NA
TO-15	CHLOROMETHANE	AIR	0.50		ppbv	0.015	25	70-130	NA
TO-15	CIS-1,2-DICHLOROETHENE	AIR	0.50		ppbv	0.015	25	70-130	NA
TO-15	CIS-1,3-DICHLOROPROPENE	AIR	0.50		ppbv	0.015	25	70-130	NA
TO-15	CYCLOHEXANE	AIR	0.50		ppbv	0.028	25	70-130	NA
TO-15	DIBROMOCHLOROMETHANE	AIR	0.50		ppbv	0.015	25	70-130	NA
TO-15	FREON-114	AIR	0.50		ppbv	0.013	25	70-130	NA
TO-15	ETHYL ACETATE	AIR	0.50		ppbv	0.057	25	70-130	NA
TO-15	ETHYLBENZENE	AIR	0.50		ppbv	0.017	25	70-130	NA
TO-15	HEPTANE	AIR	0.50		ppbv	0.015	25	70-130	NA
TO-15	HEXACHLOROBUTADIENE	AIR	0.50		ppbv	0.029	25	70-130	NA
TO-15	HEXANE	AIR	0.50		ppbv	0.021	25	70-130	NA

ROCHESTER ORGANIC QC LIMITS

METHOD		ANALYTE	MATRIX	MRL	DOD LOQ**	UNITS	MDL/ LOD	DUP (RPD)	LCS (% REC)	MS (% REC)
TO-15		M+P-XYLENE	AIR	1.0		ppbv	0.010	25	70-130	NA
TO-15		2-HEXANONE	AIR	0.50		ppbv	0.061	25	70-130	NA
TO-15		2-BUTANONE	AIR	0.50		ppbv	0.060	25	70-130	NA
TO-15		4-METHYL-2-PENTANONE	AIR	0.50		ppbv	0.056	25	70-130	NA
TO-15		METHYL TERT-BUTYL ETHER	AIR	0.50		ppbv	0.015	25	70-130	NA
TO-15		METHYLENE CHLORIDE	AIR	0.50		ppbv	0.024	25	70-130	NA
TO-15		O-XYLENE	AIR	0.50		ppbv	0.010	25	70-130	NA
TO-15		PROPYLENE	AIR	0.50		ppbv	0.027	25	70-130	NA
TO-15		STYRENE	AIR	0.50		ppbv	0.017	25	70-130	NA
TO-15		TETRACHLOROETHENE	AIR	0.50		ppbv	0.019	25	70-130	NA
TO-15		TETRAHYDROFURAN	AIR	0.50		ppbv	0.033	25	70-130	NA
TO-15		TOLUENE	AIR	0.50		ppbv	0.010	25	70-130	NA
TO-15		TRANS-1,2-DICHLOROETHENE	AIR	0.50		ppbv	0.010	25	70-130	NA
TO-15		TRANS-1,3-DICHLOROPROPENE	AIR	0.50		ppbv	0.015	25	70-130	NA
TO-15		TRICHLOROETHENE	AIR	0.50		ppbv	0.028	25	70-130	NA
TO-15		TRICHLOROFLUOROMETHANE	AIR	0.50		ppbv	0.010	25	70-130	NA
TO-15		VINYL ACETATE	AIR	0.50		ppbv	0.15	25	70-130	NA
TO-15		VINYL CHLORIDE	AIR	0.50		ppbv	0.030	25	70-130	NA
TO-15		BROMOFLUOROBENZENE-SURR	AIR	NA		ppbv	NA	NA	70-140	NA

Method Reporting Limits for isomers reported as "total," are a summation of each isomer's MRL.

* Subset of compounds used to control the acceptablitily of the QC sample for the batch. All targets are monitored against the limits provided, however outlying compounds outside of this subset may not stop analysis based upon the judgement of the analyst.

** The DOD LoQ is the same as the MRL unless there is a value in the DoD LoQ column. DoD LoQ is required to be at least 3 times the MDL. Only populated for DoD Scope of Work. DoD requires use of DoD LCS and MS limits where available. See SOPs or DoD QSM.

EPA SOW OLM 04.3 does not require LCS analysis, limits are guidance for EPA and required for NYS ASP .

Limits for TCLP extracts are the same as the determinative method for the water matrix.

MDL = Method Detection Limit.
LOD = Limit of Detection
TCL = Target Compound List
LVI = Large Volume Injector
-SURR = Surrogate Compound

WETCHEM QC LIMITS

Columbia Analytical Services Rochester, NY

METHOD			ANALYTE	MATRIX	UNITS	MRL	MDL	DUP		MS		LCS		ICV/CCV
EPA	SM	Other						(RPD)	Freq	(% REC)	Freq	(% Rec)	Frequency	
305.1	2310B		Acidity	Water	mg/L	10.0	2.86	20	1/10	61-136	1/10	61-136	1/10	90-110
310.1	2320B		Alkalinity, Total, Carbonate, Bicarb	Water	mg/L	2.00	0.689	20	1/10	80-121	0.1	93-111	1/20	90-110
350.1			Ammonia	Water	mg/L	0.050	0.00955	20	1/10	59-129	0.1	90-110	1/20	90-110
350.1			Ammonia - Low Level	Water	mg/L	0.010	0.00955	20	1/10	59-129	0.1	90-110	1/20	90-110
350.1 M			Ammonia	Soil	mg/Kg	5.00	0.339	30	1/10	48-149	0.1	90-110	1/20	90-110
		D482	Ash, Percent	Non-Aq	%	0.10	NA	10	1/10	NA	NA	61-134	1/20	NA
405.1	5210B		BOD/CBOD	Water	mg/L	2.00	NA	20	1/20	47-141	1/20	85-115	1/20	NA
300.0/9056			Bromide by IC	Water	mg/L	0.10	0.0020	20	1/10	71-122	0.1	90-110	1/20	90-110
300.0M/9056			Bromide by IC	Soil	mg/Kg	10.0	0.385	30	1/10	71-127	0.1	90-110	1/20	90-110
5050/9056			Bromide for total halogens	NonAq/Soil	mg/kg	30.0		20	1/20	NA	NA	50-150	1/20	90-110
		D4809	BTU	Non-Aq	BTU	500	NA	20	1/20	NA	1/20	90-110	1/20	NA
9081			Cation Exchange Capacity	Soil	meqNa/100g	1.0	NA	30	1/20	NA	NA	NA	NA	NA
410.4			Chemical Oxygen Demand - LL	Water	mg/L	5.00	3.31	20	1/10	41-142	1/10	75-116	1/20	85-115
410.4 M			Chemical Oxygen Demand	Soil	mg/Kg	100	49.9	30	1/10	10-170	1/10	10-170	1/20	85-115
325.2	4500-Cl^- E		Chloride - Colorimetric	Water	mg/L	1.00	0.567	20	1/10	65-125	1/10	90-112	1/20	90-110
300.0/9056			Chloride by IC	Water	mg/L	0.200	0.029	20	1/10	72-118	1/10	90-110	1/20	90-110
300.0M/9056			Chloride by IC	Soil	mg/Kg	30.0	4.69	30	1/10	72-119	1/10	90-110	1/20	90-110
5050/9056			Chlorine, Percent	Non-Aq	%	0.01	NA	20	1/10	33-141	NA	33-141	1/20	NA
5050/9056			Chloride - for total halogens	NonAq/Soil	mg/kg	60.0		20	1/20	NA	NA	50-150	1/20	90-110
	409A		Chlorine Demand	Water	mg/L	5.00	NA	20	1/20	NA	NA	NA	NA	NA
330.4	4500-Cl F		Chlorine Residual (Free)	Water	mg/L	0.100	NA	20	1/10	50-150	1/20	50-150	1/20	NA
330.4	4500-Cl F		Chlorine Residual (Total)	Water	mg/L	0.100	0.0446	20	1/10	66-129	1/20	87-113	1/20	NA
110.2	2120B		Color (True)	Water	CU	5.0	NA	+/-5units	1/10	NA	NA	NA	NA	NA
120.1			Conductivity	Water	umhos/cm	NA	NA	20	1/20	NA	NA	90-110	1/10	NA
7196A	3500-Cr B		CR+6 Hexavalent Chromium	Water	mg/L	0.010	0.0011	20	1/10	85-115	1/10	90-109	1/20	90-110
218.6			CR+6 Hexavalent Chromium	Water	mg/L	0.010	0.0031	20	1/20	90-110	1/10	90-110	1/20	95-105
7199			CR+6 Hexavalent Chromium	Water	mg/L	0.010	0.0031	20	1/20	70-130	1/20	80-120	1/20	90-110
3060/7196A			CR+6 Hexavalent Chromium	Soil	mg/Kg	4.00	2.00	20	1/20	75-125	1/10	80-120	1/20	90-110
3060/7199			CR+6 Hexavalent Chromium	Soil	mg/Kg	0.40	0.101	20	1/20	75-125	1/20	80-120	1/20	90-110
		ILM05.3	Cyanide, Total	Water	mg/L	0.010		20	1/20	75-125	1/20	85-115	1/20	85-115
		ILM05.3	Cyanide, Total	Soil	mg/Kg	1.00		20	1/20	30-162	1/20	85-115	1/20	85-115
335.2/335.4			Cyanide, Total	Water	mg/L	0.010	0.0031	20	1/10	10-171	1/10	90-110	HL & LL 1/2	90-110
9012A			Cyanide, Total	Water	mg/L	0.010	0.0031	20	1/10	27-153	1/10	85-115	HL & LL 1/2	85-115
9012A			Cyanide, Total	Soil	mg/Kg	1.00	0.218	30	1/10	30-162	1/10	85-115	HL & LL 1/2	85-115
S. 7.3 SW846			Cyanide, Reactivity	Water	mg/Kg	20.0	0.082	20	1/20	1-100	1/20	1-100	1/20	85-115
S. 7.3 SW846			Cyanide, Reactivity	Soil	mg/Kg	20.0	0.082	30	1/20	1-100	1/20	1-100	1/20	85-115
D1298			Density / Specific Gravity	non-aq	kg/m3	NA	NA	10	1/10	NA	NA	0.002units	20/hydromet	NA
NYSDEC 89-9			Ethylene Glycol	Water	mg/L	1.0	0.0526	20	1/20	70-130	1/20	80-120	1/20	90-110
3500-FE D			Ferrous Iron	Water	mg/L	0.10	0.0417	20	1/10	82-123	1/10	86-114	1/20	90-110
3500-FE D			Ferrous Iron	Soil	mg/kg	10.0	2.5	30	1/10	30-161	1/10	81-120	1/20	90-110
340.2			Fluoride by ISE	Water	mg/L	0.100	0.0115	20	1/20	82-116	1/20	82-116	1/20	90-110
300.0/9056			Fluoride by IC	Water	mg/L	0.100	0.0060	20	1/10	85-129	1/10	90-110	1/20	90-110

WETCHEM QC LIMITS

Columbia Analytical Services Rochester, NY

METHOD			ANALYTE	MATRIX	UNITS	MRL	MDL	DUP		MS		LCS		ICV/CCV
EPA	SM	Other						(RPD)	Freq	(% REC)	Freq	(% Rec)	Frequency	
300.0M/9056			Fluoride by IC	Soil	mg/Kg	20.0	0.609	30	1/10	70-130	1/10	90-110	1/20	90-110
5050/9056			Fluoride for total halogens	NonAq/Soil	mg/kg	30.0		20	1/20	NA	NA	50-150	1/20	90-110
130.2	2340C		Hardness, Total	Water	mg/L	2.00	0.311	20	1/10	84-113	1/10	93-107	1/10	NA
1010			IGN- Pensky Martens Closed Cup	Water	degree C	NA	NA	10	1/20	NA	NA	24.3-29.7 C	1/20	NA
D92/ 1010.CC			IGN - Cleveland Open Cup	Soil	degree C	NA	NA	30	1/20	NA	NA	NA	NA	NA
300.0/9056			Iodide	Water	mg/L	0.20	0.041	20	1/10	70-130	1/10	90-110	1/20	90-110
5050/9056			Iodide - for total Halogens	NonAq/Soil	mg/kg	60		20	1/20	NA	NA	30-150	1/20	90-110
300.0/9056			Nitrate as N by IC	Water	mg/L	0.050	0.008	20	1/10	79-111	1/10	90-110	1/20	90-110
300.0M/9056			Nitrate as N by IC	Soil	mg/Kg	5.00	0.359	30	1/10	79-113	1/10	90-110	1/20	90-110
353.2			Nitrate/Nitrite as N	Water	mg/L	0.050	0.00284	20	1/10	69-123	1/10	90-110	1/20	90-110
300.0/9056			Nitrite as N by IC	Water	mg/L	0.050	0.001	20	1/10	70-130	1/10	90-110	1/20	90-110
353.2			Nitrite as N	Water	mg/L	0.010	0.00776	20	1/10	73-126	1/10	90-110	1/20	90-110
351.2			Nitrogen, Total Kjeldahl	Water	mg/L	0.200	0.075	20	1/10	70-117	1/10	72-108	1/20	-110(I)85-115(
351.2-M			Nitrogen, Total Kjeldahl	Soil	mg/Kg	20.0	12.1	30	1/10	13-162	1/10	13-162	1/20	-110(I)85-115(
351.2 LL			Nitrogen, Total Kjeldahl-LL	Water	mg/L	0.080	0.075	20	1/10	70-117	1/10	76-124	1/20	-110(I)85-115(
1664A			Oil and Grease by 1664A	Water	mg/L	5.00	0.84	20	1/20	78-114	1/20	78-114	1/20	NA
365.1			Othophosphate -LL	Water	mg/L	0.0020	0.0018	20	1/10	33-150	1/10	90-110	1/20	90-110
365.1			Orthophosphate	Water	mg/L	0.010	0.0026	20	1/10	33-150	1/10	90-110	1/20	90-110
9095			Paint Filter test	Sludge	mg/Kg	NA	NA	30	1/20	NA	NA	NA	NA	NA
E203			Percent Water	Waste	%	0.1	0.0112	20	1/20	NA	NA	(MeOH)86-132	1/10	NA
150.1	4500-H^{+} B		pH	Water	SU	NA	NA	±0.10	1/10	NA	NA	NA	NA	±0.05
9040/9045.			pH / Corrosivity	Water	SU	NA	NA	±0.10	1/20	NA	NA	NA	NA	±0.05
9040/9045.			pH / Corrosivity	Soil	SU	NA	NA	±0.10	1/20	NA	NA	NA	NA	±0.05
420.4			Phenolics, Total LL	Water	mg/L	0.002	0.00044	20	1/10	70-123	1/10	85-113	1/20	85-115
420.4			Phenolics, Total	Water	mg/L	0.005	0.00044	20	1/10	70-123	1/10	85-113	1/20	85-115
420.4			Phenolics, Manual Distillation	Water	mg/L	0.005		20	1/10	68-118	1/10	68-118	1/20	85-115
9066			Phenolics, Total	Water	mg/L	0.005	0.00044	20	1/10	70-123	1/10	85-113	1/20	85-115
9066			Phenolics, Total	Soil	mg/Kg	0.100	0.0177	30	1/10	66-108	1/10	75-112	1/20	85-115

WETCHEM QC LIMITS

Columbia Analytical Services Rochester, NY

METHOD			ANALYTE	MATRIX	UNITS	MRL	MDL	DUP		MS		LCS		ICV/CCV
EPA	SM	Other						(RPD)	Freq	(% REC)	Freq	(% Rec)	Frequency	
365.1 M			Phosphorus, Total - LL	Water	mg/L	0.003	0.0009	20	1/10	51-148	1/10	84-114	1/20	90-110
365.1			Phosphorus, Total	Water	mg/L	0.050	0.0158	20	1/10	51-148	1/10	90-110	1/20	90-110
365.1-M			Phosphorus, Total	Soil	mg/Kg	5.00	1.02	30	1/20	16-184	1/10	16-184	1/20	90-110
GEN-SILICON			Silicon, Percent	Soil/nonAq	%	0.0467		10	1/10	NA	NA	80-120	1/20	NA
370.1		I-2700-85	Silica, Dissolved	Water	mg/L	0.010	0.0031	20	1/10	80-117	1/10	90-117	1/20	90-110
160.3M			Solids, Dry Weight Percent (DWPS)	Soil	mg/Kg	1.0	NA	30	1/10	NA	NA	NA	NA	NA
160.5			Solids, Settleable	Water	mg/L	0.100	NA	20	1/20	NA	NA	NA	NA	NA
160.3	2540B		Solids, Total (TS)	Water	mg/L	10.0	NA	20	1/10	NA	NA	80-120	1/20	NA
160.1	2540C		Solids, Total Dissolved (TDS)	Water	mg/L	10.0	3.6	20	1/10	NA	NA	80-120	1/20	NA
160.2	2540D		Solids, Total Suspended (TSS)	Water	mg/L	1.00	NA	20	1/10	NA	NA	80-120	1/20	NA
160.4			Solids, Total Volatile (TVS)	Water	mg/L	10.0	NA	20	1/10	NA	NA	80-120	NA	NA
160.4D			Solids, Volatile Dissolved (VDS)	Water	mg/L	10.0	NA	20	1/10	NA	NA	NA	NA	NA
160.4S			Solids, Volatile Suspended (VSS)	Water	mg/L	1.00	NA	20	1/10	NA	NA	NA	NA	NA
	2540G		Solids, Percent Volatile	Soil	%	NA	NA	20	1/10	NA	NA	NA	NA	NA
375.4	426C		Sulfate, Turbidimetric	Water	mg/L	5.00	0.528	20	1/10	72-129	1/10	72-129	1/20	NA
300.0/9056			Sulfate by IC	Water	mg/L	0.200	0.007	20	1/10	61-128	1/10	90-110	1/20	90-110
300.0M/0956			Sulfate by IC	Soil	mg/Kg	30.0	0.518	30	1/10	25-151	1/10	90-110	1/20	90-110
AVS			Sulfide, Acid Volatile (AVS)	Soil	umoles/g	1.00	0.614	30	1/20	56-196	1/20	56-196	1/20	NA
S. 7.3 SW846			Sulfide Reactivity	Water	mg/Kg	100	65.2	20	1/20	0-235	NA	84-224	1/20	NA
S. 7.3 SW846			Sulfide Reactivity	Soil	mg/Kg	100	65.2	30	1/20	14-235	NA	14-235	1/20	NA
9030B			Sulfide, Acid Soluble	Water	mg/L	1.00	0.981	20	1/20	26-122	1/20	61-111	1/20	NA
9030B			Sulfide, Acid Soluble	Soil	mg/Kg	20.0	17.9	30	1/20	10-153	1/20	53-116	1/20	NA
376.1	4500-S F		Sulfide, Total	Water	mg/L	1.00	0.146	20	1/10	61-140	1/20	61-140	1/20	NA
300M			Sulfur- Alkaline Digestion	Soil	mg/kg	6.68	2.75	30	1/20	62-124	1/20	62-124	1/20	NA
425.1	5540C		Surfactants	Water	mg/L	0.02	0.00813	20	1/20	58-139	NA	58-139	1/20 HL	NA
415.1			TIC	Water	mg/L	1.00	0.0573	20	1/10	82-127	1/10	82-127	1/20	85-115
415.1	5310C		TOC - LL	Water	mg/L	0.05	0.0457	20	1/10	56-139	1/10	87-120	1/20	85-115
9060			TOC - LL	Water	mg/L	0.10	0.0457	20	1/10	56-139	1/10	87-120	1/20	85-115
415.1M/9060	5310C		TOC - RL	Water	mg/L	1.00	0.306	20	1/10	56-139	1/10	87-120	1/20	85-115
TOCLK			TOC - Lloyd Kahn	Soil	mg/Kg	300	39.8	30	1/20	29-163	1/20	55-133	1/20	85-115
TOCWB			TOC - Walkley-Black	Soil	mg/Kg	0.10	0.0262	30	1/20	69-105	1/20	83-98	1/10	NA
1664A			TPH by 1664A	Water	mg/L	5.00	1.43	20	1/20	64-132	1/20	64-132	1/20	NA
180.1			Turbidity	Water	NTU	0.10	0.035	10	1/20	NA	NA	90-110	3@run start	90-110

METALS ANALYSES QC LIMITS 2005

Method	Analyte	Matrix	Method Reporting Limit (MRL)	Method Detection Limit (MDL)	Precision (RPD)	Matrix Spike Accuracy (%REC)	LCS Accuracy (%REC)	ICV (%REC)	CCV (%REC)
200.7 (ICP) (ug/L)	Aluminum	Water	100	20.4	20	70-130	85-115	95-105	90-110
	Antimony		60 (LL 10)	32.6 (3.23)	20	70-130	85-115	95-105	90-110
	Arsenic		100 (LL 10)	39.1 (3.56)	20	70-130	85-115	95-105	90-110
	Barium		20	3.41	20	70-130	85-115	95-105	90-110
	Beryllium		5.0	0.238	20	70-130	85-115	95-105	90-110
	Boron		200	19.5	20	70-130	85-115	95-105	90-110
	Cadmium		5.0	3.36	20	70-130	85-115	95-105	90-110
	Calcium		500	15.4	20	70-130	85-115	95-105	90-110
	Chromium		10	1.87	20	70-130	85-115	95-105	90-110
	Cobalt		50	2.43	20	70-130	85-115	95-105	90-110
	Copper		20	10.0	20	70-130	85-115	95-105	90-110
	Iron		100	10.95	20	70-130	85-115	95-105	90-110
	Lead		50 (LL 5.0)	27.9 (1.39)	20	70-130	85-115	95-105	90-110
	Lithium		100	28.39	20	70-130	85-115	95-105	90-110
	Magnesium		500	18.13	20	70-130	85-115	95-105	90-110
	Manganese		10	0.382	20	70-130	85-115	95-105	90-110
	Molybdenum		25	7.79	20	70-130	85-115	95-105	90-110
	Nickel		40	4.25	20	70-130	85-115	95-105	90-110
	Potassium		2000	48.8	20	70-130	85-115	95-105	90-110
	Selenium		100 (LL 10)	54.5 (4.23)	20	70-130	85-115	95-105	90-110
	Silicon		1000	17.39	20	70-130	85-115	95-105	90-110
	Silver		10	0.915	20	70-130	85-115	95-105	90-110
	Sodium		500	452	20	70-130	85-115	95-105	90-110
	Strontium		100	1.06	20	70-130	85-115	95-105	90-110
	Thallium		10	4.39	20	70-130	85-115	95-105	90-110
	Tin		500	19.5	20	70-130	85-115	95-105	90-110
	Titanium		50	0.336	20	70-130	85-115	95-105	90-110
	Vanadium		50	6.52	20	70-130	85-115	95-105	90-110
	Zinc		20	5.24	20	70-130	85-115	95-105	90-110
1631 (CVAF) ng/L	Mercury	Water	1.00	0.084	20	70-130	80-120	80-120	80-120
245.1 (CVAA) ug/L	Mercury	Water	0.300	0.008	20	70-130	85-115	95-105	90-110
206.2 (GFAA) ug/L	Arsenic	Water	10.0	1.711	20	75-125	85-115	90-110	90-110
239.2 (GFAA) ug/L	Lead	Water	5.00	0.814	20	75-125	85-115	90-110	90-110
239.2 (GFAA) ug/L	Lead - DW	Water	1.00	0.384	20	75-125	85-115	90-110	90-110
270.2 (GFAA) ug/L	Selenium	Water	5.00	1.504	20	75-125	85-115	90-110	90-110
279.2 (GFAA) ug/L	Thallium	Water	10.0	2.975	20	75-125	85-115	90-110	90-110
6010B (ICP) (ug/L)	Aluminum	Water	100	20.4	20	75-125	80-120	90-110	90-110
	Antimony		60 (LL 10)	32.6 (3.23)	20	75-125	80-120	90-110	90-110
	Arsenic		100 (LL 10)	39.1 (3.56)	20	75-125	80-120	90-110	90-110
	Barium		20	3.41	20	75-125	80-120	90-110	90-110
	Beryllium		5.0	0.238	20	75-125	80-120	90-110	90-110
	Boron		200	19.5	20	75-125	80-120	90-110	90-110
	Cadmium		5.0	3.36	20	75-125	80-120	90-110	90-110
	Calcium		500	15.4	20	75-125	80-120	90-110	90-110
	Chromium		10	1.87	20	75-125	80-120	90-110	90-110
	Cobalt		50	2.43	20	75-125	80-120	90-110	90-110
	Copper		20	10.0	20	75-125	80-120	90-110	90-110
	Iron		100	10.95	20	75-125	80-120	90-110	90-110
	Lead		50 (LL 5.0)	27.9 (1.39)	20	75-125	80-120	90-110	90-110
	Lithium		100	28.39	20	75-125	80-120	90-110	90-110
	Magnesium		500	18.13	20	75-125	80-120	90-110	90-110
	Manganese		10	0.382	20	75-125	80-120	90-110	90-110
	Molybdenum		25	7.79	20	75-125	80-120	90-110	90-110

METALS ANALYSES QC LIMITS 2005

Method	Analyte	Matrix	Method Reporting Limit (MRL)	Method Detection Limit (MDL)	Precision (RPD)	Matrix Spike Accuracy (%REC)	LCS Accuracy (%REC)	ICV (%REC)	CCV (%REC)
	Nickel		40	4.25	20	75-125	80-120	90-110	90-110
	Potassium		2000	48.8	20	75-125	80-120	90-110	90-110
	Selenium		100 (LL 10)	54.5 (4.23)	20	75-125	80-120	90-110	90-110
	Silicon		1000	17.39	20	75-125	80-120	90-110	90-110
	Silver		10	0.915	20	75-125	80-120	90-110	90-110
	Sodium		500	452	20	75-125	80-120	90-110	90-110
	Strontium		100	1.06	20	75-125	80-120	90-110	90-110
	Thallium		10	4.39	20	75-125	80-120	90-110	90-110
	Tin		500	19.5	20	75-125	80-120	90-110	90-110
	Titanium		50	0.336	20	75-125	80-120	90-110	90-110
	Vanadium		50	6.52	20	75-125	80-120	90-110	90-110
	Zinc		20	5.24	20	75-125	80-120	90-110	90-110
7470A (CVAA) ug/L	Mercury	Water	0.300	0.00806	20	75-125	80-120	90-110	80-120
7060A (GFAA) ug/L	Arsenic	Water	10	1.711	20	75-125	80-120	90-110	80-120
7421 (GFAA) ug/L	Lead	Water	5.0	0.814	20	75-125	80-120	90-110	80-120
7740 (GFAA) ug/L	Selenium	Water	5.0	1.504	20	75-125	80-120	90-110	80-120
7841 (GFAA) ug/L	Thallium	Water	10	2.975	20	75-125	80-120	90-110	80-120
6010B (ICP) (mg/Kg)	Aluminum	Soil	10	6.72	20	75-125	C of A	90-110	90-110
	Antimony		6.0 (1.0 LL)	2.61 (0.28 LL)	20	75-125	C of A	90-110	90-110
	Arsenic		10 (1.0 LL)	3.89 (0.20 LL)	20	75-125	C of A	90-110	90-110
	Barium		2.00	0.262	20	75-125	C of A	90-110	90-110
	Beryllium		0.5	0.0356	20	75-125	C of A	90-110	90-110
	Boron		20	0.988	20	75-125	C of A	90-110	90-110
	Cadmium		0.5	0.303	20	75-125	C of A	90-110	90-110
	Calcium		50	11.1	20	75-125	C of A	90-110	90-110
	Chromium		1.00	0.122	20	75-125	C of A	90-110	90-110
	Cobalt		5.0	0.249	20	75-125	C of A	90-110	90-110
	Copper		2.0	0.568	20	75-125	C of A	90-110	90-110
	Iron		10	2.11	20	75-125	C of A	90-110	90-110
	Lead		5.0 (0.5 LL)	1.66 (0.097 LL)	20	75-125	C of A	90-110	90-110
	Lithium		10	3.22	20	75-125	C of A	90-110	90-110
	Magnesium		50	1.31	20	75-125	C of A	90-110	90-110
	Manganese		1.00	0.0247	20	75-125	C of A	90-110	90-110
	Molybdenum		2.5	0.837	20	75-125	C of A	90-110	90-110
	Nickel		4.00	0.473	20	75-125	C of A	90-110	90-110
	Potassium		200	3.43	20	75-125	C of A	90-110	90-110
	Selenium		10 (1.0 LL)	3.39 (0.31 LL)	20	75-125	C of A	90-110	90-110
	Silicon		100	2.33	20	75-125	C of A	90-110	90-110
	Silver		1.00	0.078	20	75-125	C of A	90-110	90-110
	Sodium		50	34.9	20	75-125	C of A	90-110	90-110
	Strontium		10	1.64	20	75-125	C of A	90-110	90-110
	Thallium		1.00	0.397	20	75-125	C of A	90-110	90-110
	Tin		50	1.93	20	75-125	C of A	90-110	90-110
	Titanium		5.0	0.066	20	75-125	C of A	90-110	90-110
	Vanadium		5.0	0.801	20	75-125	C of A	90-110	90-110
	Zinc		2.0	0.844	20	75-125	C of A	90-110	90-110
7471A (CVAA) mg/Kg	Mercury	Soil	0.05	0.0017	35	75-125	C of A	90-110	80-120
7060A (GFAA) mg/Kg	Arsenic	Soil	1.0	0.120	35	75-125	C of A	90-110	80-120
7421 (GFAA) mg/Kg	Lead	Soil	0.5	0.043	35	75-125	C of A	90-110	80-120
7740 (GFAA) mg/Kg	Selenium	Soil	0.5	0.156	35	75-125	C of A	90-110	80-120
7841 (GFAA) mg/Kg	Thallium	Soil	1.0	0.192	35	75-125	C of A	90-110	80-120

METALS ANALYSES QC LIMITS 2005

Method	Analyte	Matrix	Method Reporting Limit (MRL)	Method Detection Limit (MDL)	Precision (RPD)	Matrix Spike Accuracy (%REC)	LCS Accuracy (%REC)	ICV (%REC)	CCV (%REC)
200.7 CLP-M or ILM 4.1 (ILM 5.3) (ug/L)	Aluminum	Water	200	17	20	75-125	85-115	90-110	90-110
	Antimony		60	3.09	20	75-125	85-115	90-110	90-110
	Arsenic		10	6.06	20	75-125	85-115	90-110	90-110
	Barium		200	1.44	20	75-125	85-115	90-110	90-110
	Beryllium		5	0.168	20	75-125	85-115	90-110	90-110
	Cadmium		5	0.168	20	75-125	85-115	90-110	90-110
	Calcium		5000	24.1	20	75-125	85-115	90-110	90-110
	Chromium		10	0.938	20	75-125	85-115	90-110	90-110
	Cobalt		50	0.625	20	75-125	85-115	90-110	90-110
	Copper		25	3.23	20	75-125	85-115	90-110	90-110
	Iron		100	21.4	20	75-125	85-115	90-110	90-110
	Lead		3 (10)	1.53	20	75-125	85-115	90-110	90-110
	Magnesium		5000	3.69	20	75-125	85-115	90-110	90-110
	Manganese		15	0.283	20	75-125	85-115	90-110	90-110
	Nickel		40	0.574	20	75-125	85-115	90-110	90-110
	Potassium		5000	13.7	20	75-125	85-115	90-110	90-110
	Selenium		10 (35)		20	75-125	85-115	90-110	90-110
	Silver		10	0.536	20	75-125	85-115	90-110	90-110
	Sodium		5000	329	20	75-125	85-115	90-110	90-110
	Thallium		10 (25)	2.35	20	75-125	85-115	90-110	90-110
	Vanadium		50	0.119	20	75-125	85-115	90-110	90-110
	Zinc		20 (60)	3.81	20	75-125	85-115	90-110	90-110
200.7 CLP additional analytes upon request									
(ug/L)	Boron	Water	200	15.6	20	75-125	85-115	90-110	90-110
	Molybdenum		25	0.54	20	75-125	85-115	90-110	90-110
	Titanium		50	0.238	20	75-125	85-115	90-110	90-110
	Tin		500	18.8	20	75-125	85-115	90-110	90-110
245.1 CLP-M(CVAA) ug/L	Mercury	Water	0.2	0.0086	20	75-125	80-120	90-110	80-120
206.2 CLP-M (GFAA) ug.L	Arsenic	Water	10	1.71	20	75-125	85-115	90-110	80-120
239.2 CLP-M (GFAA) ug/L	Lead	Water	3	0.814	20	75-125	85-115	90-110	80-120
270.2 CLP-M (GFAA) ug/L	Selenium	Water	5	1.504	20	75-125	85-115	90-110	80-120
279.2 CLP-M (GFAA) ug/L	Thallium	Water	10	2.92	20	75-125	85-115	90-110	80-120
200.7 CLP-M or ILM 4.1 (ILM 5.3) (mg/Kg)	Aluminum	Soils	40 (20)	7.73	20	75-125	C of A	90-110	90-110
	Antimony		12 (6)	0.504	20	75-125	C of A	90-110	90-110
	Arsenic		2 (1)	0.371	20	75-125	C of A	90-110	90-110
	Barium		40 (20)	0.0788	20	75-125	C of A	90-110	90-110
	Beryllium		1 (0.5)	0.0307	20	75-125	C of A	90-110	90-110
	Cadmium		1 (0.5)	0.0495	20	75-125	C of A	90-110	90-110
	Calcium		1000 (500)	14.5	20	75-125	C of A	90-110	90-110
	Chromium		2 (1)	0.147	20	75-125	C of A	90-110	90-110
	Cobalt		10 (5)	0.099	20	75-125	C of A	90-110	90-110
	Copper		5 (2.5)	0.541	20	75-125	C of A	90-110	90-110
	Iron		20 (10)	2.85	20	75-125	C of A	90-110	90-110
	Lead		0.6 (1)	0.261	20	75-125	C of A	90-110	90-110
	Magnesium		1000 (500)	0.906	20	75-125	C of A	90-110	90-110
	Manganese		3 (1.5)	0.057	20	75-125	C of A	90-110	90-110
	Nickel		8 (4)	0.153	20	75-125	C of A	90-110	90-110
	Potassium		1000 (500)	3.43	20	75-125	C of A	90-110	90-110
	Selenium		1 (3.5)	0.863	20	75-125	C of A	90-110	90-110
	Silver		2 (1)	0.12	20	75-125	C of A	90-110	90-110
	Sodium		1000 (500)	52.7	20	75-125	C of A	90-110	90-110
	Thallium		2 (2.5)	0.855	20	75-125	C of A	90-110	90-110
	Vanadium		10 (5)	0.14	20	75-125	C of A	90-110	90-110
	Zinc		4 (6)	0.918	20	75-125	C of A	90-110	90-110
200.7 CLP additional analytes upon request									
(mg/Kg)	Boron	Soil	40	2.17	20	75-125	85-115	90-110	90-110
	Molybdenum		5	0.133	20	75-125	85-115	90-110	90-110
	Titanium		5	0.031	20	75-125	85-115	90-110	90-110
	Tin		100	1.67	20	75-125	85-115	90-110	90-110
245.5 CLP-M (CVAA) mg/Kg	Mercury	Soil	0.1	0.0017	20	75-125	C of A	80-120	80-120

METALS ANALYSES QC LIMITS 2005

Method	Analyte	Matrix	Method Reporting Limit (MRL)	Method Detection Limit (MDL)	Precision (RPD)	Matrix Spike Accuracy (%REC)	LCS Accuracy (%REC)	ICV (%REC)	CCV (%REC)
200.8 (ICP-MS) ug/L	Aluminum	Water	10	1.6	20	70-130	85-115	90-110	90-110
	Arsenic		1.0	0.19	20	70-130	85-115	90-110	90-110
	Antimony		1.0	0.0757	20	70-130	85-115	90-110	90-110
	Barium		1.0	0.0478	20	70-130	85-115	90-110	90-110
	Beryllium		1.0	0.072	20	70-130	85-115	90-110	90-110
	Cadmium		1.0	0.0368	20	70-130	85-115	90-110	90-110
	Chromium		1.0	0.203	20	70-130	85-115	90-110	90-110
	Cobalt		1.0	0.0857	20	70-130	85-115	90-110	90-110
	Copper		1.0	0.77	20	70-130	85-115	90-110	90-110
	Lead		1.0	0.0521	20	70-130	85-115	90-110	90-110
	Manganese		1.0	0.123	20	70-130	85-115	90-110	90-110
	Molybdenum		1.0	0.067	20	70-130	85-115	90-110	90-110
	Nickel		1.0	0.281	20	70-130	85-115	90-110	90-110
	Selenium		2.0	0.307	20	70-130	85-115	90-110	90-110
	Silver		1.0	0.0452	20	70-130	85-115	90-110	90-110
	Thallium		1.0	0.0424	20	70-130	85-115	90-110	90-110
	Vanadium		1.0	0.0996	20	70-130	85-115	90-110	90-110
	Zinc		5.0	0.63	20	70-130	85-115	90-110	90-110
6020 (ICP-MS) ug/L	Aluminum	Water	10	1.6	20	75-125	80-120	90-110	90-110
	Arsenic		1.0	0.19	20	75-125	80-120	90-110	90-110
	Antimony		1.0	0.0757	20	75-125	80-120	90-110	90-110
	Barium		1.0	0.0478	20	75-125	80-120	90-110	90-110
	Beryllium		1.0	0.072	20	75-125	80-120	90-110	90-110
	Cadmium		1.0	0.0368	20	75-125	80-120	90-110	90-110
	Chromium		1.0	0.203	20	75-125	80-120	90-110	90-110
	Cobalt		1.0	0.0857	20	75-125	80-120	90-110	90-110
	Copper		1.0	0.77	20	75-125	80-120	90-110	90-110
	Lead		1.0	0.0521	20	75-125	80-120	90-110	90-110
	Manganese		1.0	0.123	20	75-125	80-120	90-110	90-110
	Molybdenum		1.0	0.067	20	75-125	80-120	90-110	90-110
	Nickel		1.0	0.281	20	75-125	80-120	90-110	90-110
	Selenium		2.0	0.307	20	75-125	80-120	90-110	90-110
	Silver		1.0	0.0452	20	75-125	80-120	90-110	90-110
	Thallium		1.0	0.0424	20	75-125	80-120	90-110	90-110
	Vanadium		1.0	0.0996	20	75-125	80-120	90-110	90-110
	Zinc		5.0	0.63	20	75-125	80-120	90-110	90-110
6020 (ICP-MS) ug/g	Aluminum	Soil	2.0	1.44	20	75-125	C of A	90-110	90-110
	Arsenic		0.1	0.0225	20	75-125	C of A	90-110	90-110
	Antimony		0.2	0.044	20	75-125	C of A	90-110	90-110
	Barium		0.1	0.0855	20	75-125	C of A	90-110	90-110
	Beryllium		0.1	0.0085	20	75-125	C of A	90-110	90-110
	Cadmium		0.1	0.005	20	75-125	C of A	90-110	90-110
	Chromium		0.1	0.0315	20	75-125	C of A	90-110	90-110
	Cobalt		0.5	0.0044	20	75-125	C of A	90-110	90-110
	Copper		4.0	0.062	20	75-125	C of A	90-110	90-110
	Lead		0.1	0.0845	20	75-125	C of A	90-110	90-110
	Manganese		0.1	0.025	20	75-125	C of A	90-110	90-110
	Molybdenum		0.2	0.0145	20	75-125	C of A	90-110	90-110
	Nickel		0.1	0.034	20	75-125	C of A	90-110	90-110
	Selenium		0.2	0.084	20	75-125	C of A	90-110	90-110
	Silver		0.1	0.0114	20	75-125	C of A	90-110	90-110
	Thallium		0.1	0.07	20	75-125	C of A	90-110	90-110
	Vanadium		0.1	0.015	20	75-125	C of A	90-110	90-110
	Zinc		4.0	3.08	20	75-125	C of A	90-110	90-110

METALS ANALYSES QC LIMITS 2005

Method	Analyte	Matrix	Method Reporting Limit (MRL)	Method Detection Limit (MDL)	Precision (RPD)	Matrix Spike Accuracy (%REC)	LCS Accuracy (%REC)	ICV (%REC)	CCV (%REC)
200.8 CLP-M (ICP-MS) ILM 5.3 (ug/L)	Aluminum	Water	--	1.6	20	70-130	85-115	90-110	90-110
	Arsenic		1.0	0.19	20	70-130	85-115	90-110	90-110
	Antimony		2.0	0.0757	20	70-130	85-115	90-110	90-110
	Barium		10.0	0.0478	20	70-130	85-115	90-110	90-110
	Beryllium		1.0	0.072	20	70-130	85-115	90-110	90-110
	Cadmium		1.0	0.0368	20	70-130	85-115	90-110	90-110
	Chromium		2.0	0.203	20	70-130	85-115	90-110	90-110
	Cobalt		1.0	0.0857	20	70-130	85-115	90-110	90-110
	Copper		2.0	0.77	20	70-130	85-115	90-110	90-110
	Lead		1.0	0.0521	20	70-130	85-115	90-110	90-110
	Manganese		1.0	0.123	20	70-130	85-115	90-110	90-110
	Molybdenum		--	0.067	20	70-130	85-115	90-110	90-110
	Nickel		1.0	0.281	20	70-130	85-115	90-110	90-110
	Selenium		5.0	0.307	20	70-130	85-115	90-110	90-110
	Silver		1.0	0.0452	20	70-130	85-115	90-110	90-110
	Thallium		1.0	0.0424	20	70-130	85-115	90-110	90-110
	Vanadium		1.0	0.0996	20	70-130	85-115	90-110	90-110
	Zinc		2.0	0.63	20	70-130	85-115	90-110	90-110

LL Low Level Analysis

C of A Certificate of Analysis QC Limits Provided per manufacturer.

APPENDIX D

DATA QUALIFIERS

March 29, 2006

Columbia Analytical Services INC
An Employee - Owned Company

ORGANIC QUALIFIERS

U - Indicates compound was analyzed for but not detected. The sample quantitation limit must be corrected for dilution and for percent moisture.

J - Indicates an estimated value. The flag is used either when estimating a concentration for tentatively identified compounds, or when the data indicate the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit and greater than the MDL. This flag is also used for DoD instead of "P" as indicated below.

N - Indicates presumptive evidence of a compound. This flag is only used for tentatively identified compounds, where the identification is based on a mass spectral library search.

P - This flag is used for a pesticide/Aroclor target analyte when there is a greater than 40% (25% for CLP) difference for detected concentrations between the two GC columns. The concentration is reported on the Form I and flagged with a "P" ("J" for DoD).

Q - for DoD only – indicates a pesticide/Aroclor target is not confirmed. This flag is used when there is ≥ 100% difference for the detected concentrations between the two GC columns.

C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.

B - This flag is used when the analyte is found in the associated blank as well as in the sample.

E - This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor. If a sample or extract is re-analyzed at a higher dilution factor, as in the "E" flag above, the "DL" suffix is appended to the sample number on the Form I for the diluted sample, and ALL concentration values reported on that Form I are flagged with the "D" flag.

A - This flag indicates that a TIC is a suspected aldol-condensation product.

X - As specified in Case Narrative.

* - This flag identifies compounds associated with a quality control parameter which exceeds laboratory limits.

CAS/Rochester Lab ID # for State Certifications

NELAP Accredited
Delaware Accredited
Connecticut ID # PH0556
Florida ID # E87674
Illinois ID #200047
Maine ID #NY0032
Massachusetts ID # M-NY032
Navy Facilities Engineering Service Center Approved
Nebraska Accredited
New Jersey ID # NY004
New York ID # 10145
New Hampshire ID # 294100 A/B
Pennsylvania ID# 68-786
Rhode Island ID # 158
West Virginia ID # 292

Columbia Analytical Services INC
An Employee - Owned Company

INORGANIC QUALIFIERS

C (Concentration) qualifier –

B - if the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but was greater than or equal to the Instrument Detection Limit (IDL). This qualifier may also be used to indicate that there was contamination above the reporting limit in the associated blank. See Narrative for details.
U - if the analyte was analyzed for, but not detected

Q qualifier - Specified entries and their meanings are as follows:

D - Spike was diluted out
E - The reported value is estimated because the serial dilution did not meet criteria.
J - Estimated Value
M - Duplicate injection precision not met.
N - Spiked sample recovery not within control limits.
S - The reported value was determined by the Method of Standard Additions (MSA).
W - Post-digestion spike for Furnace AA Analysis is out of control limits (85-115), while sample absorbance is less than 50% of spike absorbance.
* - Duplicate analysis not within control limits.
+ - Correlation coefficient for the MSA is less than 0.995.

M (Method) qualifier:

- "P" for ICP
- "A" for Flame AA
- "F" for Furnace AA
- "PM" for ICP when Microwave Digestion is used
- "AM" for Flame AA when Microwave Digestion is used
- "FM" for Furnace M when Microwave Digestion is used
- "CV" for Manual Cold Vapor AA
- "AV" for Automated Cold Vapor AA
- "AF" for Automated Cold Vapor Atomic Fluorescence Spectrometry
- "CA" for Midi-Distillation Spectrophotometric
- "AS" for Semi-Automated Spectrophotometric
- "C" for Manual Spectrophotometric
- "T" for Titrimetric
- " " where no data has been entered
- "NR" if the analyte is not required to be analyzed.

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APPENDIX E

PREVENTIVE MAINTENANCE PROCEDURES

March 29, 2006

Preventive Maintenance Procedures

Instrument	**Activity**	**Frequency**
Refrigerators and Coolers	Record temperatures Clean coils Check coolant	Daily As needed As needed or if temperature outside limit
Fume Hoods	Face velocity measured Sash operation	Quarterly As needed
Ovens	Clean	As needed or if temperature outside limit
Incubators	Record temperatures	Daily, morning and evening
Water Baths	Wash with disinfectant solution	When water is murky, dirty, or growth appears
Autoclave	Check temperature Clean	Every month When mold or growth appears
Top Loading Balances	Check calibration	Before every use
Analytical Balances	Check alignment Check calibration Clean pans and compartment	Before every use Before every use After every use
Dissolved Oxygen Meter	Change membrane	When fluctuations occur
pH probes	Condition probe	When fluctuations occur
UV-visible Spectrophotometer	Wavelength check	Annually
Total Organic Carbon Analyzers	Check IR zero Check digestion/condensation vessels Clean digestion chamber Clean permeation tube Clean six-port valves Clean sample pump Clean carbon scrubber Clean IR cell	Weekly Each use Every 2000 hours, or as needed Every 2000 hours, or as needed Every 200 - 2000 hours, or as needed Every 200 - 2000 hours, or as needed Every 200 - 2000 hours, or as needed Every 2000 - 4000 hours, or as needed
Total Organic Halogen Analyzers	Change cell electrolyte Change electrode fluids Change pyrolysis tube Change inlet and outlet tubes Change electrodes	Daily, or as needed Daily, or as needed As needed As needed As needed
Flow Injection Analyzer	Check valve flares Check valve ports Check pump tubing Check flow cell flares Change bulb Check manifold tubing Check T's and connectors	Monthly Monthly Daily Quarterly Every six months Every six months Every six months

Preventive Maintenance Procedures

Instrument	**Activity**	**Frequency**
Ion Chromatograph	Change column bed supports	Monthly or as needed
	Clean column	Monthly or as needed
	Change column	Every six months or as needed
	Change valve port face & hex nut	Every six months or as needed
	Clean valve slider	Every six months or as needed
	Change tubing	Annually or as needed
	Eluent pump	Annually
Atomic Absorption Spectrophotometers - FAA and CVAA	Check gases	Daily
	Clean burner head	Daily
	Check aspiration tubing	Daily
	Clean optics	Every three months
	Empty waste container	Weekly
Atomic Absorption Spectrophotometers - GFAA	Check gases	Daily
	Check argon dewar	Daily, or as needed
	Change graphite tube	Daily, or as needed
	Clean furnace windows	Monthly
ICP	Check argon dewar	Daily
	Replace peristaltic pump tubing	Daily, or as needed
	Empty waste container	Daily, or as needed
	Clean nebulizer, spray chamber, and torch	Every two weeks, or as needed
	Replace water filter	Quarterly
	Replace vacuum air filters	Monthly
Infrared Spectrophotometer, Fourier Transform	Clean sample cells	Daily, or as needed
Gel-Permeation Chromatographs	Clean and repack column	As needed
	Backflush valves	As needed
Gas Chromatographs, Semivolatiles	Check gas supplies	Daily, replace when pressure reaches 250 psi
	Change in-line filters	Quarterly or after 30 tanks of gas
	Change injection port liner	Daily or as needed
	Clip first foot of capillary column	As needed
	Change guard column	As needed
	Replace analytical column	As needed when peak resolution fails
	Check system for gas leaks	After changing columns
	Clean FID	As needed
	Leak test ECD	Annually

Preventive Maintenance Procedures

Instrument	**Activity**	**Frequency**
Gas Chromatograph/Mass Spectrometers, Semivolatiles	Check gas supplies	Daily, replace when pressure reaches 50 psi
	Change in-line filters	Quarterly or after 30 tanks of gas
	Change septum	Daily
	Change injection port liner	Weekly or as needed
	Clip first foot of capillary column	As needed
	Change guard column	As needed
	Replace analytical column	As needed when peak resolution fails
	Clean jet separator	As needed
	Clean source	As needed when tuning problems
	Change pump oil	Every six months
	Oil wick	Every six months
Purge and Trap Concentrators	Change trap	As needed
	Change transfer lines	As needed
	Clean purge vessel	Daily
Gas Chromatographs, Volatiles	Check gas supplies	Daily, replace when pressure reaches 200 psi
	Change in-line filters	Quarterly or after 30 tanks of gas
	Change septum	As needed
	Clip first foot of capillary column	As needed
	Change guard column	As needed
	Replace analytical column	As needed when peak resolution fails
	Check system for gas leaks	After changing columns or as needed
	Replenish ELCD solvents	Weekly
	Clean PID lamp	As needed
	Clean FID	As needed
	Change ion exchange resin	Quarterly
	Replace nickel tubing	Quarterly or as needed
Gas Chromatograph/Mass Spectrometers, Volatiles	Check gas supplies	Weekly, replace when pressure reaches 200 psi
	Change in-line filters	Quarterly or after 30 tanks of gas
	Change septum	Daily
	Clip first foot of capillary column	As needed
	Change guard column	As needed
	Replace analytical column	As needed when peak resolution fails
	Clean jet separator	As needed
	Clean source	As needed when tuning problems
	Change pump oil	Every six months per HP
	Oil wick	Every six months per HP

Preventive Maintenance Procedures

Instrument	**Activity**	**Frequency**
HPLC	Check gas supplies	Daily, replace when pressure reaches 200 psi
	Change guard column	As needed
	Change analytical column	As needed
	Change inlet filters	As needed
TCLP/SPLP Extractors	Monitor Room Temperature	Daily
	Monitor RPM of Rotators	Bi-weekly
	Grease fittings	As needed
	O-ring replacement	As needed

APPENDIX F

CERTIFICATIONS/ACCREDITATIONS/CONTRACTS

March 29, 2006

CAS/Rochester Certifications/Accreditations/Contracts

Federal and National Programs

- NELAP Accreditation, since January 2001.
  Primary Accreditation with New York and Florida (see below).
  Secondary Accreditation with Florida, New Jersey, New Hampshire, Pennsylvania and Illinois (see below).

- NYS DEC Analytical Services Protocol Organic and Inorganic Contract (current).

- Naval Facilities Engineering Service Center (NFESC), Approved. Expires 11/15/2007.

State and Local Programs

- State of Connecticut, Department of Health Services, Approved Public Health Laboratory.
  Certified Laboratory for Potable Water, Waste Water, Solid Waste and Soil.
  Examination for Inorganic Chemicals and Organic Chemicals. Registration No. PH-0556.
  Exp. 06/30/2008.

- The Commonwealth of Massachusetts, Department of Environmental Protection
  Certified Laboratory for Potable Water and Non-Potable Water
  Certification No. M-NY032. Exp. 06/30/2008.

- State of New Jersey, Department of Environmental Protection
  State Certified Environmental Laboratory for Drinking Water and Water Pollution.
  Certification No. NY004. Exp. 06/30/2008.

- State of New York, Department of Health, Environmental Laboratory Approval Program.
  Potable Water, Non-Potable Water, Solid and Hazardous Waste, and ASP Certification.
  Certification No. 10145. Exp. 04/01/2008.

- State of New Hampshire, Department of Environmental Services
  Full Certification for Non-Potable Water. Certification No. 294102. Exp. 10/14/2007.

- State of Rhode Island, Department of Health
  Approved for Surface Water, WasteWater, and Sewage. License No. 158. Exp. 12/30/2007.

- West Virginia Division of Environmental Protection
  Certification for TCL/TAL, GRO, DRO, and TPH parameters in WasteWater and Solid Hazardous Waste.
  Certification No.292 Call Dan Arnold 304-926-0499 for confirmation of accreditation.

- State of Delaware, Department of Natural Resources and Environmental Control. Approved for Delaware Hazardous Substance Cleanup Act.

- State of Florida, Department of Health.
  Drinking water, Wastewater, Solid Hazardous Waste, CLP. Certification No. E87674. Expires 06/30/2008.

- Pennsylvania Department of Environmental Protection.
  Non-Potable Water and Solid and Chemical Materials. Lab ID No. 68-00786. Expires 6/30/2008.

- State of Illinois, Environmental Protection Agency.
  Inorganic and Organic Hazardous and Solid Waste. Certification No. 200047. Expires 11/17/2007.

- State of Maine, Department of Health and Human Services.
  Drinking Water and Wastewater. Certification No.NY0032. Expires 11/12/2008.

CAS/Rochester Certifications/Accreditations/Contracts

Unregulated State Programs

- State of Minnesota
  Reciprocal Certification for all parameters certified under New York State.
- State of Georgia Environmental Protection Division
  Reciprocal Approval for Non-Potable/Environmental Waters and Wastes.
- State of Indiana Hazardous Waste Division
  Reciprocal Approval for Non-Potable/Environmental Waters and Wastes.
- State of Michigan - Reciprocal Approval for Non-Potable/Environmental Waters and Wastes.
- Commonwealth of Pennsylvania, Department of Environmental Resources
  Reciprocal Approval for Non-Potable/Environmental Waters and Wastes.
  PA Registration Number 68-786
- Commonwealth of Virginia, Department of General Services
  Reciprocal Approval for Non-Potable/Environmental Waters and Wastes.
- State of Mississippi - Reciprocal Approval for Non-Potable/Environmental Waters and Wastes.
- State of Maryland - Reciprocal Approval for Non-Potable/Environmental Waters and Wastes.

STANDARD OPERATING PROCEDURE

for

VOLATILE ORGANIC COMPOUNDS IN AIR SAMPLES COLLECTED IN SPECIALLY PREPARED CANISTERS AND GAS COLLECTION BAGS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS)

SOP Code: VOC-TO15

Revision: 0

June 16, 2006

Approved by: ______________________ ________
Supervisor Date

______________________ ________
Quality Assurance Program Manager Date

______________________ ________
Laboratory Manager Date

1 Mustard Street, Suite 250
Rochester, NY 14609-6925

Annual review of this SOP has been performed and the SOP still reflects current practice.

Initials: ______ Date: _________
Initials: ______ Date: _________
Initials: ______ Date: _________

DOCUMENT CONTROL
NUMBER: ________________
INITIALS: _____ DATE::_______
EFFECTIVE DATE: __________

1. SCOPE AND APPLICATION

1.1. This SOP uses EPA Compendium Methods TO-15 and TO-14A to quantify a wide range of volatile organic compounds (VOCs) in gaseous matrices collected in gas collection bags (method modification) and specially prepared stainless steel canisters. This method typically applies to ambient concentrations of VOCs 0.5ppbv and above and typically requires VOC enrichment by concentrating up to one liter of a sample volume, with a virtually unlimited upper concentration range using dilutions from source level samples.

1.2. Table 2 lists compounds that can be determined by this procedure along with their method reporting limits (MRLs). The reported MRL may be adjusted higher; however, the capability of achieving lower MRLs for specific project requirements must be thoroughly demonstrated and documented. Additional compounds may be analyzed according to this procedure as described in the referenced methods as long as the requirements of this document are adhered to; however, if a compound is not listed in the TO-15 method, it should be reported as a modification. The number of samples that may be analyzed in a 24-hour period is about twenty. The number of sample results that may be reduced in an eight-hour day is approximately twenty.

2. METHOD SUMMARY

2.1. The analytical method involves using a high-resolution gas chromatograph (GC) coupled to a mass spectrometer (MS). The GC/MS utilizes a linear quadrupole system, which allows for it to be operated by continuously scanning a wide range of mass to charge ratios (SCAN mode) or by Select Ion Monitoring mode (SIM), which consists of monitoring a small number of ions from a specified compound list. At this time, the laboratory only operates in SCAN mode.

2.2. An aliquot of an air sample is concentrated on a solid adsorbent trap (either cryogenically cooled glass beads or stronger adsorbents at higher temperatures) to collect the analytes of interest. To remove co-collected water vapor, the concentrated sample then goes through a water removal (dry purge) step, during which the sample is transferred to a second cryogenically cooled trap to remove carbon dioxide. The trap is heated and the VOCs are thermally desorbed onto a refocusing cold trap. The VOCs are then thermally desorbed onto the head of a capillary column once the cold trap is heated. The oven temperature (programmed) increases and the VOCs elute and are detected by the mass spectrometer. Mass spectra for individual peaks in the total ion chromatogram are examined with respect to the fragmentation pattern of ions corresponding to various VOCs including the intensity of primary and secondary ions. The fragmentation pattern is compared with stored spectra taken under similar conditions, in order to identify the compound. For any given compound, the intensity of the primary fragment is compared with the system response to the primary fragment for known amounts of the compound and this establishes the compound concentration that exists in the sample.

3. DEFINITIONS

3.1. **Cryogen** - A refrigerant used to obtain sub-ambient temperatures in the VOC concentrator and/or on front of the analytical column. Liquid nitrogen (cryogen) is used for this purpose and it has a boiling point of –195.8°C.

3.2. **Gauge Pressure** - Pressure measure with reference to the surrounding atmospheric pressure, usually expressed in units of psi. Zero gauge pressure is equal to atmospheric (barometric) pressure.

3.3. **Canisters** - specially prepared, leak-free, stainless steel pressure vessel (with valve) of desired volume (e.g., 6L)

3.4. **Sample collection bags** – Tedlar™ or equivalent

3.5. **MS-SCAN** - Mass spectrometric mode of operation in which the gas chromatograph (GC) is coupled to a mass spectrometer (MS) programmed to SCAN all ions repeatedly over a specified mass range.

3.6. **Neat Stock Standard** - A purchased, single component assayed reference material having a stated purity used to prepare working calibration standards.

3.7. **Initial Calibration Verification (ICV) Standard** - A solution prepared in the laboratory containing known concentration(s) of analytes of interest. The solution is prepared from neat stock standards and/or stock standards solutions which are from a different source then the standards used to prepare the working calibration standards to verify the calibration curve.

3.8. **Continuing Calibration Verification (CCV) Standard** - A working calibration standard which is analyzed at specific intervals in order to verify that the instrument continues to meet the calibration criteria.

3.9. **Field Sample** - A sample collected and delivered to the laboratory for analysis.

3.10. **QA/QC Samples**: Samples added to a sample preparation batch, or an analytical batch to provide quality assurance checks on the analysis.

3.10.1. **Laboratory Control Sample (LCS) – also called Audit Standard in TO-15** - a blank sample spiked with compounds representative of the target analytes. This is used to document laboratory performance.

3.10.2. **Laboratory Duplicates (DUP)**- Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analyses of duplicate sample indicates precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

3.10.3. **Method Blank (MB)** - an analyte-free matrix (Zero-grade air) carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process.

3.11. **Internal Standard Calibration** - Compares the instrument responses from the target compound in the sample to the responses of specific standards (called internal standards – not expected to be found in the samples), which are added to the sample or sample preparation prior to analysis. The ratio of the peak area (or height) of the target compound in the sample or sample preparation is compared to a similar ratio derived for each calibration standard.

3.12. **Surrogate** - an organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process. Surrogate compounds are added to every blank, sample, LCS, and standard. These are used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in environmental media

3.13. **Dynamic Dilution** – means of preparing calibration mixtures in which standard gases from pressurized cylinders are continuously blended with humidified zero air in a manifold so that a flowing stream of calibration mixture is available at the inlet of the analytical system.

3.14. **Percent Drift or Difference (%D)** - Used to compare two values, the percent difference indicates both the direction and the magnitude of the comparison, i.e., the percent difference may be either negative, positive, or zero. (In contrast, see relative percent difference).

3.15. **% Relative Standard Deviation (%RSD):** statistical measure of variation. Used in this method to measure the relative variation of initial calibration standards. Calculated by dividing the standard deviation of the individual calibration factors by the average calibration factor and multiplying by 100 to express as a percentage

3.16. **Relative Percent Difference (RPD)** – The absolute value of the difference of two values divided by the average of the same two values. Used to compare the precision of the analysis. The result is always a positive number.

3.17. **Batch** - Samples processed together as a unit, not to exceed 20 investigative samples. See ADM-BATCH for further discussion.

3.18. **Method Detection Limit (MDL):** a statistically derived value representing the lowest level of target analyte that may be measured by the instrument with 99% confidence that the value is greater than zero. MDL may also be called LoD (Limit of Detection).

3.19. **Method Reporting Limit (MRL):** The minimum amount of a target analyte that can be measured and reported quantitatively. The MRL is equivalent to Practical Quantitation Level (PQL) and Estimated Quantitation Level (EQL) or Limit of Quantitation (LoQ). Typically, the MRL is calculated as five times the MDL (although this is a rule of thumb and not intended to be a strict policy of establishing the MRL for a compound).

4. INTERFERENCES

4.1. Summa Canisters - Canisters shall be stored in a contaminant free location and shall be capped tightly during shipment to prevent leakage and minimize any compromise of the sample. The pressure/vacuum is checked prior to shipment and upon receipt from the field. Any problems with the sample from the field are noted on the chain of custody and the Project Manager contacted. Canisters must be cleaned and certified to be free from target analytes before being shipped to the field for sample collection.

4.2. Analytical System - The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running humidified zero air blanks. The use of non-chromatographic grade stainless steel tubing, non-PTFE thread sealants, or flow controllers with buna-N rubber components must be avoided.

4.3. **Carbon Dioxide** - Excessive levels of carbon dioxide present in a sample may interfere with analysis by freezing up the cryogenic trap. A smaller aliquot must be analyzed to eliminate this problem, or the sample should be analyzed using the higher temperature multi-adsorbent trapping technique which allows carbon dioxide to pass.

4.4. Gas Collection Bags - This procedure covers the use of gas collection vessels such as Tedlar® or Mylar® bags. However, due to the nature of these types of bags it is not recommended that clients use this option for ambient air samples. Sample collection bags made out of ®Tedlar have contaminants that are inherent to the manufacturing process. The two main contaminants are phenol and N,N-Dimethylacetamide. However, this only becomes a problem when the concentration levels in the sample are low ppbv such as ambient air monitoring samples where more of the sample usually has to be concentrated and analyzed. To minimize the loss of sample integrity, a 72-hour hold time has been incorporated into the procedure.

4.5. **Glassware** - Interferences caused by contaminants in solvents, reagents, glassware, and other sample processing hardware results in discrete artifacts and/or elevated baselines in the detector profiles should be minimized. All glassware associated with this method must be scrupulously cleaned to avoid possible contamination. The use of high purity water, reagents, and solvents helps to minimize these problems.

4.6. Contamination by carryover can occur when high level samples immediately precede samples containing significantly lower levels of contamination. Pay close attention to samples which follow high level samples. Re-analyze if contamination is suspected.

5. SAFETY

5.1. Chemicals, reagents and standards must be handled as described in the CAS safety policies, approved methods and in MSDSs where available. Refer to the CAS Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

5.2. Each compound, mixture of compounds, standards, and surrogates, as well as samples, should be treated as a potential health hazard. Exposure to these chemicals should be reduced to the lowest level possible through the use of gloves (to minimize absorption through the skin) and hoods (to minimize inhalation). Refer to the laboratory's Environmental, Health and Safety Manual as it makes reference to the safe handling of chemicals, MSDS location, and the laboratory waste management plan for the safe disposal of chemicals and samples.

5.3. **Material Safety Data Sheets (MSDS)** - The analyst should consult MSDS for compounds being handled in the course of this procedure, and be familiar with proper safety precautions to be followed when handling hazardous chemicals. Care should be taken when handling standard material in a neat or highly concentrated form.

5.4. **Liquid Nitrogen** - Liquid nitrogen can cause serious tissue damage (frostbite) with only a few seconds of contact. The valves on the cryogen dewars should be opened slowly so leaky fittings can be identified. Neoprene or leather gloves should be worn when turning valves and handling tubing and fittings that have been in contact with the cryogen.

5.5. **Protective Clothing** - Personal protective clothing (safety glasses, gloves and lab coat) are required when preparing standards and handling standard material in neat form.

5.6. **Pressurized Gases** - The use of pressurized gases is required for this procedure. Care should be taken when moving cylinders. All gas cylinders must be secured to a wall or an immovable counter with a chain or a cylinder clamp when not in use. Sources of flammable gases (i.e. pressurized hydrogen) should be clearly labeled.

5.7. **Syringes** - The proper use of syringes should be part of employee training for this SOP. Care should be taken to avoid personal injury as a result or improper handling techniques.

5.8. Refer to the Safety Manual for further discussion of general safety procedures and information.

6. SAMPLE COLLECTION, CONTAINERS, PRESERVATION, AND STORAGE

6.1. Air samples are collected in the field and delivered to the laboratory and shall be collected in either a specially prepared, leak-free, stainless steel pressure vessel (with valve) of desired volume (e.g., 6L) or a sample collection bag. Canister samples may either be grab or time integrated using a variable flow controller utilizing the canister vacuum to draw the sample. Bags require the use of an upstream pump or a "lung machine."

6.2. There are no special preservation requirements for either canisters or bags. However, bags should be stored in appropriately labeled boxes or by hanging them from clips to prevent puncture or other deterioration. Canisters should be stored on the appropriate shelves until they are to be analyzed.

6.3. Sample collection bags must be analyzed within 72 hours from confirmed time of sampling. Canisters do not have specific holding times; however, samples received by the laboratory shall be analyzed within 30 days of sampling or sooner if project specific requirements dictate.

6.4. Optional: Sample volume from a tedlar bag may be injected into a certified clean canister to maintain sample integrity and extend holding time to 30 days from the original sample collection, if necessary. Canisters may also be used in making sample dilutions.

7. APPARATUS AND EQUIPMENT

7.1. See Appendix A of the Quality Assurance Manual for configuration of specific components, serial numbers and receipt of the major components of the instrument(s).

7.2. **Gas Chromatograph (GC)** - Hewlett Packard 6890 Series or equivalent - An instrument capable of temperature programming, with a column oven that may be cooled to subambient temperature at the start of the gas chromatographic run to result in the resolution of the VOCs.

7.3. Autosampler

Entech Instruments 7100 Preconcentrator
Entech Instruments 7016CA Autosampler
KNF Diaphragm Vacuum Pump or equivalent

7.4. **Mass Spectrometer (MS)** - Hewlett Packard 5973 Series Mass Selective Detector or equivalent- A MS capable of scanning from 34 to 350 amu every second or less, using 70 volts (nominal) electron energy in the electron impact ionization mode. The mass spectrometer must be capable of producing a mass spectrum for Bromofluorobenzene (BFB) which meets all of the criteria when 50ng or less of BFB is injected onto the GC/MS system.

7.5. **Ionization Gauge Controller** - Hewlett Packard 59864B Ionization Gauge Controller or equivalent.

7.6. **Analytical Column** - Any analytical column capable of separating the compounds of interest may be used. The capillary column should be directly coupled to the source of the mass spectrometer. The following are suggested columns; an alternative column may be used as long as sufficient peak resolution and separation is achieved.

Column:

Restek RTX-1 Fused Silica Capillary Column
60m x 0.32mm ID
1.5 micron film thickness

7.7. **Data Systems** - IBM-compatible PC with Windows 95/98/NT and Hewlett Packard Chemstation software including EnviroQuant with Extracted Ion Current Profile (EICP), National Institute of Standards and Technology (NIST) library or equivalent.

7.8. **Canister Pressurization Station** - Vacuum/Pressure Gauge [0 to –30 inHg; 0-100 psig]

7.9. **Canister Sampling Devices** - Critical Orifices and Flow Controllers –either laboratory manufactured or purchased.

7.10. **Gas Collection Devices** –

- 6.0L Summa Passivated Canisters or equivalent
- Restek Corporation, 6.0L Silco Canisters or equivalent
- Tedlar bags – 0.5L, 1L, 3L, 5L, 10L, 25L, and 40L (other sizes are available; however, the volumes that are listed encompass the majority of the bags supplied and the samples submitted to the laboratory.

7.11. **Dynamic Dilution System** - Custom assembled dilution system consisting of:

- MKS Instruments, 1359C series Mass Flow Controllers of various ranges
- MKS Instruments, 247C Digital Display
- Digital Vacuum/Pressure Gauge [0 to –30 inHg; 0-100 psig]
- Stainless Steel Humidification Vessel
- Miscellaneous regulators and valves

8. PREVENTIVE MAINTENANCE

A maintenance log will be kept documenting maintenance performed on each analytical system. The serial numbers of each instrument shall be recorded, and each log entry must include a description of the maintenance performed and be initialed by the analyst performing or observing/authorizing maintenance by an outside contractor.

The instrument maintenance log must be kept current. An entry shall be made in the appropriate log every time maintenance is performed (no matter the extent). The entry in the log must include:

- the date of maintenance
- who did the maintenance
- description of the maintenance
- proof that the maintenance activity was successful.

A notation of a successful tune and continuing calibration or initial calibration and the file number that accompanies the data will serve as proof that the maintenance is complete and the instrument is in working order.

The extent of the maintenance is not important, however, it is important that a notation be included for each maintenance activity such as changing a column, tuning the instrument, changing the pump oil, cleaning the source, ordering a part. In addition, a notation should be made in the logbook stating that no samples were analyzed during the days that the instrument was down and no active maintenance was being conducted (i.e., where no other notation was made in the logbook for those days).

8.1. **Concentrating Trap** - Routine maintenance includes periodic solvent cleaning of the Silcosteel lines in the valve oven if contamination is suspected. Periodic replacement of the multi-sorbent or partial replacement of the trap is required if analyte specific deterioration is detected. After repacking the trap it should be baked for a minimum of two hours (until a clean blank is generated), whereas a partial repacking requires baking the trap for a minimum of 20 minutes (or until a clean blank is generated).

8.2. GC System

8.2.1. Column performance is monitored by observing both peak shapes and column bleed. Over time, the column will exhibit a poor overall performance, as contaminated sample matrices are analyzed. The length of time for this to occur will depend on the samples analyzed. When a noticeable decrease in column performance is evident and other maintenance options do not result in improvement, the column should be replaced. Whenever GC maintenance is performed, care should be taken to minimize the introduction of air or oxygen into the column.

8.2.2. Clipping off a small portion of the head of the column often improves chromatographic performance. When cutting off any portion of the column, make sure the cut is straight and "clean" (uniform, without fragmentation) by using the proper column-cutting tool. When removing any major portion of the column, which will affect the retention times and elution characteristics, a change in instrument conditions may be required to facilitate nominal analytical activity.

8.2.3. Performance can also be due to ineffective column ferrules, which should be replaced when a tight seal around the column is no longer possible. This can be detected with the use of a leak detector.

8.3. **Mass Spectrometer** - The Mass Selective Detector (MSD) ion source requires periodic cleaning to maintain proper performance. Symptoms of a dirty ion source include difficulty keeping the MSD in tune and fluctuating internal standard areas. The vacuum system should be serviced at a minimum of every twelve months, including changing the pump oil and checking the molecular sieve in the backstreaming trap.

8.4. **Instrument Tuning** - The instrument is tuned with guidance from the procedure described in the HP Operations Manual, when necessary. The tune shall meet the tune criteria described in this document.

9. STANDARDS, REAGENTS, EQUIPMENT, AND CONSUMABLE MATERIALS

9.1. Reagents and Equipment

9.1.1. UHP Grade Helium (99.999%)(GC carrier gas and preconcentrator purge/sweep gas)
9.1.2. Cryogen - Liquid nitrogen in 50 psi dewars (used to cool preconcentrator traps)
9.1.3. UHP/Zero Grade Air
9.1.4. UHP/Zero Grade Nitrogen
9.1.5. ASTM Type II Water or equivalent
9.1.6. Dynamic Dilution system

9.2. Standards

9.2.1. General Information and Disclaimers

9.2.1.1. EPA Method TO-15 and Appendix A provide guides for preparing standards from neat chemicals. Neat standards that are used for making trace gas standards must be of high purity; generally a purity of 98 percent or better is commercially available. At this time, this lab does not use the Static Dilution Bottle technique. A modified version of the high-pressure cylinder technique is used (see Appendix A). A canister is used in place of the high-pressure cylinder and final pressures are reduced to less than 40 psi. Standards are purchased as mixes or prepared as mixes by Columbia Analytical Services in Simi Valley, CA. Any additional compounds to be added to these mixes are added by syringe during dilution.

9.2.1.2. Vendors and vendors' products are sometimes listed for the ease of the analyst using this SOP, but products and purchased concentrations are examples only and subject to change at any time. All purchased standards are certified by the vendor. Certificates of Analysis are kept in the department until the standards are no longer being used – at which time they are filed with QA. Certificates of Analysis are available upon request. Purchased standards are routinely checked against an independent source for both analyte identification and analyte concentration.

9.2.1.3. The initial calibration curves given are typical, but also subject to variation due to targets and detection levels needed. The curves will always be at least 5 points. The lowest concentration level shall be at the method reporting level. The remaining levels should define the working linear range of the analytical system. Any other standard concentrations listed may be changed at any time.

9.2.1.4. All Standards must be traceable using the CAS lot system (ADM-DATANTRY).

9.2.2. Instrument Performance Check, Internal Standard and Surrogate Spiking Mixture (also known as Monitoring Standard) - p-Bromofluorobenzene (BFB-used as both a tune check and surrogate compound), bromochloromethane, chlorobenzene-d5, and 1,4-difluorobenzene in humidified zero air.

9.2.2.1. An Intermediate Monitoring Standard is prepared from neat compounds in a canister. After the volume of the canister is determined, calculate the mass of each compound to be spiked to achieve the final concentration. Then use the density of each neat compound to calculate the microliter amount to be spiked into the canister. Heat the injection area and inject the compounds while pressurizing the canister with zero nitrogen. Allow the contents to equilibrate for approximately 24 hours before using.

9.2.2.2. The amount required to achieve the desired concentration is determined through the use of the following equation.

$$A = \frac{C * M * V}{D * 24.46}$$

Where:

A Amount of each compound required to achieve the desired concentration of the standard in the SDB (µL)
C Desired concentration of SDB (ppmv)
M Molecular weight of the compound (g/mole)
V Actual volume of the SDB (L)
D Density of the compound in question (µg/µL)
24.46 is the molar volume of an ideal gas (l/mol) at 298 K (25 °C) and 760 mmHg (1 atm).

Example:

Calculate the amount of neat bromochloromethane needed to achieve the final concentration of 500ppmv of that compound in a 6L canister pressurized to 29.4 psi.

V = 18L
D = 1934.4µg/µL
C = 500ppmv

$$A = \frac{(500\,ppmv)(129.38\,g/mole)(18L)}{1934.4\frac{\mu g}{\mu L} * 24.46\frac{L}{mole}} = 24.6\mu L$$

Molecular Weight (g/mole)	**Density (µg/µL)**	**Compound**
129.38	1934.4	Bromochloromethane
114.09	1170.1	1,4-Difluorobenzene
117.59	1157	Chlorobenzene-d5
175.00	1593	BFB

9.2.2.3. The Working Monitoring Standard is prepared in a Summa canister by spiking an aliquot of the Intermediate Stock Standard using a gastight syringe. Connect a cleaned, evacuated Summa canister to a source of pure diluent gas (humidified zero air) using a teflon line with a stainless steel tee directly above the canister valve. One port of the tee is fitted with a septum. Spike the intermediate stock through the septum and follow with a small flow of diluent gas to flush the spike into the can. Pressurize the can to the target pressure with humid zero air, and allow the contents to equilibrate for approximately 24 hours before using.

If the final pressure of the 15L canister is 14.7psig, the pressurized volume is 30L through the use of the following equation.

$$V_P = \frac{P_{atm} + P_f}{P_{atm} + P_i}(V)$$

Where:

V_P	Pressurized canister volume (L)
P_f	Final Canister Pressure
P_i	Initial Canister Pressure
V	Volume of canister @ 1atm
P_{atm}	Atmospheric Pressure = 14.7psig

Example:

$$\frac{14.7 + 14.7}{14.7 + 0}(15L) = 30\text{L}$$

To determine how much of the intermediate standard is required:

$$A = \frac{(F)(V_P)}{(C)\left(1000\frac{ppb}{ppm}\right)}$$

Where:

F	Desired concentration of working standard (ppb)
V_p	Pressurized Volume of receiving Canister (L)
C	Concentration of intermediate standard (ppm)
A	Amount of standard (mL) of the intermediate standard required to obtain the desired working standard concentration

Example: if a 25 ppb standard is desired and the concentration of the intermediate standard is 500 ppm, the amount to add to the 30L standard volume is 1.5 mL as shown:

$$\text{A} = \frac{(25ppb)(30L)(1000mL/L)}{(500ppm)(1000ppb/ppm)} = 1.5\text{mL}$$

9.2.3. Initial Calibration (ICAL) Standard

9.2.3.1. The primary source calibration standard is purchased commercially as a mixture in a cylinder. This standard is diluted to the working standard concentration by the dynamic dilution technique. Compounds may be added individually during dilution to expand the compound list. A "cocktail" or "soup" may be made according to Attachment A and an intermediate standard prepared.

9.2.3.2. Intermediate Standard Preparation (Gaseous Compounds) If compounds need to be analyzed in addition to the existing list add them into an intermediate standard prepared in a Summa canister. After the volume of the Summa canister is determined, calculate the mass of each compound to be spiked to achieve a final concentration of 100ppm. Then use the molecular weight and density (Table 3) of each gaseous compound to calculate the microliter amount to be spiked into the Summa canister. The required spike volume of this intermediate standard, to be added during the dilution of the working standard, is calculated as in the previous example.

9.2.3.2.1. The microliter spike amount is determined by using the following equation.

$$S = \frac{C * V * M}{d * 24.46}$$

S Spike amount required in order to obtain the desired concentration (µl)
C Desired concentration (ppm)
V Final Volume of the pressurized Summa canister (L)
M Molecular Weight of the compound
d Density of the compound (ug/ul)
Molar Volume of gas at 25°C, 1atm

9.2.3.3. Working standards are prepared in Summa canisters using the Dynamic Diluter. Most compounds will be prepared at nominal concentrations of 0.5, 1.0, 2.0, 5.0, 10, 20, and 50 ppbv. The actual concentrations are documented in the ICAL file. Turn on the power to the diluter one hour prior to using to allow for the components to come to thermal equilibrium. Zero all flow controllers without pressure applied prior to use. Connect Zero Air source to the humidification chamber (flow controller #1). Set the supply pressure to 20psi. Back purge standard flow controllers with humid air prior to use, when switching from one controller to another, and after the dilution of all standards is complete. Connect the stock standard cylinder or Summa canister to the appropriate flow controller depending upon the standard flow required. Open the valves. The inlet pressure of the standard regulator is set to 25psi. The backpressure regulator should be at a maximum of 10 psi. Purge each connection to minimize room air contamination and to deliver fresh standard to the flow controller. One or more working standards may be prepared depending on reporting limits and linear range.

9.2.3.3.1. **Step1**: Determine the required flow rate of the stock standard. When choosing these flows, keep in mind that the flow rate range of the standard and diluent gas must be from 10% to 100% of the selected flow controller.

9.2.3.3.2. **Step 2**: Determine the required dilution factor for each stock.

Dilution factor = Stock Conc. (ppb) / Desired Standard Conc. (ppb)

9.2.3.3.3. **Step 3:** Calculate Total Flow

Total Flow=(Sum of stock std. flows)*(Dilution Factor)

Choose stock flows that will give a total flow of less than 10000ml/min, since this would represent the maximum possible flow of diluent gas.

9.2.3.3.4. **Step 4:** Calculate Diluent Air Flow

Air Flow=Total Flow-(Sum of stock std. flows)

Example: Prepare a 10ppb working standard. The concentration of each stock standard is 1000ppb.

Choosing stock flows of 60ml/min,

$$DilutionFactor = \frac{1000ppb}{10ppb} = 100$$

Total Flow=60ml/min*100 = 6000ml/min

Air Flow=6000ml/min-60ml/min = 5940ml/min

9.2.3.3.5. **Step 5:** Set the flow rates for each of the appropriate flow controllers. Start the air flow first and then the standard gas flow. Allow flows to equilibrate for at least five minutes or until a minimum of 20ml have passed through the standard gas flow controller. Attach an empty canister to the outlet port, allowing the standard gas to flush the connection. Close the manifold valve and note the pressure. Check the pressure gauge for fifteen seconds to make sure there is no leak. Reopen the manifold valve and slowly open the canister valve to avoid rapid pressure changes in the standard manifold.

9.2.3.3.6. **Step 6:** If additional components are to be added by syringe dilution, spike the calculated volume of intermediate standard through the septum port while the canister is filling

9.2.3.3.7. **Step 7:** Close the canister valve when the pressure reaches 10 psig. The back pressure regulator will open when it reaches 10 psig, so the canister will still be usable if the valve is not closed in time. Use the purchased stock concentrations to determine the final analyte concentrations in the standard.

9.2.4. Initial Calibration Verification (ICV) - (Laboratory Control Sample - LCS) This standard is prepared at Columbia Analytical Services in Simi Valley, CA from a secondary source standard (either a different manufacturer or different lot from the same manufacturer as the initial calibration standard) by dilution of a purchased cylinder mix. The ICV/LCS working standard should contain all of the target analytes in the calibration working standard. Differing injection volumes will account for differing concentrations. Most targets will be at a nominal concentration of 5 ppbv and the monitoring compounds at 10 ppbv, though these concentrations may vary. The actual concentrations are documented.

9.2.5. Continuing Calibration Verification Standard The CCV is the same canister as the ICAL standard diluted to a concentration approximately midpoint of the ICAL.

9.2.6. Canister Quality Control Check and Method Blank
Pressurize a cleaned canister with humidified zero grade air prior to analysis. Analyze an aliquot of one liter along with the same volume of internal standard and surrogate as standards and samples.

9.3. Storage and Expiration Dates

- Neat Stock Liquids – are stored @ -10°C to -20°C for a period of five years or as specified by the manufacturer.
- Purchased Stock Standards Cylinders must be stored at room temperature for a period of 2 years or as specified by the manufacturer.
- Prepared Stock / Intermediate Calibration Standards (ppm) prepared in canisters in a nitrogen matrix may be stored at laboratory conditions for up to twelve months in an atmosphere free of potential contaminants. This expiration time may be decreased for reactive components that are not typically available as purchased stock standards. Upon preparation, canister standards should be allowed to sit for approximately 24 hours prior to use in order for equilibration to take place. Shorter equilibration periods may be necessary and acceptable as long as performance criteria are met.
- Calibration or Working Calibration Standards prepared in canisters in a humidified air matrix may be stored at laboratory conditions for one month in an atmosphere free of potential contaminants. Upon preparation, canister standards should be allowed to sit for approximately 24 hours prior to use in order for equilibration to take place. Shorter equilibration periods may be necessary and acceptable as long as performance criteria are met.

10. RESPONSIBILITIES

It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP may perform analysis, interpretation and peer review of the results. The supervisor/manager must also ensure that method proficiency is documented initially and whenever significant changes in the instrument type, personnel, matrix or test method are made. The department supervisor/manager or designee shall perform final review and sign-off of the data.

11. PROCEDURE

11.1. Be sure the system has a current MDL and the analyst has a current demonstration of capability.

11.2. Sample Preparation

11.2.1. The pressure/vacuum is checked and the canister pressurized as needed prior to analysis by the laboratory. Samples collected in canisters shall be pressurized with humidified zero grade air.

11.2.2. Canister Pressurization Samples may be pressurized to approximately 1.0psig up to approximately 3.5psig. If pressurization occurs, humidified zero air must be utilized. This may be accomplished by connecting the sample canister to a source of pure diluent gas (zero air) using a teflon line with a stainless steel tee directly above the canister valve. One port of the tee is fitted with a septum and injecting 100µL of water into the can through the septum and allowed to vaporize for approximately 10 minutes. Alternatively, pressurize at a fill station with humidified zero air. Both of these procedures shall utilize ASTM Type II water or equivalent.

11.2.3. Initial and final pressures are recorded on the back of the sample identification tag and in the run log. The dilution factor created by filling the sample canister is calculated using the equation in Section 13.

11.3. Screening

11.3.1. The analyst must screen a sample or subset of samples if the source is of unknown origin. Typically, if the source is known to be indoor or ambient outdoor air, no screening is necessary. However, if screening is required, inject a 1mL or smaller aliquot of each sample into a GC/flame ionization detector (FID) system that has been calibrated with a standard containing a subset of the target analytes. This subset represents the most commonly found compounds in air samples, such as acetone, trichloroethylene, and toluene. A single point calibration is sufficient.

11.3.2. Alternately a sample screen may be performed on the GC/MS system by injecting an aliquot of the sample into the GC/MS injection port while running a modified TO-15 method. The results shall be quantified by an external calibration method. A dilution factor will be calculated based on sample volume and split ratio. The results are to be used for screening purposes only.

11.3.3. Use the results to determine the maximum volume of sample to be analyzed by TO-15 by utilizing the following equation. Dilutions may be prepared as necessary.

$$I = \frac{C}{H}$$

Where:

I	Injection volume (mL)
C	Maximum calibration level (ppbv)
H	Compound screening concentration (ppbv)

Example: Select the compound with the highest concentration (toluene = 500ppbv). If the upper calibration level is 50 ppbv, then the following calculation determines the maximum injection volume to analyze, based upon a normal injection volume of 500mL.

$$\frac{50\,ppbv}{500\,ppbv} * 500\,mL = 50\text{mL maximum injection volume}$$

11.4. Analytical Sequence and Data System Setup

11.4.1. Data System

11.4.1.1. For the Entech 7100, fill in the sequence log of the SmartLab program with the appropriate information.

11.4.1.2. For the HP Chemstation, load the appropriate acquisition method for the GC/MS in the top window of the Chemstation program

11.4.2. Analytical Sequence

11.4.2.1. For this internal standard calibration method analysis, a CCV standard is to be analyzed every 24 hours. That is, the last analysis in the sequence must be started within 24 hours from the time of the initiation of the sequence. The initiation is considered to be the injection of the BFB tune standard.

11.4.2.2. The analytical sequence must be completed for the analysis of ≤20 (19 samples including dilutions with one laboratory duplicate) field samples. A method blank (MB) shall be run to monitor for laboratory introduced contamination. There must be at a minimum a laboratory duplicate (DUP) analyzed in each batch to access batch precision. A laboratory control sample (LCS) shall be analyzed at a rate of at least one per batch of twenty or fewer samples. The concentration of the LCS (ICV standard) should be at the lower end of the calibration curve as an indication that the system allows for good recovery at those concentrations. The following generalized analytical sequence is to be followed:

Analytical Sequence Guideline

With Calibration Tune Check[1]
  Calibration Standards (5 Standards Minimum)
  ICV Standard[2] (Acts as the ICV and LCS)
  QC Canister Checks[6]
  MB[7]
  Sample(s) – 1-19
  Laboratory Duplicate[4]
With Continuing
  Calibration Tune Check[1]
  CCV Standard[5]
  QC Canister Checks[6]
  MB[7]
  LCS[3]
  Sample(s) – 1-19
  Laboratory Duplicate[4]

[1] The introduction of the tune check standard is the start of the 24 hour analysis window. The instrument performance check solution must be analyzed initially and once per 24 hour time period of operation.

[2] In this scenario, the ICV may also be evaluated as the LCS.

[3] An LCS shall be analyzed at a rate of 1 in 20 or fewer samples. The LCS is the second source calibration check standard analyzed at the lower end of the calibration curve.

[4] A laboratory duplicate must be analyzed at a rate of 1 per 20 or fewer samples. The duplicate must be rotated among clients, whenever possible

[5] A CCV must be analyzed at the beginning of every analytical sequence

[6] Any number of QC check canisters may be analyzed in the sequence to determine a canister cleaning batch or batches acceptability.

[7] Any of the QC Check Canisters may serve as the method blank as long as the minimum requirements detailed in this document are met. A method blank shall be analyzed at a rate of 1 in 20 or fewer samples.

Note: Client project batch specifications may require certain modifications to the analytical sequence; however, a batch may not be more lenient than that which is specified in this document.

11.5. Conditions

11.5.1. Sample Collection Conditions The suggested settings and system parameters are as follows:

Stream: Sample
  Preflush (sec): 10
  Trap (cc/min): 100
  Volume (cc): 25 to 1000

Stream: Internal Standard
  Preflush (sec): 10
  Trap (cc/min): 100
  Volume (cc): 25 to 1000

Stream: Analytical Standard
  Preflush (sec): 5
  Trap (cc/min): 100
  Volume (cc): 0

Stream: Sweep/Purge
  Preflush (sec): 5
  Trap (cc/min): 100
  Volume (cc): 75

Stream: M1 -> M2
  Preflush (sec):
  Trap (cc/min): 10
  Volume (cc): 40

Module1:
Trap temp(C): -150 Preheat? Yes
Preheat temp(C): 10
Desorb temp(C): 10
Bake temp(C): 150
Bake time(Min): 5

Bulk1:
Trap temp(C): 10
Desorb temp(C): 10
Bake temp(C): 150

Module2:
Trap temp(C): -30 Preheat? No
Preheat temp(C): 50
Desorb temp(C): 180
Bake temp(C): 190
Desorb time(C): 3.5

Bulk2:
Trap temp(C): 30
Desorb temp(C): 150
Bake temp(C): 150

Module3:
Trap temp(C): -160 Focus? Yes
Inject temp(C): 100
Inject time(Min):2
Bake temp(C): 100
Bake time(Min): 15
Bake on EventEx# : 3
Total Time (Min) : 33

Misc:
Sample Xfer temp(C): 80
GC Xfer temp(C): 100
MPOS Valve temp(C): 100

Wait for GC before injecting
Active GC: GC1
Pressure: 100
MPOS Valve temp(C): 100

11.5.2. GC/MS System

Optimize GC conditions for compound separation and sensitivity.

Item	Condition
Carrier Gas	Helium
Flow Rate	1.0-1.5mL/minute
Temperature Program	Initial Temperature: 40°C Initial Hold Temperature: 5 minutes Ramp Rate: 4°C/min to 130°C 2nd Ramp: 20°C/min to 200°C for 9 min hold
Detector B (MSD *Interface)*:	280°C
Electron Energy	70 Volts (nominal)
Mass Range	33 to 300 amu (SCAN mode)
Scan Time	To give at least 10 scans per peak, not to exceed 1 second per scan.

11.6. Instrument Performance Check (Tuning)

Inject 50ng or less (on column). The internal/surrogate standard containing BFB is typically used at an injection volume of 100 mL. The GC/MS system must meet the BFB ion abundance criteria shown in Table 1 and 1A. The Analysis may not proceed until the tune meets these criteria. The mass spectrum of BFB is acquired as follows: Three scans (the peak apex scan and the scans immediately preceding and following the apex) are acquired and averaged. When background subtraction is required, subtraction is accomplished using a single scan no more than 20 scans prior to the elution of BFB. No part of the BFB peak may be used to background subtract.

If tune is not met, perform auto tune or manual tune and then re-analyze BFB. If the BFB acceptance criteria are still not met, the MS must be retuned according to the procedure outlined in the instrument users manual. Perform necessary maintenance and make notations in the instrument maintenance logbook. It may be necessary to clean the ion source, or quadrupole, or take other necessary actions to achieve the acceptance criteria

11.7. Initial Calibration

11.7.1. Follow the requirements for initial calibration in ADM-ICAL.

11.7.2. Frequency - Each GC/MS system must be initially calibrated upon instrument set-up and recalibrated following any instrument maintenance which may change or effect the sensitivity or linearity of the instrument or if the continuing calibration verification acceptance criteria have not been met.

11.7.3. ICAL Procedure -

11.7.3.1. Attach the calibration standard and internal standard/surrogate canisters to the designated inlets on the preconcentrator and open the canister valves. Analyzing different volume aliquots of the calibration standards produces differing concentrations. Internal standards/surrogates must be added at the same volume for every standard, sample and QC sample.

11.7.3.2. Analyte responses (target ion areas) are tabulated and recorded using the Enviroquant program. Quantitation ions for the target compounds are shown in Table 2 and the primary ion should be used unless interferences are present, in which case the secondary ion may be used.

11.7.4. Calculate the RRF for each target compound relative to the appropriate internal standard

Relative Response Factor (RRF):

$$\text{RRF} = \frac{A_x C_{is}}{A_{is} C_x}$$

where:

A_x is the area response of the analyte quantitation ion.
A_{is} is the area response of the corresponding internal standard quantitation ion.
C_{is} Internal standard concentration, ng.
C_x Analyte concentration, ng.

Note: The equation above is valid under the condition that the volume of internal standard spiking mixture added in all field and QC samples is the same from run to run.

11.7.5. Using RRFs from the initial calibration, calculate the %RSD for all target compounds

Standard Deviation, SD:

$$\mathrm{SD} = \sqrt{\sum_{i=1}^{N} \frac{\left(RRF_i - \overline{RRF}\right)^2}{N-1}}$$

where:

RRF_i are the individual RRFs from each concentration level in the initial calibration curve.

$\overline{RRF}$ Average (or Mean) RRF of all concentration levels in the initial calibration curve.

N total number of calibration concentration levels

Percent Relative Standard Deviation, %RSD:

$$\%\mathrm{RSD} = \frac{SD}{\overline{RRF}}(100)$$

where:

SD Standard Deviation calculated in equation number 3

$\overline{RRF}$ Average or Mean RRF

11.7.6. Calculate the RRT for each compound over the initial calibration range

Relative Retention Time (RRT)

$$\mathrm{RRT} = \frac{\mathrm{RT_C}}{\mathrm{RT_{is}}}$$

where:

$\mathrm{RT_C}$ Retention time of the target compound, seconds.

$\mathrm{RT_{is}}$ Retention time of the internal standard, seconds.

11.7.7. Calculate the mean RRT for each analyte target compound over the initial calibration range:

Mean Relative Retention Time ($\overline{RRT}$)

$$\overline{RRT} = \sum_{i=1}^{n} \frac{RRT_i}{n}$$

where:

$\overline{RRT}$ Mean relative retention time (seconds) for the target compound for all initial calibration levels.
RRT_i Relative retention time for the target compound in level i.
n Number of calibration levels

11.7.8. Calculate the mean area response $\overline{Y}$ for each internal standard compound over the initial calibration range

Mean Area Response ($\overline{Y}$) for Internal Standard

$$\overline{Y} = \sum_{i=1}^{n} \frac{Y_i}{n}$$

where:

Y_i Area response for the primary quantitation ion for the internal standard for each initial calibration standard.
N number of calibration concentration levels

11.7.9. Calculate the mean of the retention times for each internal standard over the initial calibration range

Mean Retention Times ($\overline{RT}$)

$$\overline{RT} = \sum_{i=1}^{n} \frac{RT_i}{n}$$

Where:
$\overline{RT}$ Mean retention time, seconds
RT_i Retention time for the internal standard for each initial calibration standard, seconds.

n number of initial calibration levels

11.7.10. **Acceptance criteria –**

- The RRT for each target compound at each calibration level must be within 0.06RRT units of the mean RRT for the compound.
- The calculated %RSD for the RRF for each compound in the calibration standard must be less than 30% with at most two exceptions up to a limit of 40% (this may not be true for all projects).
- For each Internal Standard the area response (Y) at each calibration level must be within 40% of the mean area response $\overline{Y}$ over the initial calibration range.
- The retention time shift for each of the internal standards at each calibration level must be within 20s of the mean retention time over the initial calibration range for each internal standard.
- All of the following information must be retained to permit reconstruction of the initial instrument calibration: calibration date, test method, instrument, analysis date, analyte identification, analyst's initials, concentration and responses, and response factors.

11.8. Initial Calibration Verification Standard

Verify the initial calibration by analyzing an initial calibration verification standard (ICV). This standard shall be obtained or prepared from materials acquired from a different manufacturer or lot from that of the initial calibration. The ICV must be 70-130% recovery for all target compounds.

If the initial calibration verification technical acceptance criteria are not met, reanalyze and if it still fails prepare a new canister and analyze. If the criteria are still not met inspect the system for possible sources and perform any necessary maintenance and make a notation in the maintenance logbook of any steps taken. It may be necessary to clean the ion source or change the column. Perform a new initial calibration if any performed maintenance has altered instrument linearity and/or sensitivity. A demonstration of an acceptable ICV is required.

11.9. Continuing Calibration Verification Standard –

11.9.1. Frequency - Verify the calibration each working day, where necessary (e.g., an ICAL was not analyzed or the 24-hour tune window has closed) by analyzing a continuing calibration verification (CCV) standard from the initial calibration standard canister. The concentration of the calibration verification may be varied within the established calibration range. It may be necessary to analyze more than one CCV standard when linear range limitation require different concentration levels for specific compounds. This will be determined based upon the initial calibration and will be applied to only those compounds with a modified linear range.

11.9.2. Acceptance Criteria - %D must be within 30% of the initial calibration average RRFs for all target compounds to be reported from the analytical batch.

The %D is used for evaluating CCV RRFs vs. the initial calibration $\overline{RRF}$:

$$\%D = \frac{RRF_{CCV} - \overline{RRF}}{\overline{RRF}}(100)$$

where, for any given analyte:

RRF_{CCV} is the RRF from the CCV being evaluated.
$\overline{RRF}$ is the mean RRF from the current calibration curve.

11.9.3. Corrective Action –

11.9.3.1. If the continuing calibration verification technical acceptance criteria are not met, reanalyze and if it still fails prepare a new canister and analyze. If the criteria are still not met inspect the system for possible sources of the problem and perform any necessary maintenance and make a notation in the maintenance logbook of any steps taken. It may be necessary to clean the ion source or change the column.

11.9.3.2. If any corrective action and/or reanalysis fails to produce continuing calibration verification within acceptance criteria (analyzed immediately following the initial failure), then either two consecutive successful verifications must be performed following corrective action or a new initial calibration must be performed. However, sample data associated with an unacceptable calibration verification may be reported as qualified data under the following special conditions:

- When the acceptance criteria for the continuing calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported. Otherwise the sample affected by the unacceptable CCV shall be reanalyzed after a new calibration curve has been established, evaluated and accepted. If the CCV is out of control (bias high or low) for any particular analyte and that analyte is detected in a sample then that sample must be re-analyzed.

11.10. Sample Analysis –

11.10.1. Prior to analysis, bring all sample containers (canisters and bags) should be at temperature equilibrium with the laboratory.

11.10.2. Attach sample canisters Entech 7100 using a 9/16" wrench.

11.10.3. Before opening the valve, check for leaking fittings by running the leak check program in the SmartLab software.

11.10.4. If system is leak tight, perform the sample line flush routine.

11.10.5. If sample pressures/vacuums are to be checked, manually index the sample valve to each position and note the sample pressure/vacuum.

11.10.6. Index the sample position valve to the first sample position.

11.10.7. Perform the system bake out routine.

11.10.8. Open the canister valves and start the automated preconcentration procedure. Make sure the Chemstation data acquisition software has been readied.

11.10.9. Introduce the same volume of internal standards (surrogates included) as used for the standards and QC samples.

11.11. Evaluation of Sample Analysis

11.11.1.Check all target compounds using the QEdit routine in Enviroquant, making sure all extracted ion chromatogram peaks are integrated properly. See ADM-INT for manual integration procedure and policies.

__Note:__ The secondary ion quantitation is only allowed if there is sample matrix interference with the primary ion. If the secondary ion quantitation is performed, *document the reasons in the instrument run logbook and/or on the quantitation report (initial and date any notation).*

11.11.2. Check the internal standard peak areas and retention times as well as applicable surrogate recoveries to see if they meet acceptance criteria (see Section 12).

11.11.3. Upon sample injection onto the column, the GC/MS system is operated so that the MS scans the atomic range from 33 to 300 amu. At least ten scans per eluting chromatographic peak should be acquired. Scanning allows identification of unknown compounds in the sample through searching of library spectra.

11.11.4. Each run is approximately 45 minutes long. Generate a quantitation report for each run.

11.11.5. Sample Dilution

11.11.5.1. If any target analyte results are above the highest level of the initial calibration, a smaller sample aliquot should be analyzed. The dynamic range of volume aliquots for the automatic cryogenic concentrator is 25cc to 1L. If a volume smaller than 25cc is to be analyzed, a dilution should be made in a Tedlar bag, a Summa canister, or the sample directly injected using a gastight syringe. Note the method of dilution and the dilution gas used in the run log.

- Use results of the original analysis to determine the approximate dilution factor required and get the largest analyte peak within the initial calibration range.
- The dilution factor chosen should keep the response of the analyte peak for a reported target compound in the upper half of the initial calibration range of the instrument.
- All dilution factors must be documented and included in the final report.

11.11.5.2. Tedlar bag dilution:

- Make a dilution by filling a Tedlar bag with 1.0 liter of humidified zero air using a one-liter gas syringe.
- Calculate the volume of balance gas needed to obtain the required dilution.
- Remove the difference in the balance gas using a syringe.
- Add the calculated sample amount using a gastight syringe.

11.11.5.3. Direct injection:

- Make a direct injection by attaching a clean, humidified zero air filled Summa canister to the preconcentrator autosampler using 1/4" stainless steel or teflon tubing with a "tee" septum port. This canister should be the same canister that may be used as the method blank. Alternatively, the humidified dilution air may be connected directly to the sampling system by means of a purged and blanked line.

- Inject the sample through the septum while the preconcentrator withdraws an aliquot from the canister.

11.11.6. Tentatively Identified Compounds

11.11.6.1. When requested, a mass spectral library search may be made for the purpose of tentatively identifying sample components not associated with the calibration standards. The necessity to perform this type of identification will be determined by the purpose of the analyses being conducted. Data system mass spectral library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other.

11.11.6.2. Certain programs may require the reporting of non-target analytes. Only after visual comparison of sample spectra with the nearest library searches may the analyst assign a tentative identification. The following guidelines are used for making tentative identifications.

- Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.
- The relative intensities of the major ions should agree within ±20%. For example, for an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance should be between 30 and 70%.
- Molecular ions present in the reference spectrum should be present in the sample spectrum.
- Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.
- Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks. Data system library reduction programs can sometimes create these discrepancies.
- The concentration of the tentatively identified compound is estimated by assuming a response factor of 1.0 and comparing the response of the tentatively identified compound to the response of the nearest internal standard.

11.12. Storing Electronic Data

The initial calibration data must be stored in a quantitation method (on the server) using a unique filename and may not be overwritten at any time in order to maintain an accurate audit trail. There are multiple quantitation methods, which are subsets of the compound list in Table 2. Therefore, files will be named with a notation indicating the compound list and the date of the corresponding initial calibration. In addition, all data files including method blanks, continuing calibration verification, laboratory control samples and client submitted samples files are saved in a unique sub-directory on the server.

12. QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

12.1. **ICAL, ICV, CCV**, Instrument Performance Check (**tune**), are discussed in the procedure (Section 11)

12.2. Canister Cleanliness

12.2.1. Frequency – each canister must be checked for cleanliness prior to release to the field for sampling.

12.2.2. Acceptance Criteria –

12.2.2.1. A canister is considered "clean" if the analysis shows <0.2ppbv of any target analyte, except acetone and ethanol. These compounds are considered exceptions; the concentration requirement for these analytes is <1.0ppbv for acetone and <1.0ppbv for ethanol

12.2.2.2. If the batch of canisters are to be used for tentatively identified compounds (TIC) analysis, any non-target peaks present in the QC check canister analysis must be evaluated and determined to be less than the TIC reporting limit (<10% of the peak height of Internal Standard 2, as referenced in Table 2).

12.2.3. Corrective Action – return the canister for recleaning.

12.3. Method Blank

12.3.1. Frequency – One per batch. A cleanliness check may serve dual purpose as a method blank. Even if the blank fails criteria for cleanliness it may be used as a MB if it meets MB criteria.

12.3.2. Acceptance Criteria

- The area response for each internal standard in the blank must be within ±40 percent of the area response for each internal standard in the mid-level standard of the ICAL if the method blank follows the ICAL. If the method blank follows a CCV then the area response for each internal standard in the blank must be within ±40 percent of the area response of the CCV.

- The retention time for each internal standard in the blank must be within ±0.33 minutes of the retention time for each internal standard in the mid-level standard of the ICAL if the method blank follows the ICAL. If the method blank follows a CCV then the retention time for each internal standard in the blank must be within ±0.33 minutes of the retention time of the CCV.
- The method blank result for any target analyte should not be greater than the reporting limit and should not contain additional compounds with elution characteristics and mass spectral features that would interfere with identification and measurement of a method analyte.

12.3.3. <u>Corrective Action</u> If the analyte concentration results in the blank do not meet the acceptance criteria repeat analysis with remaining QC canisters until results are acceptable or prepare a canister which has previously been checked as clean. If the analyte results in the blank still do not meet the acceptance criteria the source of the problem must be investigated and measures taken to eliminate the source. Determine whether the contamination is from the instrument or due to contamination in the blank container (if results from the new can are not acceptable then the system is probably contaminated). Regardless, appropriate corrective measures must be taken and documented before sample analysis proceeds. However, if this is not a possibility and the results must be reported follow the reporting requirements stated in Section 13.

12.4. Laboratory Duplicate

12.4.1. <u>Frequency</u> – One per batch.

12.4.2. <u>Acceptance Criteria</u> Samples selected for duplicate analysis shall be rotated among client samples. The relative percent difference must fall within ±25%.

12.4.3. <u>Corrective Action</u> If the duplicate results do not meet the technical acceptance criteria, perform another duplicate analysis. If the results are still unacceptable and the associated samples are not reanalyzed then all of the sample results in the associated batch must be flagged accordingly.

12.5. Surrogates

- Frequency – added to all injections
- Acceptance Criteria – 70-140%
- Corrective Action – Analyze a smaller aliquot to reduce matrix interference.

12.6. Internal Standards

12.6.1. Frequency – added to all injections

12.6.2. Acceptance Criteria

12.6.2.1. The retention time for each internal standard must be within ±20 seconds of the retention time of the internal standard in the most recent valid calibration. If the most recent valid calibration is an initial calibration, internal standard area responses and retention times in the sample are evaluated against the corresponding internal standard area responses and RTs in the mid level standard of the initial calibration.

12.6.2.2. The area response for any internal standard must be within the range of 60 - 140% of the area of the most recent valid calibration (CCV or mid-point from the initial calibration, whichever is most current).

12.6.3. Corrective Action –

12.6.3.1. Internal Standard Responses If the problem is with the instrument, perform maintenance. If the problem is with a sample, check for interferences. If the response is high, it is likely that interference is present. In this case, lower the volume or aliquot of the sample and re-analyze. If the problem persists, report the results with the best quality and qualify the results. If the problem is corrected with the lower volume analysis, report those results.

12.6.3.2. Internal Standard Retention Times If the retention time for any internal standard within the sample changes by more than 20 sec from the latest daily calibration or initial calibration mid-point standard, the GC/MS system must be inspected for malfunctions, and maintenance performed as required. Repeat sample analysis where required

12.7. Laboratory Control Sample

- Frequency – one per batch. It may be necessary to analyze more than one LCS standard when linear range limitations require different concentration levels for specific compounds. This will be determined based upon the initial calibration and will be applied to only those compounds with a modified linear range.
- Acceptance Criteria – the recovery of the LCS must be 70-130% of the true value for all target compounds reported from the analytical batch. Exception: If the LCS recovery is greater than 130%, samples which are <MRL are acceptable to report.
- Corrective Action - If the LCS criteria are not met, determine whether the cause is instrumentation or the result of a poor injection. If the problem is instrumentation, perform

maintenance (and recalibrate if necessary). If the problem is the injection, re-analyze the LCS.

12.8. Method Detection and Reporting Limits

12.8.1. Method detection limit studies shall be performed annually on each instrument for which this method is performed. The MDL shall be performed in accordance with the procedure outlined in the *SOP for the Determination of Method Detection Limits* and the higher detection limit (from all of the instruments where this method is to be performed) for each analyte must be selected and used as the uniform method detection limit for that analyte regardless of the instrument of analysis. The quantitation limit or reporting limit for this method shall be at or above the concentration of the lowest initial calibration standard.

13. DATA REDUCTION AND REPORTING

13.1.1. All data records must explicitly connect data to the initial instrument calibration. This includes all samples, continuing calibrations and QC samples.

13.1.2. The calculations for the Initial Calibration and Daily Calibration evaluations are given in the Section 11. The calculations for percent recovery and relative percent difference are given in the Quality Assurance Manual.

13.1.3. Sufficient raw data records must be retained of the analysis, instrument calibrations and method detection limit studies including: analysis/calibration date and time, test method, instrument, sample identification, analyte identification, analyst's initials, concentrations and responses, as well as standards used for the analysis and calibrations, all manual calculations including sample dilutions and manual integrations to permit reconstruction of analyses. Make sure that all information entered and reported on the quantitation report and instrument run log is complete and accurate. Retain all daily QC per sequence on file for future reference including tune checks, opening standards, method blanks, laboratory control samples, laboratory duplicates, and initial calibrations and initial calibration verifications. Additionally, all passing QC Canister checks must also be retained on file.

13.1.4. The essential information to be associated with analysis, such as computer data files, run logs, etc. shall include: Sample ID code, date and time of analysis, instrument operating conditions/parameters (or reference to such data), analysis type, all manual calculations including dilutions and manual integrations, analyst's initials, sample preparation (pressure readings and balance gas if pressurized with helium), standard and reagent origin, receipt, preparation, and use, as well as calibration criteria, frequency and acceptance criteria, data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions.

13.2. Calculations

13.2.1. The equations needed for initial and continuing calibration are in Section 11. The equations for calculating the concentrations and volumes of standards are in Section 9.

13.2.2. **Pressure Dilution Factor, PDF**, for samples collected in Summa canisters:

$$\text{PDF} = \frac{P_{atm} + P_f}{P_{atm} + P_i}$$

where:

P_{atm} is the ambient atmospheric pressure, 29.9 "Hg at sea level.
P_f is the final sample canister pressure, in "Hg
P_i is the initial sample canister pressure, in "Hg. This will most often be a negative value (sub-ambient initial pressure.)

13.2.3. For calculating analyte concentrations in a sample, the starting point is the ppbv concentration generated by the HP Enviroquant software, which appears on the quantitation report. The equation used:

$$C_x = \frac{A_x C_{is}}{A_{is} \overline{RRF}}$$

where:

C_x is the concentration, in ppbv, of analyte x.
A_x is the area response of the analyte's quantitation ion.
A_{is} is the area response of the corresponding internal standard's quantitation ion.
C_{is} is the internal standard concentration, in ppbv.
$\overline{RRF}$ is the average or mean RRFs

13.2.4. The final analyte concentration, $FinalC_x$, in units of parts per billion volume (ppbv), is then calculated from the following:

$$FinalC_x = C_x PDF\left(\frac{Vc}{Vs}\right)$$

where:

Vc	is the calibration standard sample volume analyzed, in liters.
Vs	is the sample volume analyzed, in liters.
PDF	is the sample canister pressure dilution factor.

13.2.5. To convert concentrations units between mass/volume and volume/volume units the equations are:

$$C_{ug/m^3} = C_{ppbv}\left(\frac{FW}{24.46}\right) \quad \text{or} \quad C_{ppbv} = C_{ug/m^3}\left(\frac{24.46}{FW}\right)$$

where:

FW	is the formula weight of the analyte, in g/mole. 24.46 is the molar volume of an ideal gas at 298 K (25 °C) and 760 mmHg (1 atm), in liters per mole (l/mol).
C_{ug/m^3}	the analyte concentration in micrograms per cubic meter.
C_{ppbv}	the analyte concentration in parts per billion by volume.

Refer to Table 3 for the appropriate molecular weights.

13.3. Data Review

13.3.1. The Initial Calibration will be reviewed by the analyst and a qualified peer using the ICAL checklist found in ADM-ICAL.

13.3.2. Daily sample data and associated QC data will be reviewed by the analyst and a qualified peer using a Data Review Checklist and validated by a supervisor as outlined in ADM-DREV. ADM-DREV also describes the subsequent reviews by the Project Manager and the Lab Director or QAPM.

13.4. Reporting - Most reports are generated using STARLIMS. Data is transferred electronically from the instrument into STARLIMS.

14. METHOD PERFORMANCE

Reporting limits are based upon an MDL study performed according to ADM-MDL and filed in the MDL binders in the QA office.

Demonstration of Capability is performed upon instrument set-up, whenever a new analyst begins independent analysis, and annually thereafter according to ADM-TRANDOC and section 19 below. The documentation of this method performance is retained by the Quality Assurance office

15. POLLUTION PREVENTION AND WASTE MANAGEMENT

It is the laboratory's practice to minimize the amount of solvents, acids and reagent used to perform this method wherever feasible. Standards are prepared in volumes consistent with methodology and only the amount needed for routine laboratory use is kept on site. The threat to the environment from solvent and reagents used in this method can be minimized when disposed of properly.

The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the CAS EH&S Manual.

16. CORRECTIVE ACTIONS FOR OUT-OF-CONTROL DATA

If data is produced that is out of control, the samples are to be re-analyzed with in-control QA whenever possible. See corrective actions in Sections 11 and 12 of this SOP and in the applicable Figures in Section 12 of the Quality Assurance Manual.

17. CONTINGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

If data is produced that is out of control and is not to be re-analyzed due to sample volume restrictions, holding times, or QC controls can not be met, follow the procedures throughout this SOP, Section 15 of the Quality Assurance Manual, and the flagging criteria in Appendix D of the Quality Assurance Manual.

18. REFERENCES

- EPA Method TO-14A, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA/625/R-96/010b, U.S. Environmental Protection Agency, Research Triangle Park, NC, January 1997.

- EPA Method TO-15, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA/625/R-96/010b, U.S. Environmental Protection Agency, Research Triangle Park, NC, January 1997.

- Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, January 1999.

- Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, Addendum, January 17, 2002.

19. TRAINING OUTLINE

Read current SOP. Demonstrate a general understanding of the methodology and chemistry. Follow policies in ADM-TRANDOC.

Observe Sample Preparation and Analysis. Follow Training Plan Form (May be found on the Rochester CASLAB Intranet at P:\INTRANET\QAQC\TRAINING\QAforms.HTM.)

Participate in the methodology, documentation, and data reduction with guidance.

Perform Initial Demonstration of Capability by performing the analysis independently and analyzing a known standard four times. If recovery is within acceptable limits, complete Training Plan Form and IDC certificate and file with QA. Continuing proficiency shall be demonstrated annually using an outside PE source, an internal unknown, or a new 4 replicate study.

20. METHOD MODIFICATIONS

9.2 of the TO-15 Method described various procedures for standards preparation. CAS-R modifies the High Pressure Cylinder technique in 9.2.5 of TO-15 by using a canister instead of a cylinder and final pressures are reduced to less than 40psi.

9.2.2.3 of the TO-15 Method requires an internal standard concentration of 10 ppbv. CAS-R uses 1-10 ppbv as not to push the upper end of the linear range with internal standard. The internal standard is set depending upon the required analytical range and the injection volume utilized during the initial calibration.

21. INSTRUMENT-SPECIFIC ADDENDUM

Instrument manuals are located near the instrument(s)

22. ATTACHMENTS

Table 1: Instrument Tune Check Ion Abundance Criteria (TO-15)
Table 1A: Instrument Tune Check Ion Abundance Criteria (TO-14A)
Table 2: Target Compounds, CAS Numbers, Quantitation Ions, MRLs, and Internal Standard Associations
Table 3: Molecular Weights and Densities
Attachment A - Preparation of Gas Phase Standards for Ambient Air Analysis

23. CHANGES FROM PREVIOUS REVISION

- Not Applicable

TABLE 1

Required BFB Key Ions and Ion Abundance Criteria for Method TO-15

Mass	Ion Abundance Criteria[2]
50	8.0 to 40.0 percent of m/e 95
75	30.0 to 66.0 percent of m/e 95
95	Base Peak, 100 Percent Relative Abundance
96	5.0 to 9.0 Percent of m/e 95
173	Less than 2.0 Percent of m/e 174
174	50.0 to 120.0 Percent of m/e 95
175	4.0 to 9.0 Percent of m/e 174
176	93.0 to 101.0 Percent of m/e 174
177	5.0 to 9.0 Percent of m/e 176

TABLE 1A

Required BFB Key Ions and Ion Abundance Criteria for Method TO-14A

Mass	Ion Abundance Criteria
50	15 to 40 percent of m/e 95
75	30 to 60 percent of m/e 95
95	Base Peak, 100 Percent Relative Abundance
96	5 to 9 Percent of m/e 95
173	Less than 2 Percent of m/e 174
174	>50 Percent of m/e 95
175	5 to 9 Percent of m/e 174
176	>95 and <101 Percent of m/e 174
177	5 to 9 Percent of m/e 176

Note: The criteria listed in Tables 1 and 1A shall be met or exceeded in order for EPA Compendium Methods TO-15 or TO-14A to be referenced.

TABLE 2

Target Compounds, CAS Numbers, Quantitation Ions, MRLs, and Internal Standard Associations

Compound[1]	CAS Number	Primary Ion[2]	Secondary Ion(s)[2]	MRL (ppbv)[3]	Internal Standards[4]
Bromochloromethane (IS1)	74-97-5	130	128, 132	1.0	Internal Standard 1
Propene	115-07-1	42	39,41	1.0	IS1
Dichlorodifluoromethane (CFC 12)	75-71-8	85	87	1.0	IS1
Chloromethane	74-87-3	50	52	1.0	IS1
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)	76-14-2	135	137	1.0	IS1
Vinyl Chloride	75-01-4	62	64	1.0	IS1
1,3-Butadiene	106-99-0	54	39, 53	1.0	IS1
Bromomethane	74-83-9	94	96	1.0	IS1
Chloroethane	75-00-3	64	66	1.0	IS1
Ethanol	64-17-5	45	46	5.0	IS1
Acetone	67-64-1	58	43	5.0	IS1
Trichlorofluoromethane	75-69-4	101	103	1.0	IS1
Isopropyl Alcohol	67-63-0	45	43	1.0	IS1
1,1-Dichloroethene	75-35-4	96	61	1.0	IS1
Methylene Chloride	75-09-2	84	49	1.0	IS1
Trichlorotrifluoroethane	76-13-1	151	101	1.0	IS1
Carbon Disulfide	75-15-0	76	78	1.0	IS1
trans-1,2-Dichloroethene	156-60-5	61	96	1.0	IS1
1,1-Dichloroethane	75-34-3	63	65	1.0	IS1
Methyl tert-Butyl Ether	1634-04-4	73	57	1.0	IS1
Vinyl Acetate	108-05-4	86	43	1.0[7]	IS1
2-Butanone (MEK)	78-93-3	72	43	1.0	IS1
cis-1,2-Dichloroethene	156-59-2	61	96	1.0	IS1
Ethyl Acetate	141-78-6	61	70	1.0	IS1
n-Hexane	110-54-3	57	86	1.0	IS1
Chloroform	67-66-3	83	85	1.0	IS1
Tetrahydrofuran	109-99-9	72	71,42	1.0	IS1
1,4-Difluorobenzene(IS2)	540-36-3	114	88	1.0	Internal Standard 2

TABLE 2 (Continued)

Target Compounds, CAS Numbers, Quantitation Ions, MRLs, and Internal Standard Associations

Compound[1]	CAS Number	Primary Ion[2]	Secondary Ion(s)[2]	MRL (ppbv)[3]	Internal Standards[4]
1,2-Dichloroethane	107-06-2	62	64	1.0	IS2
1,1,1-Trichloroethane	71-55-6	97	99, 61	1.0	IS2
Benzene	71-43-2	78	77	1.0	IS2
Carbon Tetrachloride	56-23-5	117	119	1.0	IS2
Cyclohexane	110-87-7	84	69,56	1.0	IS2
1,2-Dichloropropane	78-87-5	63	62	1.0	IS2
Bromodichloromethane	75-27-4	83	85	1.0	IS2
Trichloroethene	79-01-6	130	132	1.0	IS2
1,4-Dioxane	123-91-1	88	58	1.0	IS2
n-Heptane	142-82-5	71	57,100	1.0	IS2
cis-1,3-Dichloropropene	10061-01-5	75	77	1.0	IS2
4-Methyl-2-Pentanone	108-10-1	58	85	1.0	IS2
trans-1,3-Dichloropropene	10061-02-6	75	77	1.0	IS2
1,1,2-Trichloroethane	79-00-5	97	83	1.0	IS2
Toluene	108-88-3	91	92	1.0	IS2
2-Hexanone	591-78-6	43	58	1.0	IS2
Dibromochloromethane	124-48-1	129	127	1.0	IS2
1,2-Dibromoethane	106-93-4	107	109	1.0	IS2
Tetrachloroethene	127-18-4	166	164	1.0	IS2
Chlorobenzene-d5(IS3)	3114-55-4	82	117	1.0	Internal Standard 3
Chlorobenzene	108-90-7	112	114	1.0	IS3
Ethylbenzene	100-41-4	91	106	1.0	IS3
m-, p-Xylenes	1330-20-7	91	106	1.0	IS3
Bromoform	75-25-2	173	175	1.0	IS3
Styrene	100-42-5	104	78, 103	1.0	IS3
1,1,2,2-Tetrachloroethane	79-34-5	83	85	1.0	IS3
o-Xylene	95-47-6	91	106	1.0	IS3
4-Bromofluorobenzene(S)	460-00-4	174	176	1.0	IS3
4-Ethyltoluene	622-96-8	105	120	1.0	IS3
1,3,5-Trimethylbenzene	108-67-8	105	120	1.0	IS3

TABLE 2 (Continued)

Target Compounds, CAS Numbers, Quantitation Ions, MRLs, and Internal Standard Associations

Compound[1]	CAS Number	Primary Ion[2]	Secondary Ion(s)[2]	MRL (ppbv)[3]	Internal Standards[4]
1,2,4-Trimethylbenzene	95-63-6	105	120	1.0	IS3
Benzyl Chloride	100-44-7	91	126	1.0	IS3
1,3-Dichlorobenzene	541-73-1	146	148	1.0	IS3
1,4-Dichlorobenzene	106-46-7	146	148	1.0	IS3
1,2-Dichlorobenzene	95-50-1	146	148	1.0	IS3
1,2,4-Trichlorobenzene	120-82-1	184	145, 182	1.0	IS3
Hexachlorobutadiene	87-68-3	225	227	1.0	IS3

(S) = Surrogate (IS1) = Internal Standard 1 (IS2) = Internal Standard 2 (IS3) = Internal Standard 3

Note 1: Additional compounds may be reported as long as the minimum requirements of this document are met. The compounds listed in this table are reported using TO-15 SCAN. These compounds are included in the laboratories' standard 62 compound reporting list.

Note 2: These are suggested primary and secondary ions. However, any ions in the analyte spectra that are sufficient enough in response to reach the desired reporting limit and having a limited amount of interference, is acceptable for both the primary and secondary ion selection. Analyst experience should be utilized in determining appropriate ions.

Note 3: The method reporting limit listed is the standard SCAN limit (lowest concentration in the initial calibration curve), but may change with each new initial calibration performed. Therefore, current reporting limits should be reviewed.

Note 4: The listing of the internal standard by which the compounds are quantitated is for TO-15 SCAN only.

Table 3
Molecular Weight and Density

Compound Name	Molecular Weight	Density (g/mL)
Propene	42.08	N/A
Dichlorodifluoromethane	120.9	1.329
Chloromethane	50.49	0.911
Freon 114	170.9	1.455
Vinyl Chloride	62.5	0.9106
1,3-Butadiene	54.09	0.6149
Bromomethane	94.94	1.6755
Chloroethane	64.52	0.8902
Ethanol	46.07	0.7893
Acetone	58.08	0.7845
Trichlorofluoromethane	137.4	N/A
Isopropyl Alcohol	60.1	0.7809
1,1-Dichloroethene	96.94	1.213
Methylene Chloride	84.94	1.3266
Trichlorotrifluoroethane	187.38	1.5635
Carbon Disulfide	76.14	1.2632
trans-1,2-Dichloroethene	96.94	1.2565
1,1-Dichloroethane	98.96	1.1757
Methyl tert-Butyl Ether	88.15	0.7402
Vinyl Acetate	86.09	0.9317
2-Butanone	72.11	0.7999
cis-1,2-Dichloroethene	96.94	1.2837
Ethyl Acetate	88.106	0.9003
n-Hexane	86.17	0.6548
Chloroform	119.4	1.4832
Tetrahydrofuran	72.11	0.8892
1,2-Dichloroethane	98.96	1.2351
1,1,1-Trichloroethane	133.4	1.339
Benzene	78.11	0.8765
Carbon Tetrachloride	153.8	1.594
Cyclohexane	84.16	0.7739
1,2-Dichloropropane	113	1.156
Bromodichloromethane	163.8	1.98
Trichloroethene	131.4	1.4642
1,4-Dioxane	88.11	1.0337
n-Heptane	100.2	0.6837
cis-1,3-Dichloropropene[2]	111	1.224

Table 3
Molecular Weight and Density

Compound Name	Molecular Weight	Density (g/mL)
4-Methyl-2-Pentanone	100.2	0.7965
trans-1,3-Dichloropropene[2]	111	1.217
1,1,2-Trichloroethane	133.4	1.4397
Toluene	92.14	0.8669
2-Hexanone	100.16	0.8113
Dibromochloromethane	208.3	2.451
1,2-Dibromoethane	187.9	2.1791
Tetrachloroethene	165.8	1.6227
Chlorobenzene	112.6	1.1058
Ethylbenzene	106.2	0.867
m- & p-Xylene	106.2	0.8642,0.8611
Bromoform	252.8	2.899
Styrene	104.1	0.906
1,1,2,2-Tetrachloroethane	167.9	1.5953
o-Xylene	106.1	0.8802
4-Ethyltoluene	120.2	0.8614
1,3,5-Trimethylbenzene	120.2	0.8652
1,2,4-Trimethylbenzene	120.2	0.8758
Benzyl Chloride	126.59	1.1004
1,3-Dichlorobenzene	147	1.2884
1,4-Dichlorobenzene*	147	1.2475
1,2-Dichlorobenzene	147	1.3059
1,2,4-Trichlorobenzene	181.5	1.459
Hexachlorobutadiene	260.8	1.556

* Indicates a solid at room temperature.

Note 1: The density for a mixture of cis- & trans-1,3-Dichloropropene is 1.2205g/mL.

Attachment A

Preparation of Gas Phase Standards for Ambient Air Analysis

TELEDYNE INSTRUMENTS
Tekmar
A Teledyne Technologies Company

Preparation of Gas Phase Standards for Ambient Air Analysis

Application Note

By: Valerie J. Naughton

Introduction

Understanding gas phase standard preparation for ambient air methods is paramount to successful analyses. Standard preparation using EPA water, wastewater, and soil methods is routine. The analyst purchases stock methanolic standards and dilutes them into the working range of the instrument. Unlike conventional methods, air standard preparation is significantly more time consuming and technique intensive. Stock standards in compressed gas cylinders are available for specific method analytes, such as Compendium Method TO14[1] compounds. These, however, can be cost prohibitive and do not always address the needs of every customer. Custom blends are available in compressed gas cylinders, but are also costly and usually require four to eight weeks for preparation and stabilization.

This paper addresses several approaches to preparing gas phase standards for air toxics analysis. Included are techniques and calculations for making multi-component neat mixtures which can be diluted into static dilution bottles and ultimately into canisters for system calibration and performance checks. These techniques can be used to help alleviate cost when specific, non-routine analyses are requested. They can also be utilized by laboratories not receiving sufficient requests for air toxics analyses to justify the purchase of a compressed gas standard.

Also discussed are techniques for using compressed gas standards alone and combined with static dilution bottle standards to produce working standards in canisters. Some canister cleaning techniques are specified along with the importance of humidifying canisters for cleaning and standard preparation. Throughout the paper, good laboratory practices are described as these are essential to accurate and reproducible standard preparation.

Preparing Primary Stock Mixtures from Neat Liquids

A static dilution bottle (SDB) is a glass round bottom flask of known volume equipped with a septum-containing (Mininert) valve. It is used to vaporize and dilute small volumes of neat liquids to the gas phase, producing an intermediate standard. To prepare a gas phase standard in an SDB, a calculated amount of neat compound is injected into the flask. When preparing a multi-component standard, it is generally easier and more efficient to prepare an equimolar primary stock mixture of compatible neat compounds and make a single injection of the mixture into the SDB. This equimolar mixture is commonly referred to as a soup.

Before preparing the soup, the desired analytes are identified and categorized according to reactivity. An effective way to accomplish this is to group the compounds based on functionality, i.e., hydrocarbons, halocarbons, aromatics, alcohols, aldehydes, ketones, etc. If there are only a few compounds in each subset, decide if any subsets can be combined, such as alcohols, aldehydes, and ketones into a polar soup. The ratio of the molecular weight to the density provides the volume required for one mole of each component. This ratio is multiplied by the desired number of millimoles to adjust the volume per component injected. The number of millimoles injected per component is determined by the cost and availability of neat compounds, and the total volume of soup required. Soups are commonly prepared in 2 ml amber vials; therefore an appropriate total soup volume is 500 μl to 1500 μl.

$$\frac{\text{Molecular weight (mg/mmol)}}{\text{Density (mg/ul)}}\ \text{(Desired mmol (mmol/cmp))} = \text{Volume(ul)/mmole component}$$

The total volume for the soup is determined by summing the individual component volumes, and adjusting the number of moles injected if the total volume is greater or less than the desired range. To establish the approximate molar concentration of an individual soup component, the following calculation is applied:

$$\frac{\text{Number of mmoles injected (mmol)}}{\text{Total soup volume (ul)}} = \text{Molar Concentration (mmol/ul)}$$

When sealed with a septum-containing screw cap or Mininert valve and stored in the freezer, a compatible primary stock soup is stable for approximately six months.

Meticulous cleaning of syringes by flushing with methanol and vacuum drying with a syringe cleaner will minimize contamination of the primary standard and the source neat compound. Ideally, a single syringe should be used for each neat compound. If this is not possible, carefully clean and dry the syringe between injections, and flush the syringe several times with a small volume of neat solution prior to final measurement and injection.

Preparing Gas Phase Intermediate Standards from Primary Stock Mixtures

Primary neat stock mixtures are diluted and vaporized in an SDB producing a gas phase intermediate standard. The SDB must first be cleaned and dried. The SDB is opened in a hood to allow existing contents to exhaust, and is then filled with water to force the remaining components out of the bottle. If the SDB is new, these first two steps can be eliminated. Next, the SDB is washed with laboratory detergent and warm water. The bottle is rinsed until no more soap is evident and lastly, several rinses are made with organic free water. The SDB is dried in a 100°C oven, removed, and allowed to cool. The SDB can be placed in a 300°C muffle furnace to char any remaining organics; however, high temperatures will change the shape and ultimately the volume of the container. As a general rule, the actual SDB volume should be determined upon initial purchase, and after baking at temperatures in excess of 100°C. Several clean glass beads are placed in the SDB, and the bottle is flushed with nitrogen gas. The SDB is capped immediately with a clean Mininert valve containing a new septum, and is now ready for standard preparation.

The desired SDB concentration is established and the actual SDB volume is recorded. From the ideal gas law, the molar volume of an ideal gas is determined (V=nRT/P). The volume of soup required for a given final concentration in the SDB is calculated by the following equation:

$$\frac{(\text{Conc}_{\text{SDB}}\ (\text{ul/L}))\ (V_{\text{SDB}}\ (\text{L}))}{(\text{Molar Conc (umol/ul)})\ ((nRT/P)\ (\text{ul/umol}))} = V_{\text{soup added to SDB}}\ (\text{ul})$$

The calculated volume of soup is added to the SDB through the septum port of the Mininert™ valve. The bottle is swirled, stirring the glass beads to enhance vaporization and the standard is allowed to equilibrate several hours. Heating the SDB to 65°C may be required for intermediate standards containing components with low vapor pressures similar to trichlorobenzenes and hexachlorobutadiene to ensure complete vaporization[2].

Concentration units for air analysis are commonly expressed as a volume to volume ratio. That is, an SDB containing analytes at a concentration of 200ppm v/v contains 200 microliters of analyte per liter of air. Conventional water and soil methodologies express concentration units in terms of mass of analyte per volume of water (ug/L) or mass of analyte per mass of soil (mg/kg)[3,4]. Volume to volume measurements are easily converted to the more familiar mass to volume measurements by using the molar volume and molecular weight in a conversion equation. For example, an SDB containing acetone at a concentration 10ppm v/v yields 23.9ug/L of acetone:

$$\frac{(\text{SDB concentration(ul/L)})}{(\text{Molar volume of an ideal gas(ul/umol)})}\ (\text{MW of acetone(ug/umol)}) = \text{Concentration of acetone (ug/L)}$$

$$\frac{10\text{ul/L}}{24.45\text{ul/umol}}\ (58.08\ \text{ug/umol}) = 23.9\text{ug/L}$$

Preparing Working Standards from SDB's

Canister Cleaning

The final step in ambient air standard preparation is diluting the SDB into a working range canister standard. Care must be taken to ensure the canister is clean. Many questions exist regarding parameters for canister cleaning, including the necessity of heat and humidity, the use of nitrogen or compressed air, the number of fill/evacuate cycles, the duration of final evacuation and the final evacuation pressure. The procedure outlined here performs well for cleaning canisters containing a modified TO14 standard up to 200ppbv, 100% relative humidity, and 5% carbon dioxide. Cleanliness specifications are less than 0.2ppbv per target analyte. Modifications to this procedure may be necessary depending on the source of the samples.

The canister is placed in an oven with the canister valve exposed to ambient air, and is heated to 140°C. A cold finger is placed in line before the vacuum pump to trap impurities which may diffuse from the vacuum pump oil. The canister is initially evacuated to ~25in vacuum, followed by pressurization to ~30psig, with humidified zero air. The cycles are repeated seven to ten times. The humidity chamber is then taken off line, and seven to ten fill/evacuate cycles are repeated with dry zero air. The final evacuation is held for 30-60 minutes. The canister valve is closed and the canister is now ready for standard preparation or sampling. Per EPA methodologies, all canisters must be tested for cleanliness until the cleaning system is verified, after which, a smaller percentage of canisters is tested. Canisters must also be pressure tested over a 24 hour period to ensure that the container is leak free[5].

Standard Preparation

Prior to injecting standard into the cleaned, evacuated canister, the canister is humidified with purified water. Humidification further passivates the interior surface, reducing activity and facilitating the removal of compounds, and creates an environment that more accurately represents the actual sample matrix. Preparing canister standards at 50% relative humidity provides sufficient moisture to reduce canister surface activity. It is standard practice to base relative humidity on the canister volume at ambient pressure, not the final pressurized volume.

From a relative humidity table[6], the mass of water contained in a cubic meter of saturated air at a specific temperature can be obtained. This value is used to calculate the volume of water required for a specific relative humidity. For example, at 25°C, 23.05g of water saturates a cubic meter of air. To calculate the volume of water required to provide 100% relative humidity in a six liter canister, apply the following relationship:

$$(23.05\text{g/m}^3)\ (\text{m}^3/1000\text{L})\ (6\text{L}) = 0.1383\text{g } H_2O \text{ in 5L canister}$$

$$\frac{(0.1383\text{g})}{1\text{g/ml}}\ (1000\text{ul/ml}) = 138.3\text{ul } H_2O \text{ in 6L canister}$$

Injecting 138.3ul of water into a six liter canister will provide 100% relative humidity. Reducing the volume injected to 69ul will result in 50% relative humidity.

Relative humidity is strongly dependent on temperature. A drop of only 5°C in room temperature creates a 25% difference in the mass of water required to saturate a cubic meter of air. Therefore, for greatest accuracy, room temperature should be monitored and humidity tables utilized to determine the correct value for specific laboratory conditions.

Once the canister is humidified, the gas phase intermediate standard can be injected. To determine the volume of SDB intermediate standard to inject, the desired canister concentration, SDB concentration, and final canister volume must be known. The following relationship is used to calculate the volume required.

$$\frac{(\text{Desired canister concentration (ul/L)})\ (\text{Final canister volume (L)})}{\text{Concentration}_{\text{SDB}}\ (\text{ul/L})} = \text{Volume}_{\text{from SDB}}\ (\text{L})$$

A six liter canister at atmospheric pressure has a volume of six liters. From this, the final canister volume can be calculated from the final canister pressure. The following conversion factors between atmospheric pressure units are valuable for making this determination.

1atm = 14.7psia = 0psig = 29.9in Hg = 760mm Hg = 760 Torr

To accurately transfer a volume of gas from the SDB to the canister, a gas tight syringe must be used. Insert the syringe through the Mininert™ valve and draw an aliquot of standard. Flush the contents of the syringe into a hood and repeat. Once flushed, insert the syringe through the Mininert™ valve and pump several times, filling the syringe and releasing the contents back into the SDB. Finally, slowly draw standard into the syringe past desired final volume; allow several seconds for equilibration, then adjust to the correct volume. Remove the syringe from the SDB and immediately inject the contents into the humidified canister. The canister can now be pressurized to the final dilution volume.

Every time standard is removed from the SDB, the concentration changes. To increase the useful lifetime of an SDB standard, remove volumes of 25ml or less. The volume removed can be manipulated by increasing the SDB concentration or adjusting the canister final volume/pressure. Depending upon the volume removed, an SDB intermediate standard is usable for approximately two months.

Compressed gas standards are often used in conjunction with SDB standards to increase the number of compounds per analysis. Metering the cylinder standard through an electronic mass flow controller (MFC) is an accurate, effective and relatively inexpensive method for delivering the standard to a canister. The standard is allowed to flow through the MFC for approximately 15min to ensure that the contents are homogeneous. The outlet to the MFC is then connected to the canister and the standard transfer is timed to obtain the desired volume. Alternately, gas blending or permeation tube systems can be utilized to create working range standards. Although these techniques automate the standards preparation process, they are costly.

Conclusion

Standard preparation for air toxics analysis requires analyst skill and is time intensive. Understanding the basic calculations and close attention to good laboratory practices will greatly simplify the process. To eliminate repeated tedious calculations, the equations outlined can be incorporated into a spreadsheet program. Once established, spreadsheets are easily customized to reflect any analyte mixture.

Acknowledgment

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Preparation of Standards Using a "Cocktail" or "Soup".

The Teldyne Application Note above is included for reference for technique. The actual procedures used by the lab are as follows:

The Summa can stock standard is prepared by spiking a small amount of a neat chemical cocktail and pressurizing with humid zero air in accordance with procedures below:

Cocktail Preparation Equi-mass "soup" (contains compounds in equal mass amounts) or cocktail prepared from the neat compounds:

Step 1: This cocktail is prepared by combining 25mg of each neat compound into a small glass vial. Use a microliter syringe to transfer each compound, cleaning with solvents in between. Put the vial in the freezer between aliquots to minimize volatilization. Take the density of each compound into account to determine the **actual amount of each compound to spike into the cocktail:.**

$$S = \frac{A}{D}$$

Where:

S Actual spike amount (μL)
A Desired amount for each compound (mg)
D Density (mg/μL), refer to Table 3 for the density

Example: The actual amount of acrolein to add to the cocktail is calculated by the following.

$$\text{S(Acrolein)} = \frac{25mg}{\left(0.840\frac{mg}{\mu l}\right)} = 29.8\mu\text{L}$$

Step 2: The concentration of each compound in the cocktail:

$$C = \frac{A}{V}\left(1000\frac{\mu g}{mg}\right)$$

Where:

C Concentration of cocktail (µg/µL)
A Amount of each compound (mg)
V Final volume of cocktail (added spike amounts of each compound) (µL)

Example:

$$C = \frac{25mg}{631.8\mu L}\left(1000\frac{\mu g}{mg}\right) = 39.569\mu g/\mu L$$

Intermediate Standard - Prepare the intermediate standard by spiking a small aliquot of the soup into a certified clean, evacuated Summa canister in order to achieve a final nominal concentration of 1000ng/L. Attach a teflon line with a stainless steel tee to the fill station. Attach the empty canister to the tee. Put a septum in the remaining tee fitting. Open the canister valve for a few seconds, and then close it. Check the vacuum gauge for fifteen seconds to make sure there is no leak. Then open the valve again and spike in the neat cocktail. Start air flow into the can and slowly pressurize to 58.8 psig. Then allow the contents to equilibrate for approximately 24 hours before using the spike amount is determined by using the following equation.

$$S = \frac{C_1 V}{C_2 * 1000ng/\mu g}$$

Where:

S Spike amount required in order to obtain the desired concentration (µL)
C_1 Desired concentration (ng/L)
C_2 Concentration of cocktail (µg/µL)
V Final volume of Summa canister (L) – as calculated above

Example: Determine the spike amount of the cocktail required to achieve the desired intermediate standard concentration.

$$S = \frac{\left(1000\frac{ng}{L}\right)(30L)}{1000\frac{ng}{\mu g} * 27.81\frac{\mu g}{\mu L}} = 1.08\mu L$$

STANDARD OPERATING PROCEDURE

VOLATILE ORGANIC COMPOUNDS BY GC/MS

VOC-8260B

Revision 8

August 22, 2006

Approved By:	Supervisor	Date
	QA Coordinator	Date
	Laboratory Manager	Date

1 Mustard Street, Suite 250
Rochester, New York 14609

Annual review of this SOP has been performed and the SOP still reflects current practice.
Initials: ______ Date: __________
Initials: ______ Date: __________
Initials: ______ Date: __________

DOCUMENT CONTROL
NUMBER: ______________
Initials: ______ Date: __________

*See DOD Summary Attachment for DOD Specific Criteria

1. SCOPE AND APPLICATION

This SOP is used to determine the concentration of volatile organic compounds (VOCs) in water and soil, sediment and sludge using USEPA methods 8260B, 5030B, and 5035A. Method 5035A is discussed in a separate SOP (VOC-5035A). The use of this method for low concentrations by SIM Mode is discussed in Attachment I. This method may also be applicable to various types of aqueous and nonaqueous waste samples. Appendix C of the Quality Assurance Manual (QAM) lists the compounds that are routinely determined by this method with the associated Method Reporting Limits (MRLs) and Quality Control Limits for water and soil matrices. The reported compound list and MRLs may be adjusted if required for specific project requirements and supported by a current Method Detection Limit (MDL) study. The method can quantitate most volatile organic compounds with a boiling point <200°C.

2. METHOD SUMMARY

2.1. This method gives gas chromatographic/mass spectrometric (GC/MS) conditions for the detection of parts per billion (ppb) levels of volatile organic compounds. A sample aliquot is injected into the gas chromatograph (GC) by the purge and trap method. The compounds are separated on a small bore fused silica capillary column. The compounds are detected by a mass selective detector (MSD), which gives both qualitative as well as quantitative information.

2.2. Lower MRLs can be achieved by purging a volume larger than the standard 5 mL discussed herein. With a larger purge volume (10 or 25 mL), all reporting limits listed in Appendix C of the QAM would become half or one-fifth the listed value, respectively. All internal, surrogate, and matrix spike solutions are prepared in the same manner discussed herein, but when spiked into a larger sample volume the actual concentrations are diluted by a factor of two or five, respectively. Since the initial and continuing calibration standards would also require a larger purge, the range of calibration is decreased by the appropriate factor.

2.3. In the purge and trap process an inert gas, helium, is bubbled through the sample aliquot, at room temperature. This gas stream sweeps the volatile organic compounds out of the aqueous phase and into the gas stream - it purges the compounds out of the sample. The gas stream then passes through a sorbent column which selectively adsorbs (traps) these compounds out of the helium. After the purging sequence is done, the sorbent column (the trap) is heated and backflushed onto the GC column. The GC column separates the compounds and passes then onto the MSD for identification and quantification.

2.4. Method Summary for SIM mode is discussed in Attachment I.

3. DEFINITIONS

3.1. **Analysis Window** - Samples are analyzed in a set referred to as "a window". The window begins with the injection of the tune verification standard. Standards, required QC samples and samples may be run for 12-hours in this window. A new window must be opened to continue analysis.

3.2. **Initial Calibration Curve** – analysis of analytical standards for a series of different specified concentrations; used to define the linearity and dynamic range of the response of the detector to the target compounds.

3.3. **Laboratory Control Sample (LCS) or Reference Standard** – An aliquot of analyte-free water or other blank matrix to which known quantities of analytes of interest from a second source are added in the laboratory. The LCS is analyzed the same as a sample. Its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate measurements. The LCS contains a full list of compounds. The LCS is evaluated for all client targets in the batch, however only a subset of compounds designated to represent the targets is typically reported.

3.4. **Matrix Spike/ Matrix Spike Duplicate Analysis (MS/MSD)** – An aliquot of a sample to which known amounts of compounds of interest from a second source are added in the laboratory prior to analysis. The MS/MSD are analyzed the same as a sample. The purpose of the matrix spike is to evaluate the effects of the sample matrix on the compounds determined by the analysis. Percent recoveries are calculated for each of the analytes detected. The relative percent difference between the samples is calculated and used to assess analytical precision. The concentration of the spike should be at 5-10 times the MRL or at levels specified by a project analysis plan. The LCS is evaluated for all of the targets for which the system is calibrated. Corrective action is taken if acceptance criteria is not met for targets in the client's target list.

3.5. **Method Blank (MB)** - A volume of analyte-free water treated and analyzed exactly the same as a sample. The purpose of the blank is to determine if any of the analytes of interest or other interferences are present in the analytical system, particularly in regards to carry-over of analytes from highly contaminated samples into other analyses.

3.6. **Percent Drift or Percent Difference (%D)** - Used to compare two values, the percent difference indicates both the direction and the magnitude of the comparison, i.e., the percent difference may be either negative, positive, or zero. (In contrast, see relative percent difference).

3.7. **% Relative Standard Deviation (%RSD):** statistical measure of variation. Used in this method to measure the relative variation of initial calibration standards. Calculated by dividing the standard deviation of the individual response factors by the average response factor and multiplying by 100 to express as a percentage.

3.8. **Relative Percent Difference (RPD)** – The absolute value of the difference of two values divided by the average of the same two values. Used to compare the precision of the analysis. The result is always a positive number.

3.9. **Surrogate** - Surrogates are organic compounds which are similar to the analytes of interest in chemical composition, and chromatography, but which are not normally found in environmental samples. The purpose of the surrogates is to help determine matrix effects and to evaluate the preparation and analysis of samples. These compounds were spiked into all blanks, standards, and samples prior to analysis. Percent recovery is calculated for each surrogate.

3.10. **Internal Standards** - Internal standards are organic compounds which are similar to the analytes of interest but which are not found in the samples. The chosen internal standards are used to calibrate the instrument's response.

3.11. **Batch** – group of samples (not to exceed 20) of the same matrix analyzed together within sequence. See ADM-BATCH for further discussion.

3.12. **Independent Calibration Verification (ICV)** - Verification of the ratio of instrument response to analyte amount. ICV solutions (also referred to as laboratory control samples or reference samples) are made from a stock solution which is different from the stock used to prepare calibration standards (Second Source).

3.13. **Continuing Calibration Verification Standard (CCV)** - A standard injected into the instrument at specified intervals and is used to verify the initial calibration. The source of this standard is the same as that used for calibration purposes.

3.14. **4-Bromofluorobenzene (BFB) Tune Standard** – 50 ng (on-column) of BFB (a solution in methanol) is analyzed to open an analysis window.

3.15. **Method Detection Limit (MDL):** a statistically derived value representing the lowest level of target analyte that may be measured by the instrument with 99% confidence that the value is greater than zero

3.16. **Method Reporting Limit (MRL):** The minimum amount of a target analyte that can be measured and reported quantitatively. The MRL is equivalent to Practical Quantitation Level (PQL) and Estimated Quantitation Level (EQL). Typically, the MRL is calculated as five times the MDL (although this is a rule of thumb and not intended to be a strict policy of establishing the MRL for a compound).

3.17. **Target Analyte** – a compound of interest for which the method is capable of measuring.

4. INTERFERENCES

Interferences include but are not limited to impurities in the inert purge gas, dirty plumbing/purge vessels, cross contamination of highly contaminated samples, in transport and storage, and carry over from one analysis to subsequent ones.

Avoid using non-PTFE thread sealants, plastic tubing, and rubber components, since such materials out-gas organic compounds, which will concentrate in the trap during, purge operation.

If a sample containing low concentration of VOCs is analyzed immediately after a sample containing high concentration of VOCs, a blank may be analyzed between samples to rinse the system and avoid carry-over. If samples are being injected using a syringe, the syringe should also be rinsed with sufficient volumes of methanol or DI between samples. Screening samples using the PID or Hnu may also be used to avoid injecting sample with high VOC concentration.

Storage blanks (cooler blanks) are placed in the coolers containing samples to be tested for VOCs. These blanks are prepared, held/sampled, and analyzed according to VOC-BLANK.

Trip blanks are collected with aqueous samples and carried through the sampling, handling, and storage to check for contamination of volatile compounds capable of diffusion such as methylene chloride and fluorocarbons.

5. SAFETY

Chemicals, reagents and standards must be handled as described in the CAS safety policies, approved methods and in MSDSs where available. Refer to the CAS Environmental, Health and Safety Manual and the appropriate MSDS prior to beginning this method.

The use of pressurized gases is required for this procedure. Care should be taken when moving cylinders. All gas cylinders must be secured to a wall or an immovable counter with a chain or a cylinder clamp at all times. Sources of flammable gases (e.g., pressurized hydrogen) should be clearly labeled.

Refer to the Safety Manual for further discussion of general safety procedures and information.

6. SAMPLE CONTAINERS, COLLECTION, PRESERVATIONS, AND STORAGE

6.1. All sample containers for VOC analysis are purchased precleaned and certified from major lab equipment suppliers. All containers should be of glass or amber glass and equipped with a screw top cap and PFTE (Teflon) lined septa and capable of containing a minimum of 40 mL of aqueous sample or 2-4 oz. of soil sample. New lots of vials are routinely checked for cleanliness and target compound contamination.

6.2. Aqueous Samples

6.2.1. Aqueous Samples should be collected (received) in 40 ml VOA vials with zero headspace. Samples should be preserved to pH <2 with hydrochloric acid (Because 2-chloroethylvinyl ether degrades in the presence of acid, it is recommended that samples are not preserved if this is compound of concern). Ideally, three VOA vials will be received for each sample. Samples will be refrigerated to 0-6°C upon sample login.

6.2.2. Aqueous sample bottles are slowly filled to just overflowing taking care not to flush out the preservative or to trap air bubbles in the samples. The bottles are sealed with PFTE lined septa toward the sample and inverted to check for air bubbles.

6.3 Soil Samples

Soil samples are collected per individual state, agency, or QAP requirements. See State Summary spreadsheet in VOA lab office for details. The following options are available:

6.3.1 Option 1:

Soil jars with PFTE lined septa are used to collect soil samples. The soil is pressed into the jar to the top to eliminate any headspace.(New York State). Holding time is 14 days from sample collection to analysis.

6.3.2 Option 2.

Encore style sampler and capsules are sent to the field and a fraction of either approximately 5 gm or 25 gm are collected by field personnel and shipped back to the laboratory, chilled to 0-6°C while in transit. The laboratory then has 48 hrs from sampling to preserve the soil fractions in DI water for the low concentration fractions and Methanol for high concentration fraction.

6.3.3 Option 3.

Soil vials are prepared by laboratory personnel. For each field sample, two 40 mL VOA vials, each containing a 5 mL solution of Sodium Bisulfate(1gm/5mL), are sealed, labeled and tarred. Another 40 mL VOA vial containing 10 mLs of Purge and Trap Methanol is sealed, labeled and tarred. A Top Loading balance, if necessary, is supplied to the field personnel and a 5 gm fraction is added to each of the three supplied vials. Optionally a Encore sampler may be used to sample these fractions, then added to the above mentioned vials. The field sampler then returns the fractions (40mL vials) back to the laboratory chilled to 0-6°C. At which time the lab weighs the vials to determine or confirm the soil content and must perform the analysis within 14 days of sampling. (See VOC-5035).

6.4 All samples (preserved waters and soils) must be stored at 0-6°C and must be analyzed within 14 days of collection. Aqueous samples not prepreserved with HCl must be analyzed within 7 days of collection. See SMO-GEN for further discussion of sample receipt and handling.

7. APPARATUS AND EQUIPMENT

7.1. See Appendix A of the Quality Assurance Manual for configuration of specific components, computer hardware and software, serial numbers and receipt of the major components of the instruments.

7.2. Gas chromatograph/Mass Selective Detector Systems

7.2.1. Gas Chromatograph - An analytical system complete with a temperature-programmable gas chromatograph suitable for splitless injection and all required accessories, including syringes, analytical columns, and gases.

7.2.2. GC Column Options:

- Hewlett Packard HP-624, 25 M, 0.2 mm ID fused silica, 1.12 micron film thickness, or equivalent;
- J&W DB624, 60 M, 0.32 mm ID fused silica, 1.8 micron film thickness, or equivalent;
- J&W DB624, 60 M, 0.25 mm ID fused silica, 1.0 micron film thickness, or equivalent;
- J&W DB624, 20 M, 0.18 mm ID fused silica, 1.0 micron film thickness, or equivalent.

7.2.3. Mass Spectrometer - HP5970B, HP5971, HP5972, or HP5973 - Capable of scanning from 35 to 300 amu every 2 second or less, using 70 volts (nominal) electron energy in the electron impact ionization mode.

7.2.4. Data System - A computer system interfaced to the mass spectrometer. The system allows the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic program. The computer has software (HP Chemstation) that can search any GC/MS data file for ions of a specific mass and that can plot such ion abundances versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). The software allows integrating the abundances in any EICP between specified time or scan-number limits. The most recent version of the EPA/NIST Mass Spectral Library should also be available.

7.3. Appropriate analytical balance (0.0001 g recommended for standard preparation and 0.01 g for sample weighing), volumetric flasks, syringes, vials, and bottles for standards preparation.

7.4. Purge and Trap with Autosampler

7.4.1. Each volatile GC/MS analytical system uses a purge and trap concentrator system to introduce the sample onto the GC column. Each purge and trap has an autosampler (A/S) attached to run multiple samples, one at a time, and run unattended for extended periods of time.

7.4.2. Varian Archon autosamplers – these autosamplers add both Internal Standards and Surrogate Standards automatically from two individual receptacles, removing some of the inconsistencies related to the repetitive analyst setup of the older autosampler technology. In turn, the sample and standard preparation vary for both methods 5030 and 5035 using these autosamplers. The preparation of both samples and standards for method 8260B by 5030 and 5035 will be addressed below.

7.4.3. Centurian autosamplers – these autosamplers add both Internal Standards and Surrogate Standards automatically from two individual receptacles, removing some of the inconsistencies related to the repetitive analyst setup of the older autosampler technology. In turn, the sample and standard preparation vary using these autosamplers. The preparation of both samples and standards for method 8260B waters will be addressed below.

7.4.4. Adsorbent Traps: Supelco K-Traps Carboxen Vocarb 3000.

7.5. PH indicator Paper – wide range – examples: pHydrion by Mikro 1-12 or EMD colorpHast 0-14.

7.6. See VOC-5035 for further equipment related to soil sample collection, preservation, and extraction.

8. PREVENTATIVE MAINTANENCE

Typical preventive maintenance measures include, but are not limited to, the following items:

- Check gas supply
- Change in-line filters, septum, gold seal, and injection port liner, as needed
- Clip column as needed
- Clean source

Specific instructions for these maintenance activities are found in the appropriate instrument manuals.

Maintenance log - All Preventive maintenance, as well as instrument repair, should be documented in the appropriate instrument maintenance log. Most routine maintenance and troubleshooting are performed by CAS staff. Other maintenance or repairs may, or may not require factory service, depending upon the nature of the task. Any maintenance performed by outside services must also be documented – either through notes in the log or through documents provided by the service. The log entries will include the date maintenance was performed, symptoms of the problem, serial numbers of major equipment upgrades or replacements. The datafile name of the first acceptable run after maintenance is to be documented in the maintenance log.

9. STANDARDS, REAGENTS, AND CONSUMABLE MATERIALS

9.1. Solvents must be of sufficient purity to permit usage without lessening the accuracy of the determination or introducing interferences. Solvents are to be checked for contamination before use. See ADM-CTMN.

- Methanol, purge and trap grade or equivalent. Purchased commercially. Store at room temperature for up to 3 years.

9.2. See VOC-5035 for preservatives.

9.3. **Standards storage and expiration** – All of the standards in this SOP are stored in the freezer and are allowed to warm to room temperature before using. Prepared standards expire one month from preparation or sooner if indicated by poor performance. Purchased standards expire upon manufacturer's indications or one month from opening, whichever is sooner. All ampulated gas standards expire upon manufacturer's indications or one month from opening. All dilutions made from the opened gas standard less than 100 ppb expire one week from preparation, unless verified against another source or continue to perform within 20%D of the initial calibration.

9.4. Standards Preparation General Information and Disclaimers

All of the preparation instructions are general guidelines. Other technical recipes may be used to achieve the same results. Example – a 20 mg/L standard may be made by adding 1 mL of 200 mg/L to 10 mLs or may be made by adding 4 mL of 50 mg/L to 10 mLs. The preparation depends upon the final volume needed and the initial concentration of the stock. Reasonable dilution technique is used.

The initial calibration curves given are typical, but also subject to variation due to targets and detection levels needed. The curves will always be at least 5 points. The lowest concentration level shall be at the method reporting level. The remaining levels should define the working linear range of the analytical system.

Vendors and vendors' products are sometimes listed for the ease of the analyst using this SOP, but products and purchased concentrations are examples only and subject to change at any time. All purchased standards are certified by the vendor. Certificates of Analysis are kept in the department until the standards are no longer being used – at which time they are archived with QA. Certificates of Analysis are available upon request. Purchased standards are routinely checked against an independent source for both analyte identification and analyte concentration.

All Standards must be traceable using the CAS lot system (ADM-DATANTRY).

All targets are routinely spiked in the LCS, MS, and MSD.

9.5. **Internal Standards and Surrogates** - The surrogates used are Dibromofluoromethane, toluene-d$_8$, 4-bromofluorobenzene, and 1,2-dichloroethane-d$_4$. The internal standards are pentafluorobenzene, 1,4-difluorobenzene, 1,4-dichlorobenzened$_4$ and chlorobenzene-d$_5$. All surrogates and internal standards are added to every standard, sample, blank and spike at 50 ug/L (5 ul of a 50 ppm working standard mix to 5.0 mL sample volume) for water and soils. The initial calibration standards have additional surrogate added to attain varied calibration concentration levels. 1,2-Dichlorethane-d4 is reported and evaluated only if requested, even though it is always added.

9.5.1. **Stock standards** (purchased) – used for both Archon and Centurian systems

9.5.1.1. Internal Standard Mix (2500 ug/mL) - Supelco 8260B Equity IS Mix.

9.5.1.2. Surrogate Mix (2500 ug/mL) –Ultra 8260B Surrogate Mix

9.5.2. **Centurian Intermediate and Working Standards (prepared)**

9.5.2.1. Centurian IS and Surr Intermediate Standards

9.5.2.1.1. Internal Standard Mix (500 ug/mL) – Dilute 1.0 mL of 2500 ug/mL Stock Internal Standard Mix to 5.0 mL with Methanol.

9.5.2.1.2. Surrogate Mix (500 ug/mL) – Dilute 1.0 mL of 2500 ug/mL Stock Surrogate Mix to 5.0 mL with Methanol.

9.5.2.2. Centurian IS and Surrogate Working standards (prepared)

9.5.2.2.1. Internal Standard Mix (50 ug/mL) – Dilute 500 uL of 500 ug/mL Internal Standard Mix to 5.0 mL with Methanol.

9.5.2.2.2. Surrogate Mix (50 ug/mL) – Dilute 500 uL of 500 ug/mL Surrogate Mix to 5.0 mL with Methanol.

9.5.2.2.3. Surrogate Mix (25 ug/mL) – Dilute 250 uL of 500 ug/mL Surrogate Mix to 5.0 mL with Methanol.

9.5.2.2.4. Combined Internal Standard/Surrogate Mix (50 ug/mL) – Dilute 500 uL of 500 ug/mL Intermediate Internal Standard Mix and 500 uL of 500 ug/mL Intermediate Surrogate Mix to 5.0 mL with Methanol.

9.5.3. Archon IS/Surr Working Standard (prepared)

9.5.3.1. Combined Internal Standard/Surrogate Mix (250 ug/mL) – Dilute 1 mL of 2500 ug/mL Internal Standard Stock and 1 mL of 2500 ug/mL Surrogate Stock to 10 mLs with methanol.

9.5.3.2. This solution is placed into an autosampler vial that acts as a reservoir for the autosampler. 1 uL is automatically added to each injection (5 mL) for a concentration of 50 ug/L. The sample or standard is transferred from the Archon through a nickel transfer line, past a ported valve that is calibrated to deliver 1 uL of IS/Surr mix. The sample fraction is transferred to a fritted sparge chamber on the Tekmar 2016 concentrator at which time the sample or standard is purged on to the absorbent trap.

9.6. **<u>Tune Standard</u>** (10 ug/L) – dilute 1 uL of 500 ug/mL Working Surrogate Standard (the Surrogate standard contains the BFB needed for the Tune) to 50 mLs with DI.

9.6.1. For Waters – place the whole vial on the system.

9.6.2. For Soils – place 5 mLs of the solution into a vial and place on the system.

9.7. <u>Preparation of Primary Standards for 8260B Full List Targets</u>

9.7.1. Full List Stock Standard Solutions

9.7.1.1. Targets/Gases/APP-MANN Stock Standards

- Supelco 8-61339 (2000 ug/mL) – purchased
- Supelco 4-8799-0 (2000 ug/mL) – purchased
- Supelco 86-1298 (various levels) – purchased

9.7.1.2. HSL Stock Standards

- Supelco 46831-u (2000 ug/mL)

- Chloroprene (2000 ug/mL) – Supelco 86-1145

- Acrolein (approximately 32000 ppm) – made from neat - exact concentration calculated from exact mass added (recorded to 0.1 mg).

9.7.1.3.Freons Plus Special Stock Standard

- Accustandard Primary Freons Custom 5-9219 (2000 ug/mL)
- 8260 Extras - Absolute 94237 (500-40000 ug/mL)

9.7.2. Full List Targets Working Solutions

9.7.2.1.Targets/Gases/App-MANN Higher Working solution (500-10000 ppm) – Dilute 1.25 mLs of each of the three Targets/Gases/App-MANN Stock solutions to 5.0 mLs with methanol.

9.7.2.2.HSL Working solution (500 ppm compounds and 2500 ppm acrolein) – Dilute 1.25 mLs of 2000 ppm Supelco 46831-u, 1.25 mLs of 2000 ppm chloroprene, and a volume (volume calculated to bring to desired concentration) of ~32000 ppm acrolein to 5.0 mLs with methanol.

9.7.2.3.Freons Plus Special Working Solution (500-40,000 ppm) – Dilute 1.25 mLs of 2000 ug/mL Freons Special Stock and 1.25 mL of 8260 Extras to 5.0 mLs with methanol.

9.7.2.4.Low Level Combined Working Solution – Dilute 10 uL of each of the above working solutions to 1.0 mLs with methanol.

9.7.3. Calibration Level Standards for waters by Archon (Example-varies by instrument)

Concentration of standard (VSTD)	0.5	1	2	5	10	20	50	100	150	200
Concentration of surrogate	50*	50*	50*	60	75	50*	50	100	150	200
Vol. Of low level combined working std.	5	10	20	0	0	0	0	0	0	0
Vol. of target/gases working std. (uL)	0	0	0	0.5	1	2	5	10	15	20
Vol. Of HSL working Std (uL)	0	0	0	0.5	1	2	5	10	15	20
Vol. Of Freons Special Std (uL)	0	0	0	0.5	1	2	5	10	15	20
Vol. Of 500 ppm Surrogate Stock (uL)	0	0	0	1	2.5	0	0	5	10	15

*Not used in the surrogate curve

Dilute the above volumes to 50 mLs with DI. Place each standard in its own vial. The Archon draws 5.0 mLs of the standard from the vial and adds 1 uL of the combined 50 ppm IS/Surr standard. Not all of the points are always used.

9.7.4. Calibration Level Standards for waters by Tekmar (Example-varies by instrument)

Concentration of standard (VSTD)	1	5	20	50	100	150	200
Final Concentration of surrogate (ppb)	50*	50*	20	50	100	150	200
Vol. of low level comb. working std. (uL)	10	0	0	0	0	0	0
Vol. Of targets/gases working std. (uL)	0	0.5	2	5	10	15	20
Vol. Of HSL working Std (uL)	0	0.5	2	5	10	15	20
Vol. Of Freons working Std (uL)	0	0.5	2	5	10	15	20
Vol. Of 500 ppm Surrogate Stock (uL)	0	0	2	0	5	10	15
Vol. Of 50 ppm IS stock (uL)	0	0	5	0	0	0	0

*Not used in the surrogate curve

Dilute the volumes above to 50 mLs with DI. Remove a 5.0 mL aliquot and add 5.0 uL of 50 ppm combined IS/Surr stock to all except the 20 ppb standard which already had the Internal Standards and Surrogates added. Purge 5.0 mLs.

9.7.5. Calibration Level Standards for Soils by Archon (Example-varies by instrument)

Concentration of standard (VSTD)	5	10	20	50	100	150	200
Concentration of surrogate	50*	50*	75	50	100	125	150
Vol. Of low level combined working std.without Freons (uL)	50	100	0	0	0	0	0
Vol. of target/gases working std. (uL)	0	0	2	5	10	15	20
Vol. Of HSL working Std (uL)	0	0	2	5	10	15	20
Vol. Of 500 ppm Surrogate Stock (uL)	0	0	2.5	0	5	7.5	10

*Not used in the surrogate curve

Dilute the above volumes to 50 mLs with DI. Transfer 5.0 mLs each standard to separate vials. The Archon adds 1 uL of the combined 50 ppm IS/Surr standard to the vial of the aqueous standard and purges directly in the vial. Not all of the points are always used.

When calibrating for the analysis of soils by 5035/8260B, the standard solution above must contain the same amount of Sodium Bisulfate as the samples being analyzed.

9.8. Preparation of Secondary Standards for 8260B Full List Targets

9.8.1. Secondary Stock Standards

9.8.1.1. Secondary Targets/Gases

- Supelco 8-561298 – purchased
- Supelco 4-58799- purchased
- Supelco 8-561339 – purchased

9.8.1.2. Secondary HSL

- Supelco 456831-U- purchased
- Supelco 85561145 – purchased
- Acrolein – made from a second source of neat acrolein.

9.8.1.3. Secondary Freons

- Absolute 93034 (1000 ppm) – purchased
- Absolute 94236 8260B Extra Compound SS (2000-40,000).

9.8.2. Working Standards

- Secondary Targets/Gases (500-10,000 ppm)- Dilute 1.25 mLs of each of the Target/Gases purchased standards to 5.0 mL with methanol.

- Secondary HSL (500-2500 ppm) – Dilute 1.25 mLs of each of the purchased HSL standards and 0.390 mLs of the acrolein standard to 5.0 mLs with methanol.

- Secondary Freons Plus – Dilute 1.0 mL of 93034 (SS Freons – 1000 ppm) purchased standard and 94236 (SS Extras 2000-40000 ppm) standard to 5.0 mLs with methanol.

9.8.3. **ICV (50 ppb)**– Dilute 5.0 uL of Secondary Target/Gases Working stock, 5.0 uL of Secondary HSL Working Stock, and 12.5 uL of Secondary Freons Plus working stock to 50.0 mLs with DI.

9.8.4. **LCS (20 ppb)**- Dilute 2.0 uL of Secondary Target/Gases Working stock, 2.0 uL of Secondary HSL Working Stock, and 5 uL of Secondary Freons Plus working stock to 50.0 mLs with DI.

9.8.5. **MS/MSD (50 ppb)**- Add 5.0 uL of Secondary Target/Gases Working stock, 5.0 uL of Secondary HSL Working Stock, and 12.5 uL of Secondary Freons Plus working stock to 50.0 mLs of sample.

9.8.6. **Method Blank** – Analyze DI as a sample.

10. RESPONSIBILITIES

10.1. It is the responsibility of the analyst to perform the analysis according to the instructions in this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are only to be performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.

11. PROCEDURE

11.1. Be sure the system has a current MDL and the analyst has a current Demonstration of Capability.

11.2. Sample Preparation –samples are screened according to VOC-SAMPL.

11.2.1. Water Samples

11.2.1.1. No preparation is generally required, other than dilution with reagent water to bring analytes into the upper half of the calibration range. Thus, a 5.0 mL sample volume is run straight from the sample vial for a 5.0 mL purge. Other purge volumes (10, 25 mLs for low level) may be used depending on client requirements.

11.2.1.2. After analysis, the pH of all water samples are to be checked with pH paper. The pH shall be noted in the run log. If the pH is not <2, file a pH discrepancy form and give to the Project Manager.

11.2.1.3. Samples requiring dilutions due to targets above the linear range of the instruments are prepared as follows according to ADM-DIL:

11.2.1.3.1. (1/5) = 10 mL sample adjusted to 50 mL in a 50 mL ground glass graduated cylinder inverted once and transferred to a 40 mL VOA vial

11.2.1.3.2. (1/25) = 2.0 mL sample adjusted to 50 mL in a 50 mL ground glass graduated cylinder inverted once and transferred to a 40 mL VOA vial

11.2.1.3.3. (1/50) = 1.0 mL sample adjusted to 50 mL in a 50 mL ground glass graduated cylinder inverted once and transferred to a 40 mL VOA vial

11.2.1.4. Internal standards and surrogates are added to the diluted sample by the autosampler.

Note: At no time should less than 1 mL of the original sample fraction be used for the preparation of the diluted sample. This insures a representative fraction of sample is diluted.

11.2.2. Soil samples

11.2.2.1. Follow VOC-5035 for preparation of soils by 5035.

11.2.2.2. 5.0g ± 0.05 g weighed on a certified top-loading balance or equivalent. Record the weight to two decimal places.

11.3. Instrument Performance Check –Tuning

11.3.1. Verify than the MS meets standard mass spectral abundance criteria prior to initiation of any samples by injecting the 4-bromofluorobenzene (BFB) tune standard. The tune standard must be analyzed at the beginning of the analytical sequence and every 12-hours of continuous analysis. The 12-hour clock starts at the time of the BFB injection. Evaluate the ion abundance using the following scenarios:

11.3.1.1. One scan at the apex, or one scan immediately preceding the apex or one scan immediately following the apex;

11.3.1.2. The mean of the apex and the immediate preceding or following scans;

11.3.1.3. The mean of the apex, immediately preceding scan, and immediately following scan;

11.3.1.4. Any of the three scenarios above with background subtraction. If background subtraction is necessary, a single scan, no more than 20 scans prior to the elution of BFB may be used. Do not background subtract part of the BFB peak.

11.3.2. Each volatile GC/MS system must meet the BFB ion abundance criteria shown in Table 1 for a 50 ng injection of BFB.

11.3.3. If tuning criteria cannot be met, the source may need cleaning, filaments replaced or other maintenance. Record the corrective action taken in the run log or maintenance log and re-inject the tune standard. Sample analysis may not proceed until the tune meets these criteria.

11.4. Initial Calibration – follow the CAS ICAL Policy for Organic Analytes.

11.4.1. Tune the instrument according to 11.3.

11.4.2. Run an instrument blank to demonstrate that the instrument is free of contamination before analyzing the standards.

11.4.3. A 5 point calibration <u>must</u> be analyzed. More points can be used for better response. The standards must be analyzed the same as the samples (example: if samples are to be heated, the standards are to be heated). Calibration levels are given in Section 9 depending on the client requirements. Analyze each calibration standard and tabulate the area response of the characteristic quantitation ions versus concentration for each compound, internal standards and surrogate. The low level standard used during calibration shall be the reporting level for the analysis. The midpoint standard of the initial calibration curve establishes the retention time window position for each analyte and surrogate.

11.4.4. The internal standards should permit most of the components of interest in a chromatogram to have retention times of 0.80 - 1.20, relative to one of the internal standards. Use the base peak ion from the specific internal standard as the primary ion for quantitation (see instrument specific addendum - attached). If interferences are noted, use the next most intense ion as the quantitation ion.

11.4.5. Calculate the response factors (RF) for each compound and surrogate relative to the specified internal standard by:

$$RF_x = \frac{(A_x)\,(C_{ISTD})}{(A_{ISTD})\,(C_x)}$$

Where:

A_x = Area of the characteristic quantitation ion for compound x.
A_{ISTD} = Area of the characteristic quantitation ion for the specified internal standard.
C_x = The concentration of the compound added (ppb).
C_{ISTD} = The concentration of the specified internal standard (ppb).

11.4.6. Calculate the mean response factor $(\overline{RF_x})$ for each analyte and surrogate from the calibration levels. Calculate standard deviation (SD) and the percent relative standard deviations (%RSD) for each analyte from the mean with:

$$SD = \sqrt{\sum_{i=1}^{N} \frac{(RF_i - \overline{RF})^2}{N - 1}}$$

where:
RF_i= RF for each of the 5 calibration levels
RF= mean of 5 initial RFs for a compound.
N = Number of RF values (i.e., 5)

$$\%RSD = \frac{(SD)}{(\overline{RF_x})} 100.$$

where:
RSD = relative standard deviation.
RF = mean of 5 initial RFs for a compound.
SD = standard deviation of average RFs for a compound.

11.4.7. Initial Calibration criteria

11.4.7.1. The % RSD should be less than 15% for each target compound. If the %RSD of any target is greater than 15%, see the options below.

11.4.7.2. If the % RSD for any target compound is 15% or less, linearity can be assumed over the calibration range, and the relative response factor for each analyte and surrogate is used to quantitate sample analytes.

11.4.7.3. If the % RSD of any compound is > 15%, construct a linear regression calibration curve of area ratio (A/A_{is}) versus concentration using the equation of a line ($y=mx+b$). The origin may not be used as a calibration point and the required Correlation Coefficient must be ≥ 0.990*. If the Calibration Correlation is not met, linear regression may not be used to quantitate the target. See the option below. It is good lab practice to mark all target compounds on a curve to identify target compounds calculated using linear regression.

11.4.7.4. The response of 5 SPCC's (System Performance Check Compounds) must meet the following minimum $\overline{RF}_x$:

SPCC	**5 mL purge**	**25 mL purge**
Chloromethane	>0.10	>0.010
1,1-Dichloroethane	>0.10	>0.200
Bromoform	>0.10	>0.05
Chlorobenzene	>0.30	>0.500
1,1,2,2-Tetrachloroethane	>0.30	>0.100

11.4.7.5. Initial Calibration Verification Standard (ICV)- inject and analyze the ICV to verify the initial calibration immediately after the calibration. The % recovery must meet 70-130%* for all compounds.

11.4.8. Only after the calibration has passed all of the above criteria shall samples be analyzed.

11.5. Daily GC/MS Calibration and Analytical Sequence

11.5.1. The start of a 12-hour analysis window requires a check of the Mass Spec Detector's tune via an injection of 50 ng of BFB. The acceptance criteria must be met before client samples are analyzed.

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*See DOD Summary Attachment for DOD Specific Criteria

11.5.2. CCV –

11.5.2.1. Frequency - After the tuning criteria have been verified, the initial calibration must be checked and verified by analyzing a midrange Continuing Calibration Verification Standard (CCV).

11.5.2.2. Concentration - The 50 ppb level is recommended. NELAC requires this calibration check standard to vary in concentration over time. An injection of the CCV and LCS standards shall satisfy this requirement as long as the standards are two different concentrations.

11.5.2.3. Limits and Corrective Action-

11.5.2.3.1. Each SPCC compound must meet it's minimum RF (see above). This is the same check that is applied to the initial calibration. If these criteria are not met, correct the problem and obtain a compliant CCV or recalibrate before sample analysis begins.

11.5.2.3.2. The CCC compounds listed previously are used to check the validity of the initial calibration. Calculate the %D for each compound using the calculations below. The %D for each CCC must meet ≤ 20% for the initial calibration to be valid.

11.5.2.3.2.1. For **linear regression calibrations** , calculate the percent drift using:

$$\%\ Drift = \frac{C_c - C_T}{C_T} \times 100$$

where:

C_c = Calculated concentration of Calibration Check Compound standard.

C_T = Theoretical concentration of prepared standard.

11.5.2.3.2.2. For **calibrations based on RF**, calculate the percent difference using:

$$\%\ Difference = \frac{RF_v - \overline{RF}}{\overline{RF}} \times 100$$

where RF_v is the response factor from the analysis of the verification standard and $\overline{RF}$ is the mean response factor from the initial calibration.

11.5.2.4. If the CCC compounds are not included in the initial calibration, all compounds must meet the ≤ 20% criteria.

11.5.2.5. For all other TCL compounds, the %D should meet ≤25%. Two compounds may be greater than 25%D, however must not exceed 40%D for analysis to continue. It is good lab practice to maintain ≤20%D when a compound is positive in a sample to ensure accurate quantitation, but not required.*

11.5.3. Internal Standards - If the tune criteria and the continuing calibration criteria are met, then evaluate the retention times of all compounds, surrogates, and internal standards against the initial calibration. If the retention time for any internal standard changes by more than 30 seconds from the current initial calibration mid-point standard, the system must be inspected for malfunctions and corrections must be made, as required. If the area for any of the internal standards changes by a factor of 2 (-50% to +100%) from the current initial calibration mid-point std., corrections must be made to the system. Reanalyze any samples associated with malfunctioning system.

11.5.4. Analyze the LCS. Evaluate the LCS according to the instructions in 12.

11.5.5. Analyze a method blank to check the system for contamination. Evaluate the MB according to the instructions in 12.

11.5.6. When all of the above criteria are met, client sample analysis may begin.

11.5.7. When purging 25 mL sample volumes to obtain lower detection limits, criteria from the EPA Statement of Work, OLC 02.1 shall be followed. See Table 3.

11.6. Identification of Analytes and Data Interpretation, and Client Sample Analysis

11.6.1. Note that medium soils (prepared by method 5035) are run on water curves on any autosampler. Client samples are analyzed on an instrument running an appropriate calibration for the target compound list needed for the sample.

11.6.2. The qualitative identification of compounds determined by this method is based on retention time, and comparison of the sample mass spectrum, after background correction, with characteristic ions in a reference mass spectrum. The reference mass spectrum must be generated by the laboratory using the conditions of this method. The characteristic ions from the reference mass

*See DOD Summary Attachment for DOD Specific Criteria

spectrum are defined to be the three ions of greatest relative intensity, or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds should be identified as present when the criteria below are met. If there is no peak found for an analyte in the expected retention time window and the mass spectra does not match according to the below, then the analyte is "not found".

11.6.2.1. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion.

11.6.2.2. The RRT of the sample component is within ± 0.06 RRT units of the RRT of the standard component.

11.6.2.3. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum.

11.6.2.4. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is less than 25% of the sum of the two peak heights. Otherwise, structural isomers are identified as isomeric pairs.

11.6.2.5. Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks obviously represent more than one sample component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra is important.

11.6.2.6. Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification of compounds. When analytes coelute (i.e., only one chromatographic peak is apparent), the identification criteria can be met, but each analyte spectrum will contain extraneous ions contributed by the coeluting compound.

11.6.3. For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification.

11.6.4. If the response for any quantitation ion exceeds the initial calibration curve range of the GC/MS system, dilute the sample (from a fresh vial if available) according to section 11.2 and ADM-DIL. If a fresh vial is not available, the use of a compromised vial must be documented in the runlog and on the case narrative (by use of a NCAR – see ADM-NCAR).

11.6.5. If the detector becomes saturated from a high concentration sample run a blank after the sample to demonstrate the instrument is free from carry-over. If there is contamination, take corrective action. The instrument must be demonstrated to be free from contamination before analysis may continue.

12. QA/QC REQUIREMENTS

12.1. **Method Blank** - For every 12-hour analysis window and for each analytical batch, after meeting the tune and continuing calibration criteria, at least one method blank must be run and reportable for each matrix. All blanks reported must be free from target analytes with the exception of known common laboratory contaminants. Acetone and Methylene Chloride must not be present at a level greater than 5 times the MRL and all samples affected should be marked with the appropriate lab flag. Method blanks are considered free of contamination if the result is less than half of the reporting limit. Reanalyze the MB until the system is shown to meet these criteria. Reanalyze any samples associated with a non-compliant method blank.

Exception: if a target analyte is greater than ten times the method blank contaminant, the analysis may continue since the sample concentration is high enough that possible contamination has not significantly affected its concentration.

12.2. **LCS-**

12.2.1. **Frequency** - With each batch of samples (20 samples maximum), a minimum of one LCS for each matrix must be analyzed to ensure instrument performance. When batches are less than 20 samples, the LCS is performed on a per batch basis. The LCS is prepared by spiking a blank with the matrix spike solution, and going through the entire extraction and analysis. LCSs may be analyzed in duplicate to avoid discarding a sequence due to mishaps such as poor desorption, improper standard preparation, or poor injection. In order to be considered as duplicates, LCSs must be run together without samples or other QC in between. When duplicate LCSs are analyzed within the sequence, the following acceptance criteria have been established:

12.2.1.1. When the first LCS of the duplicate pair meets LCS criteria, this LCS is reported and used to verify continued performance. Continue with the sequence. The second is not evaluated or reported.

12.2.1.2. When the first LCS of the duplicate pair does not meet the LCS criteria and the second LCS does meet LCS criteria, the second LCS is reported and used to verify continued performance. If known, the cause of the first failure should be noted in the run log. Continue with the sequence. The first LCS is not reported.

12.2.1.3. When some or all compounds are outlying within the first or second or both LCSs, the results shall not be merged to report an acceptable LCS. If the outliers are high bias and the associated samples prior to and following the LCS are non-detect for those compounds, the LCS may be used to verify the performance and reported with the high bias. Otherwise the sequence is not valid since the LCS cannot be used to close the previous samples or open for the following samples. The unacceptable LCS and associated samples shall be reanalyzed.

12.2.2. **Acceptance Criteria** -

12.2.2.1. Calculate percent recovery (%R) as follows:

$$\%R = X/TV \times 100$$

Where: X = Concentration of the analyte recovered
TV = True value of amount spiked

12.2.2.2. Acceptance criteria for lab control samples are listed in Appendix C of the Quality Assurance Manual*.

Exceptions:. Client-specific QAPP requirements also may superceed lab control limits listed in Appendix C of the Quality Assurance Manual.

12.2.3. **Corrective Action** - If the LCS recovery for any control analyte* fails acceptance limits, corrective action is required except as described below. If instrument corrective action is not applicable or ineffective, re-analysis of the associated samples is required. If any other analyte fails the acceptance limits, the analyst must evaluate the impact on data quality and take any necessary corrective action, which may include re-analysis of the associated samples. Project-specific requirements may require all

*See DOD Summary Attachment for DOD Specific Criteria

compounds to be treated as control analytes, or dictate use of project acceptance criteria.

12.2.4. Sample analysis may continue under the following circumstances when controlled compound* recoveries fall outside the control limits listed in Appendix C of the Quality Assurance Manual.

- High outlying recovery associated with a non-detect sample result since the high bias would have negligible effect on non-detect sample results.
- Reanalysis would result in a worse quality scenario such as holding time issues or insufficient sample volume.
- Low outlying recoveries associated with non-detect sample results as long as the response factors for these compounds are adequate to show the compound's presence in the sample.

12.3. MS/MSD –

12.3.1. **Frequency** - For each batch of samples (20 samples maximum), a minimum of one MS/MSD pair for each matrix must be analyzed to assess sample matrix and to ensure instrument performance. If there is not enough sample to process MS/MSD, a Blank Spike and Blank Spike Duplicate will be processed to show precision in the batch. See below.

12.3.2. **Recovery Limits** - The limits for MS recovery and MS/MSD RPD are given in Appendix C of the Quality Assurance Manual*.

12.3.3. **Recovery Corrective Action** -

12.3.3.1. Although all targets are evaluated, only the method specific compounds (1,1-Dichloroethene, trichloroethene, benzene, toluene, and chlorobenzene) are typically reported from the MS/MSD analyses. The results of the MS/MSD analysis is used for client assessment of sample matrix and is not used to control the analysis. Outlying MS/MSD recoveries associated with an acceptable LCS may indicate sample matrix interferences, but does not warrant reanalysis or confirmation. All data shall be reported with the appropriate flags or mentioned in the Case Narrative.

12.3.3.2. If the MS/MSD does not pass precision or accuracy requirements, evaluate the associated LCS. If the LCS passes QC requirements it is presumed that matrix has affected the

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*See DOD Summary Attachment for DOD Specific Criteria

spiked samples and the run may continue. If the concurrent LCS fails for the same compound or any other compound the validity of the LCS should be examined and any samples prior to the LCS and after the last CCV should be reanalyzed, including the MS/MSD.

12.3.4. **RPD Limits** – given in Appendix C of the Quality Assurance Manual

12.3.5. **RPD Corrective Action** - if the RPD value between samples or MS/MSD results exceed limits listed in Appendix C of the QAM, examine the chromatograms and benchsheets for potential matrix interferences. Examples may include product layers on aqueous samples that may result in non-homogenous subsampling, non-homogenous soil samples, chromatographic interferences resulting in poor peak resolution and inconsistent integrations, or poor purging efficiencies (indicated by surrogate recovery). Reanalyze the pair if deemed appropriate. The outlying RPD should be mentioned in the Case Narrative so that data may be flagged appropriately.

12.4. **BS/BSD** – (Blank Spike/Blank Spike DUP) - only run when there is insufficient sample for MS/MSD at the MS/MSD frequency. The RPD must meet RPD limits listed for the MS/MSD. If it does not, the outlying RPD must be mentioned in the case narrative.

12.5. **Calibration** - The acceptance criteria for tuning verification, initial, and continuing calibration verification are discussed in the procedure (Section 11).

12.6. **Surrogates and Internal Standards** –

12.6.1. **Frequency** – Added to all injections

12.6.2. **Acceptance Criteria** - The limits for surrogate recovery is given in Appendix C of the Quality Assurance Manual. Dichlorethane-d4 is evaluated and reported only if requested. The limit for internal standards is (-50% to 100%).

12.6.3. **Corrective Action** - When instances of Surrogate or internal area count failures occur, the associated sample is repeated and the results are compared. If the questioned samples fail a second analysis, the first run is reported to the client and the sample flagged with an "*" indicating a probable matrix interference exists. In the case where Tier package work is required and the appropriate forms need to be generated, the second analytical analysis is also reported to the client. If the second analysis passes, report these data.

12.6.4. If a surrogate(s) fails acceptance, the sample must be evaluated for matrix interferences and "historical results". Reanalyze the sample to confirm the interference. If needed contact client and flag the data in the report. If surrogates are diluted more than 10 times, report as "D", diluted below calibration. For package reports, include initial and confirmation analysis results. High outlying recoveries associated with non-detect sample results need not be reanalyzed. They need only be noted in the case narrative as high bias with non-detect results.

13. DATA REDUCTION AND REPORTING

13.1. Calculations

The GC/MS data stations, in current use, all use the H-P RTE Integrator to generate the raw data used to calculate the standards $\overline{RF_x}$ values, the sample amounts, and the spike values. The software does three passes through each data file. The first two identify and integrate each internal standard and surrogate. The third pass uses the time-drift information from the first two passes to search for all method analytes in the proper retention times and with the proper characteristic quantitation ions. The primary and secondary quantitation ions are given in Table 2. The internal standard with which the analytes are associated changes with each column and is documented in the Initial Calibration Summary Report. The current associations per instrument are attached to this SOP in the Instrument Specific Addendum.

13.1.1. The results for a water sample are calculated as follows when $\overline{RF_x}$ is used:

$$A_x = \frac{(Resp_x)(Amt_{ISTD})}{(Resp_{ISTD})(\overline{RF_x})} \times DilFactor$$

Where:
A_x = the amount, in ppb, of the analytes in the sample;
$Resp_x$ = the peak area of the analytes of interest;
$Resp_{ISTD}$ = the peak area of the associated internal standard;
Amt_{ISTD} = the amount, in ppb, of internal standard added; and
$\overline{RF_x}$ the average response from the five-point for the analytes of interest.

13.1.2. The results for a soil sample are broken into two types, the low-level type and the high-level type.

13.1.2.1. The low-level type is a direct heated purge of soil and requires its own separate five-point. For soil, 5 grams is weighed out into the sample vial, and is purged with 5 mL of blank reagent water at a temperature of 40°C ±2°. The results for low-level soil work are calculated by taking the normal print out, in ppb, (see the water results outlined above) and correcting for the total, dry soil sample actually purged (the dry weight is determined according to GEN-DWPS in the General Chemistry Department and the 8260 correction is made in LIMS):

$$(A_x) * \frac{(5\ grams)}{(ASW_t\ gr)(\%\ Solids)} = A_x\ Low\text{ - }Level\ Soil$$

Where:
A_x = the amount, in ppb, from the data station;
5 grams = the nominal amount of soil that is heated and purged;
ASW_t = the actual soil wet weight, in grams, that is purged
% Solids = the correction factor for dry weight in decimal form.

13.1.2.2. The high-level type is based on an extraction (see VOC-5035). In general, a four-gram wet weight of soil is extracted with 10 mL of purge-and-trap methanol. A 100 ul aliquot of this extract is run against the results for a high-level soil extract are calculated as follows:

$$(A_x) * \frac{(Dilution)(5\ ml)}{(ASW_t)(\%\ Solids)} = A_x\ High\text{ - }Level\ Soil\ Amt.$$

Where:
A_x = the data station results, in ppb;
Dilution = the dilution of the extract.
5 mL = the amount of methanol used to extract the soil;
ASW_t = the actual wet weight of soil extracted
% Solids = the dry soil correction in decimal form.

It should be noted that some states and governing agencies require differing amounts of soil and Methanol ratio be maintained these ratios are generally, 1:2.5, 1:2, 1:1. The amount of extract added is never greater than 100 ul per 5 mL DI. As an example, the Archon autosampler would require the addition of 1.0 mL to 49 mL DI. This is then transferred to a 40 mL VOA vial. See the included table in method 5035 for specific state regulation on soil to Methanol ratios.

13.2. All sample data and QC data, including calibration verification must reference the name (date or filename) of the ICAL on the raw data report.

13.3. Manual Integration – When the data system incorrectly quanititates or identifies analytes, manual integration is necessary. Data must be integrated consistently between standards, samples, and QC. See ADM-INT.

13.4. Reporting

Most reports are generated using STARLIMS. All data is transferred electronically from the instrument into STARLIMS. The data is reviewed by a qualified peer with applicable checklists (see ADM-DREV) before the data is acceptable and able to be reported to the client.

14. METHOD PERFORMANCE

Reporting limits are based upon an MDL study performed according to ADM-MDL and filed in the MDL binders in the QA office.

Demonstration of Capability is performed upon instrument set-up , whenever a new analyst begins independent analysis, and annually thereafter according to ADM-TRANDOC and section 19 below. The documentation of this method performance is retained by the Quality Assurance office

Accuracy and Precision Data is available in SW-846 method 8260B.

15. WASTE MANAGEMENT AND POLLUTION PREVENTION

15.1. It is the laboratory's practice to minimize the amount of solvents, acids and reagent used to perform this method wherever feasible. Standards are prepared in volumes consistent with methodology and only the amount needed for routine laboratory use is kept on site. The threat to the environment from solvent and reagents used in this method can be minimized when recycled or disposed of properly.

15.2. The laboratory will comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the CAS EH&S Manual.

15.3. Excess, unused sample and testing byproducts are disposed following the procedures in the *SMO-SPDIS.*

16. CORRECTIVE ACTION FOR OUT OF CONTROL DATA

If data is produced that is out of control, the samples are to be re-analyzed with in-control QA whenever possible. See corrective actions in Section 12 of this SOP and in the applicable Figures in Section 12 of the Quality Assurance Manual.

17. CONTINGENCIES FOR HANDLING OUT OF CONTROL OR UNACCEPTABLE DATA

If data is produced that is out of control and is not to be re-analyzed due to sample volume restrictions, holding times, or QC controls can not be met, follow the procedures in Section 15 of the Quality Assurance Manual.

18. REFERENCES

18.1. *Test Methods for Evaluating Solid Waste Physical/Chemical Methods,* USEPA SW-846, Third Edition, December 1996.

19. TRAINING OUTLINE

19.1. Read current SOP and applicable methodologies. Demonstrate a general understanding of the methodology and chemistry. Follow policies in ADM-TRANDOC.

19.2. Observe Sample Preparation and Analysis. Follow GC/MS Training Plan Form.

19.3. Participate in the methodology, documentation, and data reduction with guidance

19.4. Demonstrate Competency by performing the analysis independently. Analyze four replicates of the LCS. If recovery is within the limits of the LCS in Appendix C of the Quality Assurance Manual, complete Training Plan Form, summary spreadsheet, and IDC certificate and file with QA. An IDC study must be acceptable before the new analyst may analyze samples independently. Continuing Demonstration of Capability is demonstrated annually with the acceptable performance of a Proficiency sample, or new four replicate study.

20. METHOD MODIFICATIONS

None

21. INSTRUMENT-SPECIFIC ADDENDUM

Attached are the printouts from the GC/MS instruments running 8260B showing which analytes are associated with which internal standard. The instrument is the third item in the first line (Data File) of the report. Example: Data File: J:\ACQUDATA\MSVOA#. The internal standards are the first compound in each section (always have an AvgRF and CCRF of 1.000) and the associated analytes are listed below the internal standard.

22. ATTACHMENTS

Table 1	BFB Tune QC Criteria
Table 2	Characteristic Masses for Purgeable Organic Compounds
Attachment I	SIM MODE
Attachment II	CURRENT IS/ANALYTE ASSOCIATIONS PER INSTRUMENT
Attachment III	DOD Summary and QC Criteria

23. CHANGES FROM PREVIOUS REVISION

- Updated DoD requirements to QSM V3 throughout
- 7-Added column option – 60M, 0.25 mm ID, 1 micron.
- 7-Added paragraph describing Centurian
- 8-Updated maintenance – added need to change gold seal – eliminated references to guard columns and jet separators.
- Throughout - Removed references to Tekmar since the Tekmars are no longer being used
- 9-Changed the Tekmar IS and Surr standards prep to Centurian
- 9-Changed the tune standard from 1 ug/L to 10 ug/L.
- 9-Updated the manufacturer's standards used
- 11-Eliminated the grand mean option and the associated 30% RSD ICAL criteria for CCCs.
- 11-Added the minimum $\overline{RF_x}$ for 25 mL purge SPCCs to table in 11 instead of referencing the attached Table 3 from QLC02.1. Eliminated Table 3.
- 12-Added BS/BSD
- Incorporated the SIM Mode Addendum into the SOP in an Attachment.

TABLE 1

4-BROMOFLUOROBENZENE CHARACTERISTIC ION ABUNDANCE CRITERIA

Mass/é ratio	Ion Abundance Criteria
50	15 - 40% of mass/é 95
75	30 - 60% of mass/é 95
95	base peak, 100% relative abundance
96	5 - 9% of mass/é 95
173	<2% of mass/é 174
174	>50% of mass/é 95
175	5 - 9% of mass/é 174
176	>95%; <101% of mass/é 174
177	5 - 9% of mass/é 176

*See DOD Summary Attachment for DOD Specific Criteria

Table2

CHARACTERISTIC MASSES (m/z) FOR PURGEABLE ORGANIC COMPOUNDS

Compound	Primary Characteristic Ion	Secondary Characteristic Ion(s)
Acetone	58	43
Acetonitrile	41	40, 39
Acrolein	56	55, 58
Acrylonitrile	53	52, 51
Allyl alcohol	57	58, 39
Allyl chloride	76	41, 39, 78
Benzene	78	-
Benzyl chloride	91	126, 65, 128
Bromoacetone	136	43, 138, 93, 95
Bromobenzene	156	77, 158
Bromochloromethane	128	49, 130
Bromodichloromethane	83	85, 127
Bromoform	173	175, 254
Bromomethane	94	96
iso-Butanol	74	43
n-Butanol	56	41
2-Butanone	72	43
n-Butylbenzene	91	92, 134
sec-Butylbenzene	105	134
tert-Butylbenzene	119	91, 134
Carbon disulfide	76	78
Carbon tetrachloride	117	119
Chloral hydrate	82	44, 84, 86, 111
Chloroacetonitrile	48	75
Chlorobenzene	112	77, 114
1-Chlorobutane	56	49
Chlorodibromomethane	129	208, 206
Chloroethane	64 (49*)	66 (51*)
2-Chloroethanol	49	44, 43, 51, 80
Bis(2-chloroethyl) sulfide	109	111, 158, 160
2-Chloroethyl vinyl ether	63	65, 106
Chloroform	83	85
Chloromethane	50 (49*)	52 (51*)
Chloroprene	53	88, 90, 51
3-Chloropropionitrile	54	49, 89, 91
2-Chlorotoluene	91	126
4-Chlorotoluene	91	126
1,2-Dibromo-3-chloropropane	75	155, 157
Dibromochloromethane	129	127
1,2-Dibromoethane	107	109, 188
Dibromomethane	93	95, 174

*See DOD Summary Attachment for DOD Specific Criteria

Compound	Primary Characteristic Ion	Secondary Characteristic Ion(s)
1,2-Dichlorobenzene	146	111, 148
1,2-Dichlorobenzene-d_4	152	115, 150
1,3-Dichlorobenzene	146	111, 148
1,4-Dichlorobenzene	146	111, 148
cis-1,4-Dichloro-2-butene	75	53, 77, 124, 89
trans-1,4-Dichloro-2-butene	53	88, 75
Dichlorodifluoromethane	85	87
1,1-Dichloroethane	63	65, 83
1,2-Dichloroethane	62	98
1,1-Dichloroethene	96	61, 63
cis-1,2-Dichloroethene	96	61, 98
trans-1,2-Dichloroethene	96	61, 98
1,2-Dichloropropane	63	112
1,3-Dichloropropane	76	78
2,2-Dichloropropane	77	97
1,3-Dichloro-2-propanol	79	43, 81, 49
1,1-Dichloropropene	75	110, 77
cis-1,3-Dichloropropene	75	77, 39
trans-1,3-Dichloropropene	75	77, 39
1,2,3,4-Diepoxybutane	55	57, 56
Diethyl ether	74	45, 59
1,4-Dioxane	88	58, 43, 57
Epichlorohydrin	57	49, 62, 51
Ethanol	31	45, 27, 46
Ethyl acetate	88	43, 45, 61
Ethylbenzene	91	106
Ethylene oxide	44	43, 42
Ethyl methacrylate	69	41, 99, 86, 114
Hexachlorobutadiene	225	223, 227
Hexachloroethane	201	166, 199, 203
2-Hexanone	43	58, 57, 100
2-Hydroxypropionitrile	44	43, 42, 53
Iodomethane	142	127, 141
Isobutyl alcohol	43	41, 42, 74
Isopropylbenzene	105	120
p-Isopropyltoluene	119	134, 91
Malononitrile	66	39, 65, 38
Methacrylonitrile	41	67, 39, 52, 66
Methyl acrylate	55	85
Methyl-t-butyl ether	73	57
Methylene chloride	84	86, 49
Methyl ethyl ketone	72	43
Methyl iodide	142	127, 141

Compound	Primary Characteristic Ion	Secondary Characteristic Ion(s)
Methyl methacrylate	69	41, 100, 39
4-Methyl-2-pentanone	100	43, 58, 85
Naphthalene	128	-
Nitrobenzene	123	51, 77
2-Nitropropane	46	-
2-Picoline	93	66, 92, 78
Pentachloroethane	167	130, 132, 165, 169
Propargyl alcohol	55	39, 38, 53
β-Propiolactone	42	43, 44
Propionitrile (ethyl cyanide)	54	52, 55, 40
n-Propylamine	59	41, 39
n-Propylbenzene	91	120
Pyridine	79	52
Styrene	104	78
1,2,3-Trichlorobenzene	180	182, 145
1,2,4-Trichlorobenzene	180	182, 145
1,1,1,2-Tetrachloroethane	131	133, 119
1,1,2,2-Tetrachloroethane	83	131, 85
Tetrachloroethene	164	129, 131, 166
Toluene	92	91
1,1,1-Trichloroethane	97	99, 61
1,1,2-Trichloroethane	83	97, 85
Trichloroethene	95	97, 130, 132
Trichlorofluoromethane	151	101, 153
1,2,3-Trichloropropane	75	77
1,2,4-Trimethylbenzene	105	120
1,3,5-Trimethylbenzene	105	120
Vinyl acetate	43	86
Vinyl chloride	62	64
o-Xylene	106	91
m-Xylene	106	91
p-Xylene	106	91
Internal Standards/Surrogates:		
Benzene-d_6	84	83
Bromobenzene-d_5	82	162
Bromochloromethane-d_2	51	131
1,4-Difluorobenzene	114	
Chlorobenzene-d_5	117	
1,4-Dichlorobenzene-d_4	152	115, 150
1,1,2-Trichloroethane-d_3	100	
4-Bromofluorobenzene	95	174, 176
Chloroform-d_1	84	
Dibromofluoromethane	113	

Compound	Primary Characteristic Ion	Secondary Characteristic Ion(s)
Internal Standards/Surrogates		
Dichloroethane-d_4	102	
Toluene-d_8	98	
Pentafluorobenzene	168	
Fluorobenzene	96	77

* Characteristic ion for an ion trap mass spectrometer (to be used when ion-molecule reactions are observed).

*See DOD Summary Attachment for DOD Specific Criteria

ATTACHMENT I
SIM MODE

SIM MODE

SCOPE

This SOP uses EPA method 8260B for the determination of low concentration levels of specific volatile organic compounds (VOCs) in aqueous, soil, sludge, sediment, and various types of waste. A mass spectrometer operating under the selective ion monitoring (SIM) mode is used for the analysis. The compounds that are routinely determined by this procedure are listed in SIM MODE Table 1. Other VOCs are available upon request. The list may be used in entirety or in part by meeting established method criteria for the compounds of interest. The reported MRL may be adjusted higher; however, the capability of achieving lower MRLs for specific project requirements must be demonstrated.

METHOD SUMMARY

Gas chromatographic/mass spectrometric (GC/MS) conditions are detailed in the 8260B SOP. The compounds are detected by a mass selective detector (MSD) using the SIM mode. The retention time and the ratio of two characteristic ions of each analyte are used for identification. The response of either the primary ion or the secondary ion is used for quantitation. Additional ions may be used to confirm the presence of each compound.

PROCEDURE

All applicable procedure and quality control (QC) requirements discussed in the 8260B SOP apply, only the linear range reduces based upon level of quantitation requested. Thus associated QC (LCS, CCVs, MS/MSD, Internal Standards, and Surrogates) spiking concentrations also reduce in concentration. For example, a typical linear range may be 0.05-5.0ppb with internal and surrogate standards spiked at 1.0 ppb, the CCV spiked at 1.0ppb, and an LCS spiked at 0.5ppb. Preparation of standards need only to include the compounds of interest.

INTERFERENCES

Due to the low concentration levels being sought in SIM mode, cleanliness is extremely important to avoid laboratory contamination. Multiple instrument blanks are recommend to be analyzed prior to any SIM-mode analyses. Good laboratory practices must be maintained through out the preparation of standards and samples and analysis to avoid contamination.

SIM MODE Table 1
List of Target Analytes and Reporting Levels*

Compound	Reporting Limit (ug/L)
Benzene	0.05
Toluene	0.05
Ethylbenzene	0.05
Xylene, total	0.05
Vinyl Chloride	0.10
Carbon tetrachloride	0.05
Tetrachloroethane	0.05

*See DOD Summary Attachment for DOD Specific Criteria

ATTACHMENT II

CURRENT IS/ANALYTE ASSOCIATIONS PER INSTRUMENT

```
                 Evaluate Continuing Calibration Report

Data File : J:\ACQUDATA\MSVOA3\DATA\103002\C5527.D       Vial: 29
Acq On    : 30 Oct 102   8:28 am                    Operator: DROOT
Sample    : ccv                                     Inst     : MS #3
Misc      :                                         Multiplr: 1.00

Method       : J:\ACQUDATA\MSVOA3\METHODS\EXP1021.M
Title        : 8260voa
Last Update  : Tue Oct 22 08:08:39 2002
Response via : Multiple Level Calibration

Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
Max. RRF Dev :  25%     Max. Rel. Area : 200%

      Compound                           AvgRF    CCRF      %Dev Area% Dev(min)
-------------------------------------------------------------------------------
 1        Pentafluorobenzene             1.000    1.000      0.0  107   0.00
 2        Dichlorodifluoromethane        0.535    0.577     -7.9  126   0.03
 3 p      Chloromethane                  1.230    1.223      0.6  118   0.03
 4 c      Vinyl Chloride                 0.799    0.851     -6.6  131   0.02
 5        Bromomethane                   0.366    0.350      4.4  100   0.02
 6        Chloroethane                   0.458    0.497     -8.5  128   0.02
 7        FREON 21                       1.049    0.984      6.2   98   0.02
 8        Trichlorofluoromethane         0.573    0.597     -4.2  127   0.00
 9        Diethyl Ether                  0.761    0.815     -7.0  119   0.02
10        FREON 123A                     0.859    0.925     -7.7  119   0.02
11        Acrolein                       0.155    0.165     -6.3  120   0.03
12        FREON 113                      0.214    0.231     -8.3  137   0.00
13        FREON 123                      0.811    0.857     -5.7  116   0.00
14 c      1,1-Diclethene                 0.482    0.513     -6.4  129   0.02
15        Acetone                        0.338    0.312      7.7  106   0.02
16        Iodomethane                    0.272    0.283     -4.2  101   0.02
17        Carbon Disulfide               2.239    2.596    -16.0  120   0.00
18        2-PROPANOL                     0.074    0.077     -3.7  113   0.03
19        Acetonitrile                   0.172    0.181     -5.3  111   0.03
20        Allyl Chloride                 0.372    0.407     -9.5  129   0.00
21        Methylene Chloride             0.731    0.745     -1.9  122   0.02
22        TBA                            0.077    0.082     -6.8  117   0.03
23        Acrylonitrile                  0.415    0.462    -11.3  122   0.00
24        Methyl-t-Butyl Ether           1.850    1.938     -4.7  118   0.02
25        trans-1,2-Dichloroethene       0.584    0.645    -10.3  130   0.00
26 p      1,1-Diclethane                 1.239    1.316     -6.2  127   0.00
27        Vinyl Acetate                  0.598    2.505   -319.0# 509#   0.00
28        2-Chloro-1,3-butadiene         1.027    1.174    -14.3  118   0.00
29        2,2-Dichloropropane            0.561    0.800    -42.8# 172   0.00
30        2-Butanone                     0.610    0.664     -8.9  119   0.00
31        ~~Ethyl Acetate                  1.184    0.644     45.6#  60  -0.14~~
32        cis-1,2-Dichloroethene         0.658    0.705     -7.2  123   0.00
33        Propionitrile                  0.146    0.160     -9.5  121   0.00
34        Methacrylonitrile              0.378    0.405     -7.3  122   0.00
35        Bromochloromethane             0.309    0.314     -1.5  116   0.00
36 c      Chloroform                     0.985    1.018     -3.3  126   0.00
37        Tetrahydrofuran                0.398    0.403     -1.3  121   0.00
38        1,1,1-Trichloroethane          0.605    0.673    -11.1  132   0.00

39 I      1,4 - Difluorobenzene          1.000    1.000      0.0  106   0.00
40 s      surr4,Dibrflmethane            0.293    0.319     -9.0  106   0.00
41        Carbontetrachloride            0.228    0.253    -11.2  133   0.00
-------------------------------------------------------------------------------
(#) = Out of Range
C5527.D  EXP1021.M      Wed Oct 30 09:29:20 2002           GCMS  10/30  Page 1
```

*See DOD Summary Attachment for DOD Specific Criteria

```
                 Evaluate Continuing Calibration Report

Data File : J:\ACQUDATA\MSVOA3\DATA\103002\C5527.D          Vial: 29
Acq On    : 30 Oct 102   8:28 am                        Operator: DROOT
Sample    : ccv                                         Inst    : MS #3
Misc      :                                             Multiplr: 1.00

Method        : J:\ACQUDATA\MSVOA3\METHODS\EXP1021.M
Title         : 8260voa
Last Update   : Tue Oct 22 08:08:39 2002
Response via  : Multiple Level Calibration

Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
Max. RRF Dev :  25%     Max. Rel. Area : 200%

          Compound                          AvgRF   CCRF      %Dev Area% Dev(min)
 ----------------------------------------------------------------------------------
 42       1,1-Dichloropropene               0.404   0.445    -10.2   136    0.00
 43       Iso-Butyl Alcohol                 0.030   0.031     -5.9   116    0.00
 44       Benzene                           1.337   1.412     -5.6   127    0.00
 45 S     surr1,1,2-Diclethane              0.335   0.350     -4.5   108    0.00
 46       1,2-Dichloroethane                0.427   0.408      4.6   116    0.00
 47       N-Heptane                         0.433   0.613    -41.7#  175    0.00
 48       Trichloroethene                   0.354   0.309     12.6   105    0.00
 49 c     1,2-Diclpropane                   0.447   0.467     -4.6   122    0.00
 50       Methyl Methacrylate               0.317   0.353    -11.2   125    0.00
 51       1,4-Dioxane                       0.004   0.004     -3.5   121    0.00
 52       Dibromomethane                    0.228   0.226      0.7   114    0.00
 53       Bromodichloromethane              0.409   0.415     -1.6   118    0.00
 54       2-Nitropropane                    0.116   0.137    -18.5   135    0.00
 55       2-Chloroethylvinyl Ether          0.350   0.362     -3.4   115    0.00
 56       cis-1,3-Dichloropropene           0.594   0.640     -7.7   125   -0.01

 57 I     d5 - Chlorobenzene                1.000   1.000      0.0   114    0.00
 58       4-Methyl-2-Pentanone              0.808   0.777      3.8   115    0.00
 59 c     Toluene                           1.356   1.374     -1.3   130    0.00
 60       trans-1,3-Dichloropropene         0.584   0.600     -2.9   123    0.00
 61       Ethyl Methacrylate                0.669   0.684     -2.2   124    0.00
 62       1,1,2-Trichloroethane             0.336   0.330      1.8   119    0.00
 63 s     surr3,Toluene-d8                  1.247   1.292     -3.6   108    0.00
 64 s     surr2,bfb                         0.462   0.523    -13.3   117    0.00
 65       Tetrachloroethene                 0.268   0.276     -3.0   136   -0.01
 66       2-Hexanone                        0.530   0.532     -0.4   115    0.00
 67       1,3-Diclpropane                   0.710   0.708      0.3   121   -0.01
 68       Dibromochloromethane              0.316   0.311      1.5   119    0.00
 69       1,2-Dibromoethane                 0.353   0.343      2.9   116    0.00
 70 p     Chlorobenzene                     0.790   0.790      0.1   128    0.00
 71       1,1,1,2-Tetrachloroethane         0.270   0.272     -0.6   122    0.00
 72 c     Ethylbenzene                      1.371   1.417     -3.3   131    0.00
 73       (m+p)Xylene                       0.468   0.491     -4.9   134    0.00
 74       o-Xylene                          0.470   0.475     -1.0   129    0.00
 75       Styrene                           0.864   0.887     -2.6   129    0.00
 76 p     Bromoform                         0.206   0.213     -3.6   121    0.00
 77       Isopropylbenzene                  1.082   1.138     -5.1   132    0.00
 78       Cyclohexanone                     0.074   0.042     43.7#   70    0.00

 79 I     d4 - Dichlorobenzene              1.000   1.000      0.0   117    0.00
 80 p     1,1,2,2-Tetrachloroethane         0.954   1.208    -26.6#  162    0.00
 81       Trans-1,4-Dichloro-2-butene       0.315   0.348    -10.5   143    0.00
 --------------------------------------------------------------------------------
  (#) = Out of Range
  C5527.D  EXP1021.M       Wed Oct 30 09:29:27 2002       GCMS           Page 2
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                 Evaluate Continuing Calibration Report

   Data File : J:\ACQUDATA\MSVOA3\DATA\103002\C5527.D        Vial: 29
   Acq On    : 30 Oct 102   8:28 am                       Operator: DROOT
   Sample    : ccv                                        Inst     : MS #3
   Misc      :                                            Multiplr: 1.00

   Method         : J:\ACQUDATA\MSVOA3\METHODS\EXP1021.M
   Title          : 8260voa
   Last Update    : Tue Oct 22 08:08:39 2002
   Response via   : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 200%

          Compound                            AvgRF    CCRF       %Dev Area% Dev(min)
   ------------------------------------------------------------------------------------
 82       1,2,3-Trichloropropane              0.278    0.261       6.2  123    0.00
 83       n-Propylbenzene                     3.209    3.320      -3.5  135    0.00
 84       Bromobenzene                        0.704    0.671       4.7  122    0.00
 85       1,3,5-Trimethylbenzene              1.762    1.811      -2.8  134    0.00
 86       2-Chlorotoluene                     1.983    1.995      -0.6  130    0.00
 87       4-Chlorotoluene                     2.213    2.193       0.9  129    0.00
 88       tert-Butylbenzene                   1.405    1.449      -3.1  137    0.00
 89       1,2,4-Trimethylbenzene              1.773    1.785      -0.7  131    0.00
 90       sec-Butylbenzene                    2.198    2.283      -3.9  135    0.00
 91       p-Isopropyltoluene                  1.625    1.722      -6.0  139    0.00
 92       1,3-Dclbenz                         1.174    1.153       1.8  128    0.00
 93       1,4-Dclbenz                         1.214    1.149       5.4  124    0.00
 94       n-Butylbenzene                      1.614    1.780     -10.3  149    0.00
 95       1,2-Dclbenz                         1.154    1.118       3.2  125    0.00
 96       1,2-Dibromo-3-chloropropane         0.172    0.166       3.8  124    0.00
 97       Nitrobenzene                        0.000    0.000       0.0  133    0.02
 98       1,2,4-Tcbenzene                     0.527    0.545      -3.5  133    0.00
 99       Hexachlorobt                        0.174    0.199     -14.6  147    0.02
100       Naphthalen                          1.454    1.527      -5.0  133    0.00
101       1,2,3-Tclbenzene                    0.482    0.497      -3.2  130    0.02
102       TOTAL XYLENE                        0.000    0.000       0.0    0#   0.03





 ---------------------------------------------------------------------------------
   (#) = Out of Range               SPCC's out = 0  CCC's out = 0
   C5527.D  EXP1021.M          Wed Oct 30 09:29:30 2002       GCMS            Page 3
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                 Evaluate Continuing Calibration Report

   Data File : J:\ACQUDATA\MSVOA5\DATA\102902\A4331.D        Vial: 85
   Acq On    : 30 Oct 102  12:23 am                      Operator: B.ALLGEIER
   Sample    : CCV                                       Inst    : 5971 - In
   Misc      :                                           Multiplr: 1.00

   Method        : J:\ACQUDATA\MSVOA5\METHODS\EXP1021.M
   Title         : 8260voa
   Last Update   : Tue Oct 22 10:50:10 2002
   Response via  : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 200%

          Compound                           AvgRF   CCRF      %Dev Area% Dev(min)
 -------------------------------------------------------------------------------
  1       Pentafluorobenzene                 1.000   1.000      0.0   89   0.02
  2       Dichlorodifluoromethane            0.495   0.525     -6.1   93   0.00
  3 p     Chloromethane                      0.652   0.698     -7.1   92   0.00
  4 c     Vinyl Chloride                     0.495   0.527     -6.4   95   0.00
  5       Bromomethane                       0.363   0.339      6.7   88   0.00
  6       Chloroethane                       0.317   0.341     -7.4   96   0.00
  7       Trichlorofluoromethane             0.583   0.653    -11.9   96   0.00
  8       Diethyl Ether                      0.395   0.407     -3.1   91   0.00
  9       Acrolein                           0.084   0.065     22.5   70   0.01
 10       FREON 113                          0.190   0.210    -10.6   97   0.01
 11 c     1,1-Diclethene                     0.364   0.374     -2.7   95   0.00
 12       Acetone                            0.156   0.168     -7.7  105   0.01
 13       Iodomethane                        0.444   0.605    -36.4#  98   0.00
 14       Carbon Disulfide                   1.649   1.758     -6.6   87   0.02
 15       Acetonitrile                       0.016   0.017     -5.3   94   0.00
 16       Allyl Chloride                     0.240   0.262     -9.3   91   0.00
 17       Methylene Chloride                 0.507   0.521     -2.8   92   0.02
 18       TBA                                0.039   0.038      1.7   86   0.00
 19       Methyl-t-Butyl Ether               1.289   1.368     -6.1   93   0.00
 20       Acrylonitrile                      0.200   0.212     -6.4   93   0.00
 21       trans-1,2-Dichloroethene           0.434   0.453     -4.3   93   0.02
 22 p     1,1-Diclethane                     0.963   1.054     -9.4   94   0.01
 23       Vinyl Acetate                      0.099   0.063     36.5#  55   0.01
 24       2-Chloro-1,3-butadiene             0.782   0.875    -11.8   87   0.02
 25       2,2-Dichloropropane                0.683   0.664      2.8   83   0.01
 26       2-Butanone                         0.318   0.330     -3.6   94   0.00
 27       cis-1,2-Dichloroethene             0.494   0.528     -6.9   93   0.01
 28       Propionitrile                      0.076   0.079     -3.0   91   0.01
 29       Methacrylonitrile                  0.225   0.229     -1.8   92   0.00
 30       Bromochloromethane                 0.268   0.290     -8.5   96   0.02
 31       Tetrahydrofuran                    0.184   0.182      0.7   89   0.01
 32 c     Chloroform                         0.907   1.008    -11.1   97   0.00
 33       1,1,1-Trichloroethane              0.645   0.725    -12.5   97   0.02

 34       1,4-Difluorobenzene                1.000   1.000      0.0   93   0.00
 35 s     surr4,Dibrflmethane                0.332   0.358     -7.9   94   0.00
 36       Carbontetrachloride                0.303   0.332     -9.6   98   0.02
 37       1,1-Dichloropropene                0.395   0.415     -5.0   94   0.00
 38       Iso-Butyl Alcohol                  0.014   0.012     12.9   77   0.02
 39       Benzene                            1.196   1.228     -2.7   92   0.00
 40 s     surr1,1,2-Diclethane               0.364   0.411    -12.9   96   0.00
 41       1,2-Dichloroethane                 0.441   0.461     -4.6   98   0.00
 -------------------------------------------------------------------------------
 (#) = Out of Range
 A4331.D  EXP1021.M      Wed Oct 30 11:09:15 2002                      Page 1
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*See DOD Summary Attachment for DOD Specific Criteria

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                     Evaluate Continuing Calibration Report

Data File : J:\ACQUDATA\MSVOA5\DATA\102902\A4331.D          Vial: 85
Acq On    : 30 Oct 102  12:23 am                        Operator: B.ALLGEIER
Sample    : CCV                                         Inst    : 5971 - In
Misc      :                                             Multiplr: 1.00

Method       : J:\ACQUDATA\MSVOA5\METHODS\EXP1021.M
Title        : 8260voa
Last Update  : Tue Oct 22 10:50:10 2002
Response via : Multiple Level Calibration

Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
Max. RRF Dev :  25%     Max. Rel. Area : 200%

           Compound                          AvgRF    CCRF      %Dev Area% Dev(min)
------------------------------------------------------------------------------------
 42        Trichloroethene                   0.280    0.320    -14.4  103    0.01
 43 c      1,2-Diclpropane                   0.378    0.391     -3.6   92    0.01
 44        Methyl Methacrylate               0.232    0.232     -0.1   91    0.01
 45        1,4-Dioxane                       0.003    0.002     15.8   77    0.02
 46        Dibromomethane                    0.200    0.208     -3.9   94    0.01
 47        Bromodichloromethane              0.411    0.463    -12.7   98    0.02
 48        2-Nitropropane                    0.092    0.098     -7.3   94    0.02
 49        2-Chloroethylvinyl Ether          0.236    0.248     -5.0   94    0.02
 50        cis-1,3-Dichloropropene           0.573    0.590     -3.0   91    0.02
 51        4-Methyl-2-Pentanone              0.464    0.465     -0.2   94    0.00
 52 c      Toluene                           1.210    1.259     -4.1   92    0.00
 53        trans-1,3-Dichloropropene         0.522    0.551     -5.5   92    0.00
 54        Ethyl Methacrylate                0.478    0.502     -5.0   93    0.00
 55        1,1,2-Trichloroethane             0.274    0.288     -5.3   94    0.02
 56 s      surr3,Toluene-d8                  1.138    1.200     -5.5   92    0.02
 57 s      surr2,bfb                         0.493    0.573    -16.2   97    0.02

 58        d5-Chlorobenze                    1.000    1.000      0.0   93    0.02
 59        Tetrachloroethene                 0.281    0.296     -5.6   95    0.00
 60        2-Hexanone                        0.319    0.315      1.3   95    0.02
 61        1,3-Dichloropropane               0.550    0.558     -1.5   92    0.02
 62        Dibromochloromethane              0.320    0.344     -7.7   98    0.02
 63        1,2-Dibromoethane                 0.293    0.303     -3.3   95    0.02
 64 p      Chlorobenzene                     0.807    0.832     -3.1   93    0.02
 65        1,1,1,2-Tetrachloroethane         0.280    0.298     -6.2   96    0.02
 66 c      Ethylbenzene                      1.374    1.389     -1.1   90    0.02
 67        (m+p)Xylene                       0.484    0.487     -0.5   90    0.02
 68        o-Xylene                          0.485    0.501     -3.4   92    0.03
 69        Styrene                           0.832    0.861     -3.4   91    0.02
 70 p      Bromoform                         0.218    0.240    -10.1   97    0.02
 71        Isopropylbenzene                  1.230    1.293     -5.1   93    0.02
 72        Cyclohexanone                     0.000    0.000      0.0   90    0.02

 73        d4-1,4-Dichlorobenzene            1.000    1.000      0.0   93    0.02
 74 p      1,1,2,2-Tetrachloroethane         0.932    0.854      8.3   85    0.02
 75        1,2,3-Trichloropropane            0.198    0.209     -5.3   94    0.02
 76        Trans-1,4-Dichloro-2-Butene       0.241    0.243     -1.2   90    0.02
 77        n-Propylbenzene                   3.262    3.204      1.8   88    0.02
 78        Bromobenzene                      0.708    0.747     -5.6   97    0.02
 79        1,3,5-Trimethylbenzene            1.790    1.633      8.8   82    0.02
 80        2-Chlorotoluene                   2.020    2.040     -1.0   91    0.02
 81        4-Chlorotoluene                   2.015    1.996      0.9   89    0.02
------------------------------------------------------------------------------------
  (#) = Out of Range
 A4331.D  EXP1021.M       Wed Oct 30 11:09:19 2002                          Page 2
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```
                    Evaluate Continuing Calibration Report

Data File : J:\ACQUDATA\MSVOA5\DATA\102902\A4331.D        Vial: 85
Acq On    : 30 Oct 102  12:23 am                      Operator: B.ALLGEIER
Sample    : CCV                                       Inst    : 5971 - In
Misc      :                                           Multiplr: 1.00

Method          : J:\ACQUDATA\MSVOA5\METHODS\EXP1021.M
Title           : 8260voa
Last Update     : Tue Oct 22 10:50:10 2002
Response via    : Multiple Level Calibration

Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
Max. RRF Dev :  25%     Max. Rel. Area : 200%

       Compound                           AvgRF    CCRF      %Dev Area% Dev(min)
-------------------------------------------------------------------------------
82     tert-Butylbenzene                  1.636    1.632      0.3    88    0.02
83     1,2,4-Trimethylbenzene             1.680    1.511     10.1    79    0.02
84     sec-Butylbenzene                   2.523    2.522      0.0    88    0.00
85     p-Isopropyltoluene                 1.872    1.751      6.4    82    0.02
86     1,3-Dclbenz                        1.269    1.276     -0.6    91    0.02
87     1,4-Dclbenz                        1.270    1.252      1.4    89    0.02
88     n-Butylbenzene                     1.703    1.490     12.5    76    0.02
89     1,2-Dclbenz                        1.262    1.266     -0.3    90    0.02
90     1,2-Dibromo-3-chloropropane        0.154    0.166     -7.8    95    0.02
91     Nitrobenzene                       0.000    0.000      0.0    83    0.02
92     1,2,4-Tcbenzene                    0.580    0.529      8.7    83    0.02
93     Hexachlorobt                       0.295    0.278      5.7    85    0.02
94     Naphthalen                         1.235    1.181      4.3    85    0.00
95     1,2,3-Tclbenzene                   0.537    0.500      7.0    82    0.00
96     TOTAL XYLENE                       0.000    0.000      0.0     0#  -2.30#








-------------------------------------------------------------------------------
(#) = Out of Range              SPCC's out = 0  CCC's out = 0
A4331.D  EXP1021.M           Wed Oct 30 11:09:21 2002                  Page 3
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                 Evaluate Continuing Calibration Report

  Data File : J:\ACQUDATA\MSVOA6\DATA\103002\Q9582.D          Vial: 2
  Acq On    : 30 Oct 2002  10:26 am                       Operator: PDEPALMA
  Sample    : CCV                                         Inst    : GC/MS Ins
  Misc      : 8260B/OLM4.2 for W.A.P                      Multiplr: 1.00
  MS Integration Params: INTP35.P

  Method        : J:\ACQUDATA\MSVOA6\METHODS\SOW1022W.M (RTE Integrator)
  Title         : EPA Method 8260B OLM4.2 CPD LIST
  Last Update   : Wed Oct 30 12:33:47 2002
  Response via  : Multiple Level Calibration

  Min. RRF      :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
  Max. RRF Dev :  25%      Max. Rel. Area : 200%

          Compound                             AvgRF    CCRF       %Dev Area% Dev(min)
  -------------------------------------------------------------------------------------
  1       Pentafluorobenzene                   1.000    1.000       0.0   55   -0.02
  2       Dichlorodifluoromethane              0.410    0.504     -22.9   68   -0.02
  3 P     Chloromethane                        0.243    0.222       8.6   52   -0.01
  4 C     Vinyl Chloride                       0.241    0.225       6.6   51   -0.01
  5       Bromomethane                         0.173    0.167       3.5   56   -0.01
  6       Chloroethane                         0.149    0.138       7.4   50   -0.01
  7       Trichlorofluoromethane               0.680    0.750     -10.3   60   -0.02
  8 C     1,1-Diclethene                       0.268    0.275      -2.6   57   -0.01
  9       Freon 113                            0.322    0.337      -4.7   58   -0.02
 10       Acetone                              0.109    0.104       4.6   55   -0.02
 11       Carbon Disulfide                     0.868    0.852       1.8   54   -0.02
 12       Methyl Acetate                       0.188    0.177       5.9   51   -0.02
 13       Methylene Chloride                   0.320    0.321      -0.3   56   -0.02
 14       Methyl-t-Butyl Ether                 1.146    1.168      -1.9   57   -0.02
 15       trans-1,2-Dichloroethene             0.316    0.319      -0.9   55   -0.02
 16 P     1,1-Diclethane                       0.595    0.616      -3.5   58   -0.02
 17       cis-1,2-Dichloroethene               0.351    0.373      -6.3   56   -0.02
 18       2-Butanone                           0.109    0.101       7.3   49#  -0.02
 19 C     Chloroform                           0.732    0.844     -15.3   63   -0.02
 20       1,1,1-Trichloroethane                0.766    0.914     -19.3   65   -0.02

 21       1,4-Difluorobenzene                  1.000    1.000       0.0   50   -0.02
 22 S     surr4,Dibrflmethane                  0.318    0.356     -11.9   59   -0.02
 23       Cyclohexane                          0.412    0.385       6.6   50   -0.02
 24       Carbontetrachloride                  0.542    0.722     -33.2#  69   -0.02
 25       Benzene                              0.973    1.055      -8.4   55   -0.02
 26       1,2-Dichloroethane                   0.497    0.660     -32.8#  66   -0.01
 27       Trichloroethene                      0.286    0.350     -22.4   62   -0.02
 28       Methyl Cyclohexane                   0.406    0.407      -0.2   52   -0.02
 29 C     1,2-Diclpropane                      0.230    0.247      -7.4   53   -0.01
 30       Bromodichloromethane                 0.450    0.574     -27.6#  64   -0.02
 31       cis-1,3-Dichloropropene              0.431    0.519     -20.4   60   -0.02
 32       4-Methyl-2-pentanone                 0.154    0.158      -2.6   49#  -0.01
 33 S     SURR3,Toluene-d8                     1.057    1.139      -7.8   55   -0.02
 34 C     Toluene                              1.073    1.176      -9.6   57   -0.02
 35       trans-1,3-Dichloropropene            0.468    0.560     -19.7   59   -0.02
 36       1,1,2-Trichloroethane                0.218    0.255     -17.0   58   -0.01
 37       Dibromochloromethane                 0.337    0.441     -30.9#  65   -0.01
 38 S     SURR2,BFB                            0.380    0.418     -10.0   61   -0.01

 39       d5-Chlorobenzene                     1.000    1.000       0.0   51   -0.01
 ------------------------------------------------------------------------------------
  (#) = Out of Range
 Q9582.D  SOW1022W.M       Wed Oct 30 12:40:06 2002                          Page 1
```

```
                      Evaluate Continuing Calibration Report

   Data File : J:\ACQUDATA\MSVOA6\DATA\103002\Q9582.D       Vial: 2
   Acq On    : 30 Oct 2002  10:26 am                     Operator: PDEPALMA
   Sample    : CCV                                       Inst    : GC/MS Ins
   Misc      : 8260B/OLM4.2 for W.A.P                    Multiplr: 1.00
   MS Integration Params: INTP35.P

   Method       : J:\ACQUDATA\MSVOA6\METHODS\SOW1022W.M (RTE Integrator)
   Title        : EPA Method 8260B OLM4.2 CPD LIST
   Last Update  : Wed Oct 30 12:33:47 2002
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 200%

        Compound                              AvgRF    CCRF      %Dev Area% Dev(min)
   -------------------------------------------------------------------------------
40      Tetrachloroethene                     0.285    0.375    -31.6#  65   -0.01
41      2-Hexanone                            0.138    0.150     -8.7   53   -0.01
42      1,2-Dibromoethane                     0.289    0.346    -19.7   58   -0.01
43 P    Chlorobenzene                         0.819    0.997    -21.7   61   -0.01
44 C    Ethylbenzene                          0.389    0.473    -21.6#  62   -0.01
45      (m+p)Xylene                           0.465    0.554    -19.1   61   -0.01
46      o-Xylene                              0.436    0.528    -21.1   63   -0.01
47      Styrene                               0.737    0.896    -21.6   62   -0.01
48 P    Bromoform                             0.267    0.371    -39.0#  67   -0.01
49      Isopropylbenzene                      1.070    1.327    -24.0   64   -0.01

50      1,4-Dichlorobenzene-d4                1.000    1.000      0.0   55   -0.01
51 P    1,1,2,2-Tetrachloroethane             0.689    0.730     -6.0   56   -0.01
52      1,3-Diclbenzene                       1.374    1.629    -18.6   66   -0.01
53      1,4-Diclbenzene                       1.384    1.682    -21.5   68   -0.01
54      1,2-Diclbenzene                       1.280    1.549    -21.0   68   -0.01
55      1,2-Dibromo-3-chloropropane           0.145    0.183    -26.2#  71    0.00
56      1,2,4-Tcbenzene                       0.447    0.547    -22.4   71    0.00





   -------------------------------------------------------------------------
   (#) = Out of Range            SPCC's out = 0   CCC's out = 1
   Q9582.D  SOW1022W.M        Wed Oct 30 12:40:08 2002                  Page 2
```

```
                    Evaluate Continuing Calibration Report

Data File : J:\ACQUDATA\MSVOA7\DATA\102202\V7572.D        Vial: 2
Acq On    : 22 Oct 2002   1:52 pm                      Operator: Herring
Sample    : ccv                                        Inst     : GC/MS Ins
Misc      :                                            Multiplr: 1.00
MS Integration Params: RTEINT.P

Method       : J:\ACQUDATA\MSVOA7\METHODS\EXP1004.M (RTE Integrator)
Title        : 8260voa
Last Update  : Fri Oct 04 19:07:24 2002
Response via : Multiple Level Calibration
```

R. Herring 10/22

```
Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
Max. RRF Dev :  25%     Max. Rel. Area : 200%

      Compound                        AvgRF    CCRF        %Dev Area% Dev(min)
---------------------------------------------------------------------------------
 1     Pentafluorobenzene              1.000    1.000         0.0  105  -0.04
 2     Dichlorodifluoromethane         0.555    0.598        -7.7  102  -0.03
 3 p   Chloromethane                   0.690    0.788       -14.2  113  -0.03
 4 c   Vinyl Chloride                  0.488    0.486         0.4  101  -0.02
 5     Bromomethane                    0.472    0.449         4.9   93  -0.04
 6     Chloroethane                    0.467    0.458         1.9  101  -0.03
 7     FREON 21                        1.108    1.121        -1.2  110  -0.03
 8     Trichlorofluoromethane          0.733    0.733         0.0  102  -0.03
 9     Diethyl Ether                   0.570    0.561         1.6  100  -0.03
10     FREON 123A                      0.826    0.826         0.0  112  -0.04
11     FREON 123                       0.838    0.862        -2.9  111  -0.04
12     Acrolein                        0.122    0.144       -18.0  110  -0.04
13     FREON 113                       0.248    0.243         2.0  103  -0.04
14 c   1,1-Diclethene                  0.535    0.537        -0.4  103  -0.04
15     Acetone                         0.249    0.214        14.1   96  -0.04
16     2-Propanol                      0.047    0.046         2.1   98  -0.03
17     Iodomethane                     0.473    0.375        20.7   81  -0.04
18     Carbon Disulfide                2.168    2.321        -7.1  110  -0.04
19     Acetonitrile                    0.179    0.165         7.8  100  -0.04
20     Allyl Chloride                  0.345    0.325         5.8  100  -0.04
21     Methylene Chloride              0.723    0.688         4.8  103  -0.04
22     TBA                             0.056    0.053         5.4   98  -0.04
23     Acrylonitrile                   0.324    0.303         6.5   96  -0.04
24     Methyl-t-Butyl Ether            1.580    1.521         3.7   99  -0.04
25     trans-1,2-Dichloroethene        0.657    0.655         0.3  104  -0.04
26 p   1,1-Diclethane                  1.122    1.108         1.2  100  -0.05
27     Vinyl Acetate                   1.888    2.013        -6.6  107  -0.04
28     2-Chloro-1,3-butadiene          0.937    1.053       -12.4  117  -0.04
29     2,2-Dichloropropane             0.811    0.764         5.8   97  -0.05
30     2-Butanone                      0.482    0.439         8.9   98  -0.05
31     Ethyl Acetate                   0.000    0.000         0.0   98  -0.05
32     cis-1,2-Dichloroethene          0.741    0.728         1.8  103  -0.05
33     Propionitrile                   0.116    0.110         5.2   97  -0.05
34     Methacrylonitrile               0.321    0.295         8.1   97  -0.05
35     Bromochloromethane              0.349    0.339         2.9  101  -0.05
36 c   Chloroform                      1.037    1.025         1.2  100  -0.05
37     Tetrahydrofuran                 0.276    0.255         7.6   95  -0.05
38     1,1,1-Trichloroethane           0.792    0.782         1.3  102  -0.05

39 I   1,4 - Difluorobenzene           1.000    1.000         0.0  106  -0.04
40 s   surr4,Dibrflmethane             0.356    0.358        -0.6  107  -0.05
-------------------------------------------------------------------------------
(#) = Out of Range
V7572.D  EXP1004.M       Tue Oct 22 15:01:42 2002                     Page 1
```

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                  Evaluate Continuing Calibration Report

   Data File : J:\ACQUDATA\MSVOA7\DATA\102202\V7572.D       Vial: 2
   Acq On    : 22 Oct 2002   1:52 pm                    Operator: Herring
   Sample    : ccv                                      Inst     : GC/MS Ins
   Misc      :                                          Multiplr: 1.00
   MS Integration Params: RTEINT.P

   Method       : J:\ACQUDATA\MSVOA7\METHODS\EXP1004.M (RTE Integrator)
   Title        : 8260voa
   Last Update  : Fri Oct 04 19:07:24 2002
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 200%

        Compound                              AvgRF    CCRF      %Dev Area% Dev(min)
  ------------------------------------------------------------------------------------
41      Carbontetrachloride                   0.366    0.365      0.3  101  -0.06
42      1,1-Dichloropropene                   0.486    0.466      4.1  101  -0.05
43      Iso-Butyl Alcohol                     0.022    0.020      9.1   93  -0.04
44 s    surl,1,2-Diclethane                   0.343    0.336      2.0  104  -0.05
45      Benzene                               1.521    1.452      4.5  102  -0.04
46      1,2-Dichloroethane                    0.486    0.450      7.4  103  -0.04
47      N-Heptane                             0.760    0.739      2.8   95  -0.04
48      Trichloroethene                       0.389    0.382      1.8  104  -0.05
49 c    1,2-Diclpropane                       0.481    0.442      8.1  100  -0.05
50      Methyl Methacrylate                   0.312    0.288      7.7   93  -0.05
51      1,4-Dioxane                           0.004    0.004      0.0  105  -0.05
52      Dibromomethane                        0.296    0.279      5.7  101  -0.05
53      Bromodichloromethane                  0.488    0.488      0.0  102  -0.05
54      2-Nitropropane                        0.000    0.000      0.0  100  -0.05
55      2-Chloroethylvinyl Ether              0.347    0.327      5.8  103  -0.05
56      cis-1,3-Dichloropropene               0.664    0.651      2.0  102  -0.05

57 I    d5 - Chlorobenzene                    1.000    1.000      0.0  107  -0.05
58      4-Methyl-2-Pentanone                  0.704    0.651      7.5   98  -0.05
59 c    Toluene                               1.607    1.590      1.1  102  -0.05
60      trans-1,3-Dichloropropene             0.637    0.613      3.8  100  -0.05
61      Ethyl Methacrylate                    0.666    0.610      8.4   97  -0.05
62      1,1,2-Trichloroethane                 0.361    0.347      3.9  100  -0.06
63 s    surr3,Toluene-d8                      1.272    1.253      1.5  104  -0.05
64 s    surr2,bfb                             0.517    0.522     -1.0  106  -0.05
65      Tetrachloroethene                     0.405    0.399      1.5  101  -0.05
66      2-Hexanone                            0.481    0.440      8.5   96  -0.05
67      1,3-Dichloropropane                   0.729    0.671      8.0   99  -0.06
68      Dibromochloromethane                  0.406    0.392      3.4  100  -0.06
69      1,2-Dibromoethane                     0.446    0.423      5.2   98  -0.05
70 p    Chlorobenzene                         1.055    1.027      2.7  101  -0.05
71      1,1,1,2-Tetrachloroethane             0.350    0.339      3.1  103  -0.06
72 c    Ethylbenzene                          1.797    1.783      0.8  102  -0.05
73      (m+p)Xylene                           0.657    0.640      2.6  101  -0.05
74      o-Xylene                              0.656    0.632      3.7  102  -0.06
75      Styrene                               1.160    1.115      3.9   98  -0.05
76 p    Bromoform                             0.297    0.287      3.4   97  -0.05
77      Isopropylbenzene                      1.610    1.605      0.3  102  -0.05
78      Cyclohexanone                         0.071    0.040     43.7#  58  -0.05

79 I    d4 - Dichlorobenzene                  1.000    1.000      0.0  106  -0.06
------------------------------------------------------------------------------
  (#) = Out of Range
  V7572.D  EXP1004.M       Tue Oct 22 15:01:43 2002                      Page 2
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*See DOD Summary Attachment for DOD Specific Criteria

```
                    Evaluate Continuing Calibration Report

   Data File : J:\ACQUDATA\MSVOA7\DATA\102202\V7572.D        Vial: 2
   Acq On    : 22 Oct 2002   1:52 pm                     Operator: Herring
   Sample    : ccv                                       Inst    : GC/MS Ins
   Misc      :                                           Multiplr: 1.00
   MS Integration Params: RTEINT.P

   Method       : J:\ACQUDATA\MSVOA7\METHODS\EXP1004.M (RTE Integrator)
   Title        : 8260voa
   Last Update  : Fri Oct 04 19:07:24 2002
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 200%

        Compound                          AvgRF    CCRF        %Dev Area% Dev(min)
 -------------------------------------------------------------------------------
 80 P   1,1,2,2-Tetrachloroethane         1.195    1.129        5.5   97   -0.05
 81     Trans-1,4-Dichloro-2-butene       0.329    0.300        8.8   95   -0.05
 82     1,2,3-Trichloropropane            0.319    0.257       19.4   97   -0.05
 83     n-Propylbenzene                   4.441    4.412        0.7  104   -0.05
 84     Bromobenzene                      0.878    0.877        0.1  101   -0.05
 85     1,3,5-Trimethylbenzene            2.551    2.491        2.4   99   -0.05
 86     2-Chlorotoluene                   2.817    2.778        1.4  101   -0.05
 87     4-Chlorotoluene                   2.662    2.590        2.7  101   -0.06
 88     tert-Butylbenzene                 2.158    2.132        1.2  102   -0.05
 89     1,2,4-Trimethylbenzene            2.586    2.592       -0.2  100   -0.06
 90     sec-Butylbenzene                  3.621    3.540        2.2  100   -0.05
 91     p-Isopropyltoluene                2.690    2.681        0.3  102   -0.06
 92     1,3-Dclbenz                       1.554    1.532        1.4  102   -0.05
 93     1,4-Dclbenz                       1.553    1.569       -1.0  107   -0.06
 94     n-Butylbenzene                    2.978    2.972        0.2   99   -0.05
 95     1,2-Dclbenz                       1.512    1.476        2.4  100   -0.05
 96     1,2-Dibromo-3-chloropropane       0.245    0.206       15.9   98   -0.06
 97     Nitrobenzene                      0.000    0.000        0.0   93   -0.05
 98     1,2,4-Tcbenzene                   1.066    1.014        4.9   98   -0.07
 99     Hexachlorobt                      0.380    0.360        5.3  102   -0.07
100     Naphthalen                        2.256    1.939       14.1   88   -0.07
101     1,2,3-Tclbenzene                  0.933    0.878        5.9   97   -0.07

 -------------------------------------------------------------------------------
  (#) = Out of Range                SPCC's out = 0   CCC's out = 0
  V7572.D  EXP1004.M              Tue Oct 22 15:01:43 2002                Page 3
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```
                    Evaluate Continuing Calibration Report

  Data File : J:\ACQUDATA\MSVOA8\DATA\101104\F1124.D        Vial: 5
  Acq On    : 11 Oct 2004   11:43 am                    Operator: Herring
  Sample    : CCV                                       Inst     : GCMS#8
  Misc      :                                           Multiplr: 1.00
  MS Integration Params: RTEINT.P

  Method       : J:\ACQUDATA\MSVOA8\METHODS\WAT1008.M (RTE Integrator)
  Title        : 8260voa
  Last Update  : Mon Oct 11 18:55:59 2004
  Response via : Multiple Level Calibration
                                                                R3# 10/11
  Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
  Max. RRF Dev :  20%     Max. Rel. Area : 200%

         Compound                          AvgRF    CCRF      %Dev Area% Dev(min)
 ----------------------------------------------------------------------------------
   1 I   Pentafluorobenzene                1.000    1.000      0.0  109   0.00
   2     Dichlorodifluoromethane           0.569    0.646    -13.5  115   0.00
   3 p   Chloromethane                     0.886    0.863      2.6  110   0.00
   4 c   Vinyl Chloride                    0.674    0.712     -5.6  112   0.00
   5     Bromomethane                      0.382    0.442    -15.7  135   0.00
   6     Chloroethane                      0.442    0.438      0.9  113   0.00
   7     FREON 21                          1.314    1.362     -3.7  118   0.00
   8     Trichlorofluoromethane            0.805    0.864     -7.3  115   0.00
   9     Diethyl Ether                     0.486    0.523     -7.6  117   0.00
  10     FREON 123A                        0.739    0.782     -5.8  118   0.00
  11     FREON 123                         0.810    0.824     -1.7  119   0.00
  12     Acrolein                          0.076    0.081     -6.6  124   0.00
  13     FREON 113                         0.214    0.218     -1.9  114   0.00
  [illegible] c   1,1-Diclethene           0.432    0.433     -0.2  113   0.00
  15     Acetone                           0.177    0.176      0.6  106   0.00
  16     2-Propanol                        0.023    0.019     17.4   98   0.01
  17     Iodomethane                       0.152    0.152      0.0   94   0.00
  18     Carbon Disulfide                  1.708    1.770     -3.6  120   0.00
  19     Acetonitrile                      0.050    0.057    -14.0  113   0.00
  20     Allyl Chloride                    0.250    0.285    -14.0  126   0.00
  21     Methylene Chloride                0.615    0.609      1.0  116   0.00
  22     TBA                               0.034    0.033      2.9  107   0.00
  23     Acrylonitrile                     0.205    0.218     -6.3  119   0.00
  24     Methyl-t-Butyl Ether              1.515    1.655     -9.2  120   0.00
  25     trans-1,2-Dichloroethene          0.524    0.562     -7.3  111   0.00
  26 p   1,1-Diclethane                    1.086    1.152     -6.1  114   0.00
  27     Vinyl Acetate                     0.676    0.770    -13.9  128   0.00
  28     2-Chloro-1,3-butadiene            0.981    1.102    -12.3  121   0.00
  29     2,2-Dichloropropane               0.906    0.985     -8.7  121   0.00
  30     2-Butanone                        0.292    0.300     -2.7  118   0.00
  31     cis-1,2-Dichloroethene            0.594    0.613     -3.2  116   0.00
  32     Propionitrile                     0.068    0.068      0.0  113   0.00
  33     Methacrylonitrile                 0.208    0.215     -3.4  120   0.00
  34     Bromochloromethane                0.251    0.263     -4.8  118   0.00
  35 c   Chloroform                        1.012    1.058     -4.5  114   0.00
  36     Tetrahydrofuran                   0.165    0.181     -9.7  126   0.00
  37     1,1,1-Trichloroethane             0.859    0.901     -4.9  115   0.00

  [illegible] I   1,4 - Difluorobenzene    1.000    1.000      0.0  111   0.00
  39 s   surr4,Dibrflmethane               0.328    0.373    -13.7  125   0.00
  40     cyclohexane                       0.542    0.537      0.9  111   0.00
 ----------------------------------------------------------------------------------
  (#) = Out of Range
  F1124.D  WAT1008.M      Mon Oct 11 19:23:33 2004                          Page 1
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*See DOD Summary Attachment for DOD Specific Criteria

```
                        Evaluate Continuing Calibration Report

   Data File : J:\ACQUDATA\MSVOA8\DATA\101104\F1124.D        Vial: 5
   Acq On    : 11 Oct 2004  11:43 am                      Operator: Herring
   Sample    : CCV                                        Inst    : GCMS#8
   Misc      :                                            Multiplr: 1.00
   MS Integration Params: RTEINT.P

   Method        : J:\ACQUDATA\MSVOA8\METHODS\WAT1008.M (RTE Integrator)
   Title         : 8260voa
   Last Update   : Mon Oct 11 18:55:59 2004
   Response via  : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  20%     Max. Rel. Area : 200%

          Compound                          AvgRF   CCRF       %Dev Area% Dev(min)
   ------------------------------------------------------------------------------
 41       Carbontetrachloride               0.355   0.392     -10.4  115   0.00
 42       1,1-Dichloropropene               0.443   0.470      -6.1  114   0.00
 43       Iso-Butyl Alcohol                 0.009   0.009       0.0  109   0.00
 44 s     surr1,1,2-Diclethane              0.460   0.520     -13.0  122   0.00
 45       Benzene                           1.295   1.317      -1.7  113   0.00
 46       1,2-Dichloroethane                0.503   0.517      -2.8  116   0.00
 47       N-Heptane                         0.685   0.701      -2.3  110   0.00
 48       Trichloroethene                   0.307   0.318      -3.6  115   0.00
 49       methylcyclohexane                 0.473   0.461       2.5  113   0.00
 50 c     1,2-Diclpropane                   0.355   0.369      -3.9  115   0.00
 51       Methyl Methacrylate               0.195   0.212      -8.7  123   0.00
 52       1,4-Dioxane                       0.001   0.001       0.0   83   0.00
 53       Dibromomethane                    0.190   0.202      -6.3  118   0.00
 [illegible] Bromodichloromethane           0.443   0.461      -4.1  115   0.00
 55       2-Nitropropane                    0.120   0.126      -5.0  120   0.00
 56       2-Chloroethylvinyl Ether          0.211   0.227      -7.6  130   0.00
 57       cis-1,3-Dichloropropene           0.538   0.574      -6.7  117   0.00

 58 I     d5 - Chlorobenzene                1.000   1.000       0.0  110   0.00
 59       4-Methyl-2-Pentanone              0.389   0.410      -5.4  124   0.00
 60 c     Toluene                           1.370   1.427      -4.2  115   0.00
 61       trans-1,3-Dichloropropene         0.536   0.563      -5.0  119   0.00
 62       Ethyl Methacrylate                0.421   0.452      -7.4  120   0.00
 63       1,1,2-Trichloroethane             0.246   0.257      -4.5  118   0.00
 64 s     surr3,Toluene-d8                  1.378   1.548     -12.3  123   0.00
 65 s     surr2,bfb                         0.550   0.627     -14.0  124   0.00
 66       Tetrachloroethene                 0.292   0.316      -8.2  115   0.00
 67       2-Hexanone                        0.260   0.285      -9.6  126   0.00
 68       1,3-Dichloropropane               0.544   0.564      -3.7  116   0.00
 69       Dibromochloromethane              0.284   0.312      -9.9  118   0.00
 70       1,2-Dibromoethane                 0.255   0.273      -7.1  118   0.00
 71 p     Chlorobenzene                     0.800   0.844      -5.5  113   0.00
 72       1,1,1,2-Tetrachloroethane         0.291   0.291       0.0  115   0.00
 73 c     Ethylbenzene                      1.492   1.600      -7.2  113   0.00
 74       (m+p)Xylene                       0.518   0.570     -10.0  112   0.00
 75       o-Xylene                          0.506   0.551      -8.9  112   0.00
 76       Styrene                           0.868   0.969     -11.6  114   0.00
 77 p     Bromoform                         0.165   0.189     -14.5  123   0.00
 [illegible] Isopropylbenzene               1.321   1.449      -9.7  111   0.00
 79       Cyclohexanone                     0.024   0.018      25.0#  75   0.00

 -------------------------------------------------------------------------------
   (#) = Out of Range
   F1124.D  WAT1008.M       Mon Oct 11 19:23:35 2004                    Page 2
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*See DOD Summary Attachment for DOD Specific Criteria

```
                    Evaluate Continuing Calibration Report

     Data File : J:\ACQUDATA\MSVOA8\DATA\101104\F1124.D        Vial: 5
     Acq On    : 11 Oct 2004  11:43 am                      Operator: Herring
     Sample    : CCV                                        Inst     : GCMS#8
     Misc      :                                            Multiplr: 1.00
     MS Integration Params: RTEINT.P

     Method        : J:\ACQUDATA\MSVOA8\METHODS\WAT1008.M (RTE Integrator)
     Title         : 8260voa
     Last Update   : Mon Oct 11 18:55:59 2004
     Response via  : Multiple Level Calibration

     Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
     Max. RRF Dev :  20%     Max. Rel. Area : 200%

          Compound                            AvgRF    CCRF       %Dev Area% Dev(min)
    --------------------------------------------------------------------------------
  81 p    1,1,2,2-Tetrachloroethane           0.703    0.720      -2.4   117   0.00
  82      Trans-1,4-Dichloro-2-butene         0.213    0.229      -7.5   125   0.00
  83      1,2,3-Trichloropropane              0.191    0.204      -6.8   122   0.00
  84      n-Propylbenzene                     3.430    3.625      -5.7   110   0.00
  85      Bromobenzene                        0.625    0.668      -6.9   116   0.00
  86      1,3,5-Trimethylbenzene              2.128    2.293      -7.8   109   0.00
  87      2-Chlorotoluene                     2.012    2.113      -5.0   111   0.00
  88      4-Chlorotoluene                     2.347    2.487      -6.0   112   0.00
  89      tert-Butylbenzene                   1.845    1.930      -4.6   107   0.00
  90      1,2,4-Trimethylbenzene              2.086    2.280      -9.3   109   0.00
  91      sec-Butylbenzene                    2.838    3.020      -6.4   105   0.00
  92      p-Isopropyltoluene                  2.245    2.384      -6.2   106   0.00
  93      1,3-Dclbenz                         1.151    1.214      -5.5   113   0.00
  94      1,4-Dclbenz                         1.174    1.203      -2.5   111   0.00
  95      n-Butylbenzene                      2.329    2.442      -4.9   104   0.00
  96      1,2-Dclbenz                         1.100    1.149      -4.5   111   0.00
  97      1,2-Dibromo-3-chloropropane         0.099    0.114     -15.2   121   0.00
  98      Nitrobenzene                        0.000    0.000       0.0   126   0.00
  99      1,2,4-Tcbenzene                     0.575    0.624      -8.5   113   0.00
 100      Hexachlorobu                        0.288    0.295      -2.4   100   0.00
 101      Naphthalen                          1.278    1.562     -22.2# 118   0.00
 102      1,2,3-Tclbenzene                    0.516    0.587     -13.8   115   0.00









    ---------------------------------------------------------------------------
     (#) = Out of Range               SPCC's out = 0   CCC's out = 0
     F1124.D  WAT1008.M          Mon Oct 11 19:23:36 2004                   Page 3
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ATTACHMENT III

DOD SUMMARY AND QC CRITERIA

*See DOD Summary Attachment for DOD Specific Criteria

*DOD SUMMARY

For work for the Department of Defense – the DOD Quality Systems Manual must be followed. The DOD Manual is based on the NELAC Standards with some additional requirements. The following are the requirements which are different or additional to routine analysis and must be followed for DOD work:

- Calibration Curve, Linear Regression: The correlation coefficient must be greater then or equal to 0.995.
- The Second Source Calibration Verification (ICV) must have a recovery of 75-125% of the true value.
- The Method Blank must not have any hits above ½ the reporting limit. Common laboratory contaminants must not be above the reporting limit.
- Apply J flag to all hits between MDL and MRL.
- Reporting Limits – "the lowest standard of the calibration establishes the [reporting limit], but it must not be greater than3 times the [MDL]." DOD QSM, V3, Appendix B-glossary.
- The limits for surrogates, LCS, and MS are different from Appendix C of the QAM. Follow the DOD limits given in the following tables. All DOD targets are "control analytes" for DOD. All DOD targets are spiked and evaluated.

*See DOD Summary Attachment for DOD Specific Criteria

The lower control limit generated for alternative or modified methods must be greater than 10% to be considered acceptable.

D.6 Surrogates

The surrogate compounds for each method are added to all samples, standards, and blanks to assess the ability of the method to recover specific non-target analytes from a given matrix and to monitor sample-specific recovery. Control limits for these compounds were calculated in the same study as the other analytes on the target analyte lists. Below are the limits for some of the surrogates of Methods 8260, 8270, 8081, and 8082, based on 3 standard deviations around the mean (Table D-3). Control limits are not available for some surrogates that appear on the target analyte lists in Appendix DoD-C. Sufficient data were not received for those analytes during the LCS study to perform statistically significant analyses. No ME limits are presented as marginal exceedances are not acceptable for surrogate spikes. Note: DoD prefers the use of those surrogates not identified as poor performing analytes in Table D-2 above.

TABLE D-3. SURROGATES

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit
8260 Water:				
1,2-Dichloroethane-d_4	95	8	70	120
4-Bromofluorobenzene	98	7	75	120
Dibromofluoromethane	100	5	85	115
Toluene-d_8	102	6	85	120
8260 Solid:				
4-Bromofluorobenzene	101	6	85	120
Toluene-d_8	100	5	85	115
8270 Water:				
2-Fluorobiphenyl	79	10	50	110
Terphenyl-d_{14}	92	14	50	135
2,4,6-Tribromophenol	82	13	40	125
2-Fluorophenol	63	14	20	110
Nitrobenzene-d_5	76	11	40	110
8270 Solid:				
2-Fluorobiphenyl	72	10	45	105
Terphenyl-d_{14}	78	15	30	125
2,4,6-Tribromophenol	80	15	35	125
2-Fluorophenol	70	11	35	105
Phenol-d_5/d_6	71	10	40	100
Nitrobenzene-d_5	69	10	35	100
8081 Water:				
Decachlorobiphenyl	83	17	30	135
TCMX	81	19	25	140
8081 Solid:				
Decachlorobiphenyl	94	13	55	130
TCMX	97	9	70	125
8082 Water:				
Decachlorobiphenyl	88	15	40	135
8082 Solid:				
Decachlorobiphenyl	91	11	60	125

D.7 In-House LCS Control Limits

The acceptability of LCS results within any preparatory batch shall be based on project specified limits or the following DoD-specified LCS control limits, if project-specific limits are not available. If DoD limits are not available, the laboratory must use its in-house limits for batch acceptance.

DoD strongly believes that it is important for laboratories to maintain their own in-house LCS limits. These in-house limits must be consistent with the DoD limits (project-specific, if available; otherwise the following LCS-CLs). The laboratory in-house limits shall be calculated from the laboratory's historical LCS data in accordance with a documented procedure (e.g., SOP) that is consistent with good laboratory practice. That document must describe the process for establishing and maintaining LCS limits and the use of control charts.

The laboratory in-house limits are to be used for several purposes:

- Laboratories are expected to utilize their in-house limits as part of their quality control system, and to evaluate trends and monitor and improve performance.
- When laboratories' in-house limits are outside the DoD control limits (upper and/or lower), they must report their in-house limits in the laboratory report (see Appendix DoD-A) even if the LCS associated with the batch in fact fell within the DoD limits. In this manner, DoD will be able to evaluate how laboratory performance affects the quality of the environmental data.
- DoD may review the laboratory in-house limits and associated trends, as reflected in control charts, to determine whether the laboratory's overall performance is acceptable. If deemed unacceptable, this may be a basis on which DoD makes a decision to not use the laboratory again until substantial improvement has occurred.

TABLE D-4. LCS CONTROL LIMITS FOR VOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8260 WATER MATRIX[11]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
1,1,1,2-Tetrachloroethane	105	8	80	130	75	135
1,1,1-Trichloroethane	100	11	65	130	55	145
1,1,2,2-Tetrachloroethane	96	11	65	130	55	140
1,1,2-Trichloroethane	100	8	75	125	65	135
1,1-Dichloroethane	101	11	70	135	60	145
1,1-Dichloroethene	99	10	70	130	55	140
1,1-Dichloropropene	102	10	75	130	65	140
1,2,3-Trichlorobenzene	99	14	55	140	45	155
1,2,3-Trichloropropane	98	9	75	125	65	130
1,2,4-Trichlorobenzene	100	11	65	135	55	145
1,2,4-Trimethylbenzene	103	10	75	130	65	140
1,2-Dibromo-3-chloropropane	91	14	50	130	35	145
1,2-Dibromoethane	100	7	80	120	75	125
1,2-Dichlorobenzene	96	9	70	120	60	130
1,2-Dichloroethane	100	10	70	130	60	140
1,2-Dichloropropane	100	8	75	125	65	135

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[11] A number of sporadic marginal exceedances of the control limits are allowed, depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits. LCS control limits are not available for Total Xylene. Xylene may be reported on a project-specific basis as a total number; however, for the purposes of the DoD QSM, it will be analyzed and reported as m,p-Xylene and o-Xylene. Additional limits for poor performing compounds can be found in section D.5 and for surrogate compounds in section D.6.

TABLE D-4. LCS CONTROL LIMITS FOR VOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8260 WATER MATRIX[11]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
1,3,5-Trimethylbenzene	102	10	75	130	65	140
1,3-Dichlorobenzene	100	8	75	125	65	130
1,3-Dichloropropane	100	9	75	125	65	135
1,4-Dichlorobenzene	99	8	75	125	65	130
2,2-Dichloropropane	103	11	70	135	60	150
2-Butanone	91	20	30	150	10	170
2-Chlorotoluene	100	9	75	125	65	135
2-Hexanone	92	12	55	130	45	140
4-Chlorotoluene	101	9	75	130	65	135
4-Methyl-2-pentanone	96	13	60	135	45	145
Acetone	91	17	40	140	20	160
Benzene	102	7	80	120	75	130
Bromobenzene	100	8	75	125	70	130
Bromochloromethane	97	11	65	130	55	140
Bromodichloromethane	98	8	75	120	70	130
Bromoform	99	10	70	130	60	140
Bromomethane	88	19	30	145	10	165
Carbon disulfide	100	21	35	160	15	185
Carbon tetrachloride	102	12	65	140	55	150
Chlorobenzene	102	7	80	120	75	130
Chlorodibromomethane	96	13	60	135	45	145
Chloroethane	99	12	60	135	50	145
Chloroform	100	12	65	135	50	150
Chloromethane	83	15	40	125	25	140
cis-1,2-Dichloroethene	99	9	70	125	60	135
cis-1,3-Dichloropropene	100	10	70	130	60	140
Dibromomethane	101	8	75	125	65	135
Dichlorodifluoromethane	93	21	30	155	10	175
Ethylbenzene	100	9	75	125	65	135
Hexachlorobutadiene	97	15	50	140	35	160
Isopropylbenzene	101	9	75	125	65	135
m,p-Xylene	102	9	75	130	65	135
Methyl tert-butyl ether	94	10	65	125	55	135
Methylene chloride	96	14	55	140	40	155
Naphthalene	96	14	55	140	40	150
n-Butylbenzene	103	11	70	135	55	150
n-Propylbenzene	101	9	70	130	65	140
o-Xylene	100	7	80	120	75	130
p-Isopropyltoluene	102	10	75	130	65	140
sec-Butylbenzene	100	9	70	125	65	135
Styrene	100	11	65	135	55	145
tert-Butylbenzene	99	10	70	130	60	140
Tetrachloroethene	96	18	45	150	25	165
Toluene	100	7	75	120	70	130
trans-1,2-Dichloroethene	99	13	60	140	45	150
trans-1,3-Dichloropropene	98	15	55	140	40	155
Trichloroethene	99	9	70	125	60	135
Trichlorofluoromethane	103	15	60	145	45	160
Vinyl chloride	99	16	50	145	35	165

*See DOD Summary Attachment for DOD Specific Criteria

TABLE D-5. LCS CONTROL LIMITS FOR VOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8260 SOLID MATRIX[12]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
1,1,1,2-Tetrachloroethane	100	9	75	125	65	135
1,1,1-Trichloroethane	101	11	70	135	55	145
1,1,2,2-Tetrachloroethane	93	13	55	130	40	145
1,1,2-Trichloroethane	95	11	60	125	50	140
1,1-Dichloroethane	99	9	75	125	65	135
1,1-Dichloroethene	100	12	65	135	55	150
1,1-Dichloropropene	102	11	70	135	60	145
1,2,3-Trichlorobenzene	97	12	60	135	50	145
1,2,3-Trichloropropane	97	11	65	130	50	140
1,2,4-Trichlorobenzene	98	11	65	130	55	140
1,2,4-Trimethylbenzene	100	12	65	135	55	145
1,2-Dibromo-3-chloropropane	87	16	40	135	25	150
1,2-Dibromoethane	97	9	70	125	60	135
1,2-Dichlorobenzene	97	7	75	120	65	125
1,2-Dichloroethane	104	11	70	135	60	145
1,2-Dichloropropane	95	8	70	120	65	125
1,3,5-Trimethylbenzene	99	11	65	135	55	145
1,3-Dichlorobenzene	98	9	70	125	65	135
1,3-Dichloropropane	100	8	75	125	70	130
1,4-Dichlorobenzene	98	9	70	125	65	135
2,2-Dichloropropane	101	11	65	135	55	145
2-Butanone	94	22	30	160	10	180
2-Chlorotoluene	98	10	70	130	60	140
2-Hexanone	97	16	45	145	30	160
4-Chlorotoluene	100	9	75	125	65	135
4-Methyl-2-pentanone	97	17	45	145	30	165
Acetone	88	23	20	160	10	180
Benzene	99	9	75	125	65	135
Bromobenzene[13]	93	9	65	120	55	130
Bromochloromethane	99	9	70	125	60	135
Bromodichloromethane	100	9	70	130	60	135
Bromoform	96	13	55	135	45	150
Bromomethane	95	21	30	160	10	180
Carbon disulfide	103	19	45	160	30	180
Carbon tetrachloride	100	11	65	135	55	145
Chlorobenzene	99	8	75	125	65	130
Chlorodibromomethane	98	11	65	130	55	140
Chloroethane	98	20	40	155	20	175
Chloroform	98	9	70	125	65	135
Chloromethane	90	13	50	130	40	140

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[12] A number of sporadic marginal exceedances of the control limits are allowed, depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits. LCS control limits are not available for Methyl tert-butyl ether and Total Xylene although those compounds do appear on the target analyte list for method 8260 (Table C-1 in Appendix DoD-C). Sufficient data to perform statistically significant analyses were not received for MTBE during the LCS study. Xylene may be reported on a project-specific basis as a total number; however, for the purposes of the DoD QSM, it will be analyzed and reported as m,p-Xylene and o-Xylene. Additional limits for poor performing compounds can be found in section D.5 and for surrogate compounds in section D.6.

[13] Provisional limits – outlier analyses during the LCS study resulted in LCS-CLs generated with data from fewer than four laboratories. Limits may be adjusted in the future as additional data become available.

TABLE D-5. LCS CONTROL LIMITS FOR VOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8260 SOLID MATRIX[12]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
cis-1,2-Dichloroethene	96	10	65	125	55	135
cis-1,3-Dichloropropene	99	9	70	125	65	135
Dibromomethane	100	9	75	130	65	135
Dichlorodifluoromethane[13]	85	17	35	135	15	155
Ethylbenzene	101	9	75	125	65	135
Hexachlorobutadiene	98	15	55	140	40	155
Isopropylbenzene	103	9	75	130	70	140
m,p-Xylene	102	8	80	125	70	135
Methylene chloride	97	14	55	140	40	155
Naphthalene	84	14	40	125	25	140
n-Butylbenzene	101	12	65	140	50	150
n-Propylbenzene	99	12	65	135	50	145
o-Xylene	101	8	75	125	70	135
p-Isopropyltoluene	104	10	75	135	65	140
sec-Butylbenzene	97	11	65	130	50	145
Styrene	101	9	75	125	65	135
tert-Butylbenzene	99	11	65	130	55	145
Tetrachloroethene	103	12	65	140	55	150
Toluene	99	9	70	125	60	135
trans-1,2-Dichloroethene	100	11	65	135	55	145
trans-1,3-Dichloropropene	96	10	65	125	55	140
Trichloroethene	101	8	75	125	70	130
Trichlorofluoromethane	106	27	25	185	10	215
Vinyl chloride	92	11	60	125	45	140

TABLE D-6. LCS CONTROL LIMITS FOR SEMIVOLATILE ORGANIC COMPOUNDS SW-846 METHOD 8270 WATER MATRIX[14]

Analyte	Mean	Standard Deviation	Lower Control Limit	Upper Control Limit	Lower ME Limit	Upper ME Limit
Polynuclear Aromatics						
2-Methylnaphthalene	75.0	9.5	45	105	35	115
Acenaphthene	77.6	10.1	45	110	35	120
Acenaphthylene	78.5	9.4	50	105	40	115
Anthracene	83.0	9.7	55	110	45	120
Benz[a]anthracene	82.7	8.9	55	110	45	120
Benzo[a]pyrene	81.3	9.5	55	110	45	120
Benzo[b]fluoranthene	81.8	12.1	45	120	35	130
Benzo[k]fluoranthene	84.6	13.2	45	125	30	135

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[14] A number of sporadic marginal exceedances of the control limits are allowed depending on the number of analytes spiked in the LCS. Refer to section D.2 and Table D-1 for guidance on the appropriate application of control and ME limits. LCS control limits are not available for Benzidine, 2,6-Dichlorophenol, and N-nitrosopyrrolidine, although those compounds do appear on the target analyte list for method 8270 (Table C-2 in Appendix DoD-C). Sufficient data to perform statistically significant analyses were not received for those analytes during the LCS study. Additional limits for poor performing compounds can be found in section D.5.

ARCADIS

Attachment C-2

System Startup Plan

ARCADIS
Infrastructure, environment, facilities

Northrop Grumman Systems Corporation

Attachment C-2

System Startup Plan
Operable Unit 3
Soil Gas Interim Remedial Measure

Former Grumman Settling Ponds,
Bethpage, New York
Site # 1-30-003A

February 8, 2008

Imagine the result

ARCADIS

Attachment C-2
System Startup Plan
Operable Unit 3
Soil Gas Interim Remedial Measure

Former Grumman Settling Ponds
Bethpage, New York
Site # 1-30-003A

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Date:
February 8, 2008

Tables

Attachments

1. Introduction

This Operable Unit 3 (OU3) Soil Gas Interim Remedial Measure (soil gas IRM) System Startup Plan (SSP) was prepared by ARCADIS of New York, Inc. (ARCADIS) on behalf of Northrop Grumman Systems Corporation (Northrop Grumman), and is being submitted pursuant to the Order On Consent (Consent Order or CO) Index # W1-0018-04-01 that was executed by the New York State Department of Environmental Conservation (NYSDEC) and Northrop Grumman, effective July 4, 2005 (NYSDEC 2005). The Park, which was termed the “Former Grumman Settling Ponds” and designated as Operable Unit 3 (OU3) by the NYSDEC, and the Former Grumman Plant 24 Access Road are collectively referred to in this Report as the Site.

This SSP is being submitted as an Attachment to the Sampling and Analysis Plan (SAP) which will ultimately be a component of the Operation, Maintenance and Monitoring (OM&M) Manual. This SSP identifies the procedures to be used to ensure that the system operates in accordance with the design requirements and the procedures that will be used to demonstrate system performance during the initial operating period (e.g., during the system “startup” period). All procedures and protocols described herein shall be conducted in accordance with the requirements set forth in SAP, the Quality Assurance Project Plan (QAPP), provided as Attachments C-1.1 and C-1.2 of the SAP, and the site-specific Health and Safety Plan (HASP) (ARCADIS 2005), incorporated herein by reference.

System startup will consist of two phases: a system mechanical startup/shakedown period; and, a system startup performance monitoring period. It is anticipated that the mechanical startup/shakedown period will be completed over a one to two week duration. The system startup performance monitoring period will begin immediately following the mechanical startup period and will be completed during the first 28-days of full-time system operation. A description of the system startup methodology is provided below.

2. System Mechanical Startup and Shakedown

System mechanical startup/shakedown will be completed immediately following system construction but prior to full-time system operation. System mechanical startup/shakedown will be completed prior to system startup activities to the depressurization wells (e.g., the depressurization wells will not be connected to the regenerative blowers) and will include, but not be limited to the following:

- Testing of all major mechanical equipment to ensure proper operation and motor rotation in accordance with the specifications and manufacturer's requirements.

- Testing of all electrical controls (i.e., level switches, transmitters, etc.) to ensure proper operation in accordance with the specifications and manufacturer's requirements.

- Final on-site troubleshooting and programming of the Main Control Panel (MCP); and,

- Operation of system in it's entirety to ensure proper operation.

- Programming and testing of the system autodialer.

The final connection to the depressurization well manifold will be made following completion of the mechanical startup/shakedown activities described above. The final phase of the mechanical startup/shakedown period will consist of a brief operating period with the depressurization wells connected to the system. All wells will be balanced for vacuum and flow in accordance with their initial design parameters provided in the 95% Design Report (ARCADIS 2007a). In addition, a final check will be made on the overall mechanical and electrical controls operation. Full time system operational startup will occur thereafter, as described below.

3. System Startup Activities

This section identifies the procedures to be used during the startup performance monitoring period of the Soil Gas IRM.

As referenced previously, the first 28 days of full-time system operation will be used for system startup performance monitoring. During this time period, system startup performance testing will be conducted at a greater frequency relative to the long-term OM&M requirements of the system. Testing will be used to confirm the proper operation of the system with respect to the performance objectives (e.g., the objectives described in the Soil Gas IRM Work Plan [ARCADIS 2007b]) and compliance requirements (e.g., air discharge limitations [NYSDEC 2003]). Startup performance testing will include the recording of system operating parameters and the collection of vapor and water samples for laboratory and/or field analysis. Table C-1.1 provides a summary of the proposed startup sampling schedule. Attachments C-1.1 through C-

1.3 provide the field logs that will be completed during system startup. A drawing showing the proposed sampling locations is provided in Drawing 3 of the 95% Design Report (ARCADIS 2007a). A summary of the proposed sampling schedule and methodology is provided below.

Baseline Measurements –

System performance baseline measurements will be collected prior to full-time startup of the system. Specifically, baseline measurements will be collected from all induced vacuum monitoring well locations and from all groundwater and/or perched water monitoring wells as outlined on Attachment C-1.1. Ultimately, baseline induced vacuum measurements will be compared to the induced vacuum measurements taken following system startup to demonstrate that negative pressure is being maintained within the targeted capture zone.

Day 1 –

Day 1 is defined as the first 8-hours of system operation after the system flow and vacuum balancing is completed as described in Section 2.0 above. Day 1 startup performance monitoring will include the following:

- The collection of induced vacuum readings and depth to water measurements from all monitoring points at the beginning and end of the day (Attachment C-1.1).
- The collection of individual wellhead parameters from all monitoring points at the beginning and end of the day (Attachment C-1.2).
- The collection of system general operating parameters at the beginning and end of the day (Attachment C-1.3).
- The collection of vapor performance samples for field analysis using a photoionization detector (PID) from individual depressurization wells (i.e., vapor sample ports VSP-101 through VSP-118), from the individual blower effluent lines (VSP-201, 301, and 401), from the total effluent prior to treatment (i.e., VSP-601) and from the total effluent following treatment (i.e., VSP-602) at the beginning and the end of the day (Attachment C-1.3).

- The collection of vapor performance samples for laboratory analysis from individual depressurization wells (i.e., vapor sample ports VSP-101 through VSP-118) and from the total effluent prior to vapor treatment (i.e., VSP-601) at the end of the day.

- The collection of a vapor compliance sample for laboratory analysis from the total effluent following treatment (i.e., VSP-602) for laboratory analysis at the end of the day.

Days 2, 7, 14, and 28 –

Days 2, 7, 14, and 28 startup performance monitoring will include the following:

- The collection of induced vacuum readings and depth to water measurements from all monitoring points (Attachment C-1.1).

- The collection of individual wellhead parameters from all monitoring points (Attachment C-1.2).

- The collection of system general operating parameters (Attachment C-1.3).

- The collection of vapor performance samples for field analysis using a photoionization detector (PID) from individual depressurization wells (i.e., vapor sample ports VSP-101 through VSP-118), from the total effluent prior to treatment (i.e., VSP-601) and from the total effluent following treatment (i.e., VSP-602)(Attachment C-1.3).

- The collection of a vapor performance sample for laboratory analysis from the total effluent prior to vapor treatment (i.e., VSP-601).

- The collection of a vapor compliance sample for laboratory analysis from the total effluent following treatment (i.e., VSP-602) for laboratory analysis.

In addition to the above, water quality samples will be collected and submitted for laboratory analysis from each of the individual knockout tanks (i.e., water sample ports WSP-210, 310, and 410) once during the 28 day startup period. Finally, a water quality sample will be collected and submitted for laboratory analysis from the water storage tank (WSP-501) once during the 28 day startup period. The analytical results from sample location WSP-501 will be reviewed and compared to the anticipated water quality as described in Northrop Grumman's letter to the Nassau County Department of Public Works (Northrop Grumman 2007) prior to discharge to the publicly owned treatment work (POTW).

All samples collected for laboratory analysis will be collected and submitted in accordance with the methodology and analytical methods provided in the SAP. All performance samples will be analyzed using standard laboratory turnaround times (TATs). Expedited TATs will be used for compliance sampling until a trend is established and/or breakthrough is expected.

4. Quality Assurance Procedures

All startup performance sampling will be conducted in accordance with the quality assurance procedures outlined in the QAPP provided as Attachments C-1.1 and C-1.2 of the SAP.

5. Reporting

A complete summary of the system startup field parameter and analytical results will be provided in the first monthly interim progress report as described in the SAP. Draft interim startup results will be provided to the NYSDEC in the form of electronic mail submittals during the 28 day startup period.

6. References

ARCADIS of New York, Inc. 2007a. 95% Design Report Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A September 7, 2007

ARCADIS of New York, Inc. 2007b. Operable Unit 3 – Soil Gas Interim Remedial Measure Work Plan, Former Grumman Settling Ponds, Bethpage, New York, Site #1-30-003A February 16, 2007.

New York State Department of Environmental Conservation (NYSDEC), 2005, Order on Consent Index #WI-0018-04-01, Site # 1-30-003A, July 4, 2005.

New York State Department of Environmental Conservation, Division of Air Resources-1 (DAR-1) Guidelines for the Control of Toxic Ambient Air Contaminants dated 1991 and the AGC/SGC Tables dated December 22, 2003.

Northrop Grumman Systems Corporation, September 6, 2007. Request for Discharge of IRM Condensate Water to Nassau County POTW, Northrop Grumman Systems Corporation, Bethpage, New York.

Table C-1.1. Summary of System Startup Performance Monitoring and Testing Schedule, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Sample Location/Description	Parameter/Measurement	Frequency
	Parameters for Field Analysis [1]	
Field Parameters		
Induced Vacuum and Water Level Readings	All Parameters Listed on Attachment C-1.1	Beginning and End of Day 1 Once During Days 2, 7, 14, and 28
Individual Wellhead Operating Parameters	All Parameters Listed on Attachment C-1.2	Beginning and End of Day 1 Once During Days 2, 7, 14, and 28
General System Operating Parameters	All Parameters Listed on Attachment C-1.3	Beginning and End of Day 1 Once During Days 2, 7, 14, and 28
Vapor Samples		
Individual Depressurization Wells		
VSP-101 Through VSP-118	Photoionization Detector	End of Day 1 Once During Days 2, 7, 14, and 28
Total Effluent Prior to Treatment		
VSP-601	Photoionization Detector	End of Day 1 Once During Days 2, 7, 14, and 28
Total Effluent Following Treatment		
VSP-602	Photoionization Detector	End of Day 1 Once During Days 2, 7, 14, and 28
	Samples for Laboratory Analysis	
Vapor Samples		
Individual Depressurization Wells		
VSP-101 Through VSP-118	VOCs (USEPA Method TO-15+)[2]	End of Day 1
Total Effluent Prior to Treatment		
VSP-601	VOCs (USEPA Method TO-15+)[2]	End of Day 1 Once During Days 2, 7, 14, and 28
Total Effluent Following Treatment		
VSP-602	VOCs (USEPA Method TO-15+)[2]	End of Day 1 Once During Days 2, 7, 14, and 28

continued on following page.

Table C-1.1. Summary of System Startup Performance Monitoring and Testing Schedule, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Sample Location/Description	Parameter/Measurement	Frequency
Water Samples		
Knock Out Tanks Effluent		
WSP-210	VOCs (USEPA Method 8260)	Once During 28 Day Startup[3]
WSP-310	VOCs (USEPA Method 8260)	Once During 28 Day Startup[3]
WSP-410	VOCs (USEPA Method 8260)	Once During 28 Day Startup[3]
Water Storage Tank Effluent		
WSP-501	VOCs (USEPA Method 8260)	Once During 28 Day Startup[4]

Notes:

1. All parameters for field analysis will be recorded using dedicated system mechanical gauges, handheld portable field gauges, and a portable photoionization detector (PID). All portable field equipment shall be calibrated prior to use.
2. All vapor samples to submitted for laboratory analysis using USEPA Method TO-15 (modified list plus the top 15 tentatively identified compounds (TICs) including the TIC Freon. Complete analyte list is provided in Table C-2 of the Sampling and Analysis Plan (SAP).
3. Knockout tank water samples will be collected upon collection of sufficient water to collect a sample.
4. Water storage tank sample will be collected prior to transfer to existing publicly owned treatment works (POTW).

Attachment C-1.1. System Startup Induced Vacuum Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Vapor Monitoring Point				**DW-1S** [1]	VMWC-1A	VMWC-1B	VMWC-1C	VMWC-2A	VMWC-2C	VMWC-3A	VMWC-3B
Screened Interval (ft bls)				**15 to 30**	7.5 to 8.5	12 to 13	24.7 to 39.7	9 to 10	21 to 22	7.5 to 8.5	13 to 14
Associated Depressurization Well				--	*DW-1S*	*DW-1S*	*DW-1S*	*DW-1S*	*DW-1S*	*DW-1S*	*DW-1S*
Distance From Depressurization Well to Monitoring Point (ft)				NA	10	10	10	25	25	55	55
Day	**Recorder Initials**	**Date**	**Time**	**Induced Vacuum Measurement (iwc)**							
Baseline											
Day 1											
1st Round											
2nd Round											
Day 2											
Day 7											
Day 14											
Day 28											

Notes and abbreviations on last page.

	Barometric Pressure (in Hg)	Ambient Temperature (F)	Ambient Conditions		Barometric Pressure (in Hg)	Ambient Temperature (F)	Ambient Conditions
Day 1 - AM				Day 7			
Day 1 - PM				Day 14			
Day 2				Day 28			

Attachment C-1.1. System Startup Induced Vacuum Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Vapor Monitoring Point				VMWC-3C	VMWC-4A	VMWC-4B	VMWC-4C	**DW-1D** [(1)]	VMWC-1D [(2)]	VMWC-2D	VMWC-3D
Screened Interval (ft bls)				22 to 23	6 to 7	12 to 13	21 to 22	**42 to 47**	44 to 54	44 to 45	45 to 46
Associated Depressurization Well				*DW-1S*	*DW-1S*	*DW-1S*	*DW-1S*	--	*DW-1D*	*DW-1D*	*DW-1D*
Distance From Depressurization Well to Monitoring Point (ft)				55	35	35	35	NA	13	28	58
Day	**Recorder Initials**	**Date**	**Time**	**Induced Vacuum Measurement (iwc)**							
Baseline											
Day 1											
1st Round											
2nd Round											
Day 2											
Day 7											
Day 14											
Day 28											

Notes and abbreviations on last page.

	Barometric Pressure (in Hg)	Ambient Temperature (F)	Ambient Conditions		Barometric Pressure (in Hg)	Ambient Temperature (F)	Ambient Conditions
Day 1 - AM				Day 7			
Day 1 - PM				Day 14			
Day 2				Day 28			

Attachment C-1.1. System Startup Induced Vacuum Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

				VMWC-4D	DW-2S (1)	VMWC-5A	VMWC-5B	VMWC-6A	VMWC-6B	VMWC-7A	VMWC-7B
Vapor Monitoring Point				VMWC-4D	**DW-2S** (1)	VMWC-5A	VMWC-5B	VMWC-6A	VMWC-6B	VMWC-7A	VMWC-7B
Screened Interval (ft bls)				44 to 45	**10 to 17**	7 to 8	15.2 to 19.2	8 to 9	15 to 16	7 to 8	14 to 15
Associated Depressurization Well				*DW-1D*	--	*DW-2S*	*DW-2S*	*DW-2S*	*DW-2S*	*DW-2S*	*DW-2S*
Distance From Depressurization Well to Monitoring Point (ft)				35	NA	10	10	25	25	50	50
Day	**Recorder Initials**	**Date**	**Time**	**Induced Vacuum Measurement (iwc)**							
Baseline											
Day 1											
1st Round											
2nd Round											
Day 2											
Day 7											
Day 14											
Day 28											

Notes and abbreviations on last page.

Attachment C-1.1. System Startup Induced Vacuum Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Vapor Monitoring Point				VMWC-8A	VMWC-8B	**DW-2D (1)**	VMWC-5D (2)	VMWC-6D	VMWC-7D	VMWC-8D	VMWC-13D
Screened Interval (ft bls)				7 to 8	13 to 14	**27 to 47**	40 to 50	39 to 40	36 to 37	35 to 36	27 to 47
Associated Depressurization Well				*DW-2S*	*DW-2S*	--	*DW-2D*	*DW-2D*	*DW-2D*	*DW-2D*	*DW-2D*
Distance From Depressurization Well to Monitoring Point (ft)				35	35	NA	13	28	53	35	230
Day	**Recorder Initials**	**Date**	**Time**	**Induced Vacuum Measurement (iwc)**							
Baseline											
Day 1											
1st Round											
2nd Round											
Day 2											
Day 7											
Day 14											
Day 28											

Notes and abbreviations on last page.

Attachment C-1.1. System Startup Induced Vacuum Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

				VMWC-17D	DW-3S (1)	VMWC-9A	VMWC-9B	VMWC-10B	VMWC-11B	DW-3D (1)	VMWC-10D
Vapor Monitoring Point				VMWC-17D	DW-3S (1)	**VMWC-9A**	VMWC-9B	VMWC-10B	VMWC-11B	DW-3D (1)	VMWC-10D
Screened Interval (ft bls)				32 to 47	10 to 30	**6.3 to 7.3**	19.3 to 20.3	18.8 to 19.8	19.2 to 20.2	26 to 46	39 to 40
Associated Depressurization Well				*DW-2D*	--	DW-3S	*DW-3S*	*DW-3S*	*DW-3S*	--	*DW-3D*
Distance From Depressurization Well to Monitoring Point (ft)				188	NA	30.2	34	55.3	80.8	NA	53
Day	**Recorder Initials**	**Date**	**Time**	**Induced Vacuum Measurement (iwc)**							
Baseline											
Day 1											
1st Round											
2nd Round											
Day 2											
Day 7											
Day 14											
Day 28											

Notes and abbreviations on last page.

Attachment C-1.1. System Startup Induced Vacuum Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Vapor Monitoring Point				VMWC-11D	VMWC-12D	**DW-4S (1)**	VMWC-16A	VMWC-16B	**DW-4D (1)**	VMWC-16D	**DW-5S (1)**
Screened Interval (ft bls)				39.3 to 40.3	39.2 to 40.2	15 to 30	7 to 8	13 to 14	**27 to 47**	45 to 46	15 to 30
Associated Depressurization Well				*DW-3D*	*DW-3D*	--	*DW-4S*	*DW-4S*	--	*DW-4D*	--
Distance From Depressurization Well to Monitoring Point (ft)				79	102	NA	85	88	NA	86	NA
Day	**Recorder Initials**	**Date**	**Time**	**Induced Vacuum Measurement (iwc)**							
Baseline											
Day 1											
1st Round											
2nd Round											
Day 2											
Day 7											
Day 14											
Day 28											

Notes and abbreviations on last page.

Attachment C-1.1. System Startup Induced Vacuum Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Vapor Monitoring Point				VMWC-15A	VMWC-15B	**DW-5D** (1)	VMWC-15D	**DW-6S** (1)	**DW-6D** (1)	**DW-7S** (1)	VMWC-14A
Screened Interval (ft bls)				7 to 8	13 to 14	**42 to 47**	45 to 46	**15 to 30**	**42 to 47**	**10 to 30**	6 to 7
Associated Depressurization Well				*DW-5S*	*DW-5S*	--	*DW-5D*	--	--	--	*DW-7S*
Distance From Depressurization Well to Monitoring Point (ft)				69	72	NA	73	NA	NA	NA	49
Day	**Recorder Initials**	**Date**	**Time**	**Induced Vacuum Measurement (iwc)**							
Baseline											
Day 1											
1st Round											
2nd Round											
Day 2											
Day 7											
Day 14											
Day 28											

Notes and abbreviations on last page.

Attachment C-1.1. System Startup Induced Vacuum Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Vapor Monitoring Point				VMWC-14B	**DW-7D** (1)	VMWC-14D	**DW-8S** (1)	**DW-9S** (1)	**DW-10S** (1)	**DW-11S** (1)	VMWC-18A
Screened Interval (ft bls)				18 to 19	**30 to 40**	38 to 39	**10 to 17**	**10 to 17**	**10 to 17**	**10 to 17**	7 to 8
Associated Depressurization Well				*DW-7S*	--	*DW-7D*	--	--	--	--	*DW-11S*
Distance From Depressurization Well to Monitoring Point (ft)				52	NA	61	NA	NA	NA	NA	41
Day	**Recorder Initials**	**Date**	**Time**	**Induced Vacuum Measurement (iwc)**							
Baseline											
Day 1											
1st Round											
2nd Round											
Day 2											
Day 7											
Day 14											
Day 28											

Notes and abbreviations on last page.

Attachment C-1.1. System Startup Induced Vacuum Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Vapor Monitoring Point				VMWC-18B	VMWC-1D	VMWC-5D	B24MW-3
Screened Interval (ft bls)				13 to 14	44 to 54	40 to 50	55 to 70
Associated Depressurization Well				*DW-11S*	*DW-1D*	*DW-2D*	DW-5D
Distance From Depressurization Well to Monitoring Point (ft)				42	13	13	33
Day	**Recorder Initials**	**Date**	**Time**	**Induced Vacuum Measurement (iwc)**	**Water Level Elevation (ft bmp)**		
Baseline							
Day 1							
1st Round							
2nd Round							
Day 2							
Day 7							
Day 14							
Day 28							

Notes and abbreviations on last page.

Attachment C-1.1. System Startup Induced Vacuum Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Notes and Abbreviations:

1. Vapor monitoring points in **BOLD** text are depressurization wells.
2. Water Level to be collected for this location and recorded on last page.
3. + indicates increasing, - indicates decreasing

▨ -distance and well screen depth are based on field measurements and locations not surveyed.

--	the specified well is a depressurization well
F	degrees Farenheit
ft	feet
ft bls	feet below land surface
ft bmp	feet below measuring point
in Hg	inches of mercury
iwc	inches of water column
NA	not applicable

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-1S**					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-114	--	VI-132	--	VSP-114	VI-114
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	150 scfm	--	65	--	-3.9
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				DW-1D					
Parameter				Differential Pressure [(1)]	Equivalent Flow Rate	Vacuum at Mainfold [(1)]	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-105	--	VI-123	--	VSP-105	VI-105
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	75 scfm	--	65	--	-33.5
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-2S**					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-110	--	VI-128	--	VSP-110	VI-110
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	66 scfm	--	65	--	-3.8
Day		**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				DW-2D					
Parameter				Differential Pressure [(1)]	Equivalent Flow Rate	Vacuum at Mainfold [(1)]	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-107	--	VI-125	--	VSP-107	VI-107
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	100 scfm	--	65	--	-5.0
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-3S**					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-117	--	VI-135	--	VPS-117	VI-117
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	79 scfm	--	65	--	-1.6
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-3D**					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-102	--	VI-120	--	VSP-102	VI-102
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	102 scfm	--	65	--	-2.6
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

▨ Parameter will not be recorded.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-4S**					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	. PID	Wellhead Vacuum
Instrument ID				FI-113	--	VI-131	--	VSP-113	VI-113
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	150 scfm	--	65	--	-3.9
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				DW-4D					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-106	--	VI-124	--	VSP-106	VI-106
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	75 scfm	--	65	--	-33.5
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				DW-5S					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-116	--	VI-134	--	VSP-116	VI-116
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	150 scfm	--	65	--	-3.9
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				DW-5D					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-103	--	VI-121	--	VSP-103	VI-103
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	75 scfm	--	65	--	-33.5
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-6S**					
Parameter				Differential Pressure [(1)]	Equivalent Flow Rate	Vacuum at Mainfold [(1)]	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-115	--	VI-133	--	VSP-115	VI-115
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	150 scfm	--	65	--	-3.9
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-6D**					
Parameter				Differential Pressure $^{(1)}$	Equivalent Flow Rate	Vacuum at Mainfold $^{(1)}$	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-104	--	VI-122	--	VSP-104	VI-104
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	75 scfm	--	65	--	-33.5
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-7S**					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-118	--	VI-136	--	VSP-118	VI-118
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	45 scfm	--	65	--	-0.8
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-7D**					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-101	--	VI-119	--	VSP-101	VI-101
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	49 scfm	--	65	--	-1.4
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

▨ Parameter will not be recorded.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-8S**					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-112	--	VI-130	--	VSP-112	VI-112
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	66 scfm	--	65	--	-3.8
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-9S**					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-111	--	VI-129	--	VSP-111	VI-111
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	66 scfm	--	65	--	-3.8
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-10S**					
Parameter				Differential Pressure (1)	Equivalent Flow Rate	Vacuum at Mainfold (1)	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-109	--	VI-127	--	VSP-109	VI-109
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	66 scfm	--	65	--	-3.8
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

Attachment C-1.2. System Startup Wellhead Vacuum and Flow Monitoring Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well				**DW-11S**					
Parameter				Differential Pressure [(1)]	Equivalent Flow Rate	Vacuum at Mainfold [(1)]	Temperature	PID	Wellhead Vacuum
Instrument ID				FI-108	--	VI-126	--	VSP-108	VI-108
Units				(iwc)	(scfm)	(iwc)	(F)	(ppmv)	(iwc)
Design Value				--	66 scfm	--	65	--	-3.8
Day	**Recorder Initials**	**Date**	**Time**						
Baseline							▨		
Day 1									
First Round									
Second Round									
Day 2							▨		
Day 7							▨		
Day 14							▨		
Day 28							▨		

Notes:

1. Line vacuum and flow rate measurements are to be collected inside the treatment building.

--	not applicable
F	degrees Farenheit
FI	flow rate indicator
iwc	inches of water column
ppmv	parts per million by volume
scfm	standard cubic feet per minute
VI	vacuum indicator
VSP	vapor sample point

▨ Parameter will not be recorded.

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Attachment C-1.3. System Startup General System Operating Parameter Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Parameter				Knock Out Tanks Influent Vacuum			Knock Out Tanks Totalizer		
Instrument ID				*VI-201*	*VI-301*	*VI-401*	*FQI-210*	*FQI-310*	*FQI-410*
Location				KO-200 Influent	KO-300 Influent	KO-400 Influent	KO-200 Effluent	KO-300 Effluent	KO-400 Effluent
Units				(iwc)			(gallons)		
Day	**Recorder Initials**	**Date**	**Time**						
Baseline				▨	▨	▨			
Day 1									
Day 2									
Day 7									
Day 14									
Day 28									

Notes and Abbreviations:

1. The blower effluent and total effluent air flow rates are to be measured using a hand-held anemometer.

▨	Parameter will not be recorded.	PIT	pressure indicating transmitter
BL	blower	ppmv	parts per million by volume
F	degrees Fahrenheit	scfm	standard cubic feet per minute
FE	flow monitoring element access point	TI	temperature indicator
FQI	flow totalizer indicator	TT	temperature transmitter
iwc	inches of water column	VI	vacuum indicator
KO	knock out tank	VIT	vacuum indicating transmitter
PI	pressure indicator	VPGAC	vapor phase granular activated carbon
PID	photo-ionization detector	VSP	vapor sample port

Attachment C-1.3. System Startup General System Operating Parameter Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Parameter				Blowers Influent Vacuum			Blowers Effluent Pressure		
Instrument ID				*VIT-202*	*VIT-302*	*VIT-402*	*PI-201*	*PI-301*	*PI-401*
Location				BL-200 Influent	BL-300 Influent	BL-400 Influent	BL-200 Effluent	BL-300 Effluent	BL-400 Effluent
Units				(iwc)			(iwc)		
Day	**Recorder Initials**	**Date**	**Time**						
Baseline					▨	▨	▨	▨	▨
Day 1									
Day 2									
Day 7									
Day 14									
Day 28									

Notes and Abbreviations:

1. The blower effluent and total effluent air flow rates are to be measured using a hand-held anemometer.

▨	Parameter will not be recorded.	PIT	pressure indicating transmitter
BL	blower	ppmv	parts per million by volume
F	degrees Fahrenheit	scfm	standard cubic feet per minute
FE	flow monitoring element access point	TI	temperature indicator
FQI	flow totalizer indicator	TT	temperature transmitter
iwc	inches of water column	VI	vacuum indicator
KO	knock out tank	VIT	vacuum indicating transmitter
PI	pressure indicator	VPGAC	vapor phase granular activated carbon
PID	photo-ionization detector	VSP	vapor sample port

Attachment C-1.3. System Startup General System Operating Parameter Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Parameter				Blowers Effluent Air Flow			Blowers Effluent PID		
Instrument ID				*FE* [(1)]			*VSP-201*	*VSP-301*	*VSP-401*
Location				BL-200 Effluent	BL-300 Effluent	BL-400 Effluent	BL-200 Effluent	BL-300 Effluent	BL-400 Effluent
Units				(scfm)			(ppmv)		
Day	**Recorder Initials**	**Date**	**Time**						
Baseline				▨	▨	▨	▨	▨	▨
Day 1									
Day 2							▨	▨	▨
Day 7							▨	▨	▨
Day 14							▨	▨	▨
Day 28							▨	▨	▨

Notes and Abbreviations:

1. The blower effluent and total effluent air flow rates are to be measured using a hand-held anemometer.

▨	Parameter will not be recorded.	PIT	pressure indicating transmitter
BL	blower	ppmv	parts per million by volume
F	degrees Fahrenheit	scfm	standard cubic feet per minute
FE	flow monitoring element access point	TI	temperature indicator
FQI	flow totalizer indicator	TT	temperature transmitter
iwc	inches of water column	VI	vacuum indicator
KO	knock out tank	VIT	vacuum indicating transmitter
PI	pressure indicator	VPGAC	vapor phase granular activated carbon
PID	photo-ionization detector	VSP	vapor sample port

Attachment C-1.3. System Startup General System Operating Parameter Form, Northrop Grumman Operable Unit 3 Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Parameter				Total Effluent Flow Rate	Total Effluent PID	Heat Exchanger Influent Temperature	Total Effluent Pressure	VPGAC Influent Temperature	VPGAC Effluent PID
Instrument ID				*FE* (1)	*VSP-601*	*TI-601*	*PIT-601*	*TI-602/TT-602*	*VSP-602*
Location				Combined Effluent	Combined Effluent	Combined Effluent	Combined Effluent	Combined Effluent	Combined Effluent
Units				(scfm)	(ppmv)	(F)	(iwc)	(F)	(ppmv)
Day	**Recorder Initials**	**Date**	**Time**						
Baseline				▨	▨	▨	▨	▨	▨
Day 1									
Day 2									
Day 7									
Day 14									
Day 28									

Notes and Abbreviations:

1. The blower effluent and total effluent air flow rates are to be measured using a hand-held anemometer.

▨	Parameter will not be recorded.	PIT	pressure indicating transmitter
BL	blower	ppmv	parts per million by volume
F	degrees Fahrenheit	scfm	standard cubic feet per minute
FE	flow monitoring element access point	TI	temperature indicator
FQI	flow totalizer indicator	TT	temperature transmitter
iwc	inches of water column	VI	vacuum indicator
KO	knock out tank	VIT	vacuum indicating transmitter
PI	pressure indicator	VPGAC	vapor phase granular activated carbon
PID	photo-ionization detector	VSP	vapor sample port

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Attachment C-3

System Long – Term Monitoring
and Parameter Forms

Attachment C-3.1. System Long-Term Induced Vacuum Monitoring Form, Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well	Vapor Monitoring Point	Screened Interval (ft bls)	Distance [1] (feet)	Induced Vacuum Reading (inches of water)
DW-1S		**15 to 30**	NA	
	VMWC-1A	7.5 to 8.5	10	
	VMWC-1B	12 to 13	10	
	VMWC-1C	24.7 to 39.7	10	
	VMWC-2A	9 to 10	25	
	VMWC-2C	21 to 22	25	
	VMWC-3A	7.5 to 8.5	55	
	VMWC-3B	13 to 14	55	
	VMWC-3C	22 to 23	55	
	VMWC-4A	6 to 7	35	
	VMWC-4B	12 to 13	35	
	VMWC-4C	21 to 22	35	
DW-1D		**42 to 47**	NA	
	VMWC-1D[3]	44 to 54	13	
	VMWC-2D	44 to 45	28	
	VMWC-3D	45 to 46	58	
	VMWC-4D	44 to 45	35	
DW-2S		**10 to 17**	NA	
	VMWC-5A	7 to 8	10	
	VMWC-5B	15.2 to 19.2	10	

Initials:		Date:	(+/-)[2]
Barometric Pressure (inHg)			
Ambient Temperature (Fahrenheit)			
Ambient Conditions			

Notes:

1. Distance is relative to associated depressurization well.
2. + indicates increasing, - indicates decreasing
3. Depth to water readings to be collected at this location record on last page.

Abbreviations:

---- reading recorded elsewhere on form	ft bls - feet below land surface	in Hg - inches of Mercury
DW - depressurization well	ft bmp - feet below measuring point	VMWC- vapor monitoring well cluster

▨ -distances and well screen intervals not confirmed- based on field measurements.

Attachment C-3.1. System Long-Term Induced Vacuum Monitoring Form, Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well	Vapor Monitoring Point	Screened Interval (ft bls)	Distance (1) (feet)	Induced Vacuum Reading (inches of water)
DW-2S (continued)		**10 to 17**	NA	----
	VMWC-6A	8 to 9	25	
	VMWC-6B	15 to 16	25	
	VMWC-7A	7 to 8	50	
	VMWC-7B	14 to 15	50	
	VMWC-8A	7 to 8	35	
	VMWC-8B	13 to 14	35	
DW-2D		**27 to 47**	NA	
	VMWC-5D(3)	40 to 50	13	
	VMWC-6D	39 to 40	28	
	VMWC-7D	36 to 37	53	
	VMWC-8D	35 to 36	35	
	VMWC-13D	27 to 47	230	
	▨ VMWC-17D	▨ 32 to 47	▨ 188	
DW-3S		**10 to 30**	NA	
	VMWC-9A	6.3 to 7.3	30.2	
	VMWC-9B	19.3 to 20.3	34	
	VMWC-10B	18.8 to 19.8	55.3	
	VMWC-11B	19.2 to 20.2	80.8	

Initials:		Date:	(+/-)(2)
Barometric Pressure (inHg)			
Ambient Temperature (Fahrenheit)			
Ambient Conditions			

Notes:

1. Distance is relative to associated depressurization well.
2. + indicates increasing, - indicates decreasing
3. Depth to water readings to be collected at this location record on last page.

Abbreviations:

---- reading recorded elsewhere on form
DW - depressurization well
ft bls - feet below land surface
ft bmp - feet below measuring point
in Hg - inches of Mercury
VMWC- vapor monitoring well cluster

▨ -distances and well screen intervals not confirmed- based on field measurements.

Attachment C-3.1. System Long-Term Induced Vacuum Monitoring Form, Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well	Vapor Monitoring Point	Screened Interval (ft bls)	Distance (1) (feet)	Induced Vacuum Reading (inches of water)
DW-3D		**26 to 46**	NA	
	VMWC-10D	39 to 40	53	
	VMWC-11D	39.3 to 40.3	79	
	VMWC-12D	39.2 to 40.2	102	
DW-4S		15 to 30	NA	
	VMWC-16A	7 to 8	85	
	VMWC-16B	13 to 14	88	
DW-4D		**27 to 47**	NA	
	VMWC-16D	45 to 46	86	
DW-5S		**15 to 30**	NA	
	VMWC-15A	7 to 8	69	
	VMWC-15B	13 to 14	72	
DW-5D		**42 to 47**	NA	
	VMWC-15D	45 to 46	73	
DW-6S		**15 to 30**	NA	
DW-6D		**42 to 47**	NA	

Initials:		Date:	(+/-)(2)
Barometric Pressure (inHg)			
Ambient Temperature (Fahrenheit)			
Ambient Conditions			

Notes:

1. Distance is relative to associated depressurization well.
2. + indicates increasing, - indicates decreasing
3. Depth to water readings to be collected at this location record on last page.

Abbreviations:

---- reading recorded elsewhere on form
DW - depressurization well
ft bls - feet below land surface
ft bmp - feet below measuring point
in Hg - inches of Mercury
VMWC- vapor monitoring well cluster
▨ -distances and well screen intervals not confirmed- based on field measurements.

Attachment C-3.1. System Long-Term Induced Vacuum Monitoring Form, Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Depressurization Well	Vapor Monitoring Point	Screened Interval (ft bls)	Distance [1] (feet)	Induced Vacuum Reading (inches of water)
DW-7S		**10 to 30**	NA	
	VMWC-14A	6 to 7	49	
	VMWC-14B	18 to 19	52	
DW-7D		**30 to 40**	NA	
	VMWC-14D	38 to 39	61	
DW-8S		**10 to 17**	NA	
	VMWC-16A	**See DW-4S**	57	-----
	VMWC-16B	**See DW-4S**	54	-----
DW-9S		**10 to 17**	NA	
DW-10S		**10 to 17**	NA	
	VMWC-7A	**See DW-2S**	65	-----
	VMWC-7B	**See DW-2S**	65	-----
DW-11S		**10 to 17**	NA	
	VMWC-18A	7 to 8	41	
	VMWC-18B	13 to 14	42	

Location ID	Vapor Monitoring Point	Screened Interval (ft bls)	Distance [1] (feet)	Depth to Water (ft bmp)
VMWC-1D	DW-1D	44 to 54	13	
VMWC-5D	DW-2D	40 to 50	13	
B24MW-3	DW-5D	55 to 70	33	

Initials:		Date:	(+/-)[2]
Barometric Pressure (inHg)			
Ambient Temperature (Fahrenheit)			
Ambient Conditions			

Notes:

1. Distance is relative to associated depressurization well.
2. + indicates increasing, - indicates decreasing
3. Depth to water readings to be collected at this location record on last page.

Abbreviations:

---- reading recorded elsewhere on form	ft bls - feet below land surface	in Hg - inches of Mercury
DW - depressurization well	ft bmp - feet below measuring point	VMWC- vapor monitoring well cluster

▨ -distances and well screen intervals not confirmed- based on field measurements.

Attachment C-3.2. System Long-Term Individual Wellhead Monitoring Form, Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Well ID	Well Head Readings			Manifold Readings										
	Vacuum Indicator ID	Vacuum (iwc)	Normal Operating(2) Vacuum (iwc)	Flow Indicator ID	Unit Size (inch)	Differential Pressure (iwc)	Equivalent Flow Rate (scfm)	Normal Operating(2) Flow Rate (scfm)	Vacuum Indicator ID	Vacuum (iwc)	Normal Operating(2) Vacuum (iwc)	Temperature (FE) (F)	Sample Port ID	VOC's (FE) (ppmv)
DW-7D	VI-101			FI-101					VI-119				VSP-101	
DW-3D	VI-102			FI-102					VI-120				VSP-102	
DW-5D	VI-103			FI-103					VI-121				VSP-103	
DW-6D	VI-104			FI-104					VI-122				VSP-104	
DW-1D	VI-105			FI-105					VI-123				VSP-105	
DW-4D	VI-106			FI-106					VI-124				VSP-106	
DW-2D	VI-107			FI-107					VI-125				VSP-107	
DW-11S	VI-108			FI-108					VI-126				VSP-108	
DW-10S	VI-109			FI-109					VI-127				VSP-109	

Initials:		Date:	(+/-)(1)
Barometric Pressure (inHg)			
Ambient Temperature (F)			
Ambient Conditions			

Abbreviations:

DW	depressurization well	iwc	inches of water column
FE	flow element access point	PID	photoionization detector
F	Fahrenheit	ppm	parts per million by volume
FI	flow indicator	scfm	standard cubic feet per minute
in Hg	inches of mercury	VI	vacuum indicator
		VOC's	volitile organic compounds

Notes:

1. + indicates increasing, - indicates decreasing
2. Normal Operating conditions to be defined during system start-up.

Attachment C-3.2. System Long-Term Individual Wellhead Monitoring Form, Operable Unit 3, Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Well ID	**Well Head Readings**			**Manifold Readings**										
	Vacuum Indicator ID	Vacuum (iwc)	Normal Operating[2] Vacuum (iwc)	Flow Indicator ID	Unit Size (inch)	Differential Pressure (iwc)	Equivalent Flow Rate (scfm)	Normal Operating[2] Flow Rate (scfm)	Vacuum Indicator ID	Vacuum (iwc)	Normal Operating[2] Vacuum (iwc)	Temperature (FE) (F)	Sample Port ID	VOC's (FE) (ppmv)
DW-2S	VI-110			FI-110					VI-128				VSP-110	
DW-9S	VI-111			FI-111					VI-129				VSP-111	
DW-8S	VI-112			FI-112					VI-130				VSP-112	
DW-4S	VI-113			FI-113					VI-131				VSP-113	
DW-1S	VI-114			FI-114					VI-132				VSP-114	
DW-6S	VI-115			FI-115					VI-133				VSP-115	
DW-5S	VI-116			FI-116					VI-134				VSP-116	
DW-3S	VI-117			FI-117					VI-135				VSP-117	
DW-7S	VI-118			FI-118					VI-136				VSP-118	

Initials:		Date:	(+/-)[1]
Barometric Pressure (inHg)			
Ambient Temperature (F)			
Ambient Conditions			

Abbreviations:

DW	depressurization well	iwc	inches of water column
FE	flow element access point	PID	photoionization detector
F	Fahrenheit	ppmv	parts per million by volume
FI	flow indicator	scfm	standard cubic feet per minute
in Hg	inches of mercury	VI	vacuum indicator
		VOC's	volitile organic compounds

Notes:

1. + indicates increasing, - indicates decreasing
2. Normal Operating conditions to be defined during system start-up.

Attachment C-3.3. System Long-Term General System Operating Parameter Form, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Parameter		Knock Out Tanks Influent Vacuum			Knock Out Tanks Totalizer		
Instrument ID		*VI-201*	*VI-301*	*VI-401*	*FQI-210*	*FQI-310*	*FQI-410*
Location		KO-200 Influent	KO-300 Influent	KO-400 Influent	KO-200 Effluent	KO-300 Effluent	KO-400 Effluent
Units		(iwc)			(gallons)		
Recorder Initals	**Date / Time**						

Parameter	Blowers Influent Vacuum			Blowers Effluent Pressure		
Instrument ID	*VIT-202*	*VIT-302*	*VIT-402*	*PI-201*	*PI-301*	*PI-401*
Location	BL-200 Influent	BL-300 Influent	BL-400 Influent	BL-200 Effluent	BL-300 Effluent	BL-400 Effluent
Units	(iwc)			(iwc)		

Note:

1. The blower and total effluent air flow rates are to be measured using a hand-held anemometer.

Abbreviations:

BL	blower
F	degrees Farenheit
FE	flow monitoring element access point
FQI	flow totalizer indicator
iwc	inches of water column
KO	knock out tank
PI	pressure indicator
PID	photo-ionization detector
PIT	pressure indicating transmitter
ppmv	parts per million by volume
scfm	standard cubic feet per minute
TI	temperature indicator
TT	temperature transmitter
VI	vacuum indicator
VIT	vacuum indicating transmitter
VPGAC	vapor phase granular activated carbon
VSP	vapor sample port

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Attachment C-3.3. System Long-Term General System Operating Parameter Form, Northrop Grumman Operable Unit 3
Soil Gas Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York.

Parameter		Blowers Effluent Air Flow			Total Effluent Flow Rate	Total Effluent PID	Heat Exchanger Influent Temperature
Instrument ID		*FE* (1)			*FE* (1)	*VSP-601*	*TI-601*
Location		BL-200 Effluent	BL-300 Effluent	BL-400 Effluent	Combined Effluent	Combined Effluent	Combined Effluent
Units		(scfm)			(scfm)	(ppmv)	(F)
Recorder Initals	**Date / Time**						

Parameter	Total Effluent Pressure	VPGAC Influent Temperature	VPGAC Effluent PID
Instrument ID	*PIT-601*	*TI-602/TT-602*	*VSP-602*
Location	Combined Effluent	Combined Effluent	Combined Effluent
Units	(iwc)	(F)	(ppmv)

Note:

1. The blower and total effluent air flow rates are to be measured using a hand-held anemometer.

Abbreviations:

BL	blower
F	degrees Farenheit
FE	flow monitoring element access point
FQI	flow totalizer indicator
iwc	inches of water column
KO	knock out tank
PI	pressure indicator
PID	photo-ionization detector
PIT	pressure indicating transmitter
ppmv	parts per million by volume
scfm	standard cubic feet per minute
TI	temperature indicator
TT	temperature transmitter
VI	vacuum indicator
VIT	vacuum indicating transmitter
VPGAC	vapor phase granular activated carbon
VSP	vapor sample port

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Attachment C-4

Conditional Approval Letter for Discharge to POTW

THOMAS R. SUOZZI
COUNTY EXECUTIVE

RAYMOND A. RIBEIRO, P.E.
COMMISSIONER

COUNTY OF NASSAU
DEPARTMENT OF PUBLIC WORKS
1194 Prospect Avenue
Westbury, New York 11590-2723

October 16, 2007

Mr. John Cofman
Northrop Grumman Corporation
Eastern Region
600 Grumman Road West
Bethpage, New York 11714-5000

Re: Discharge IRM Condensate Water
Northrop Grumman, OU3 Site, Bethpage, New York

Dear Mr. Cofman:

This letter is in response to your letter dated September 6, 2007, requesting approval to discharge condensate water from a soil gas remediation system to be installed at Bethpage Community Park in Bethpage, as part of a New York State Department of Environmental Conservation Order on Consent. The requested discharge would be for approximately 300 gallons per month, an anticipated concentration of total volatile organics (VOCs) of 100 parts per billion (ppb) and for a discharge period of several years.

The request is hereby conditionally approved. The condensate water collected from the soil gas system will be collected by an air-moisture separator and discharged to the County's sanitary sewer on a monthly basis. All discharged water must have a Total Volatile Organics level not to exceed 1 part per million (ppm). In order to confirm the quality of the discharge, the first three months (3) months of condensate water collected will be analyzed for volatile organics (VOCs), EPA method 8260; depending on the consistency of the first three (3) months of water quality data a long term monitoring schedule will be established. A monthly summary of the volume discharged and water quality will be forwarded to the address provided below. The location for the discharge of these wastewaters will be into the sanitary sewer intake located on the Northrop Grumman property. At no time will the water be discharged at a rate to exceed 100 gallons per minute (gpm).

This Department reserves the right to cancel this temporary approval at any time. In accordance with requirements of this Department, a disposal fee of $500.00 shall be accessed for a one year discharge period. A check in the amount of $500.00, made payable to the "Nassau County Treasurer" must be remitted, in advance to:

Nassau County Department of Public Works
Cedar Creek Water Pollution Control Plant
3340 Merrick Road
Wantagh, New York 11793-4341
Attn: Peter J. Witkowski

If you have any questions concerning the above matter, please call me at (516) 571-7352.

Very truly yours,

Peter J. Witkowski

Peter J. Witkowski
Director of Hazardous Waste Services

PJW:jld

c. Joseph L. Davenport, NCDPW
Richard Cotugno, NCDPW