SOIL VAPOR INTRUSION EVALUATION OF ON-SITE STRUCTURES WORK PLAN

OBI, LLC SITE
245-265 & 271 HOLLENBECK STREET AND 50 BALFOUR DRIVE
ROCHESTER, NEW YORK

NYSDEC SITE #828188

Prepared for: OBI, LLC
Rochester, New York

Prepared by: Day Environmental, Inc.
1563 Lyell Ave
Rochester, New York 14606

Project No.: 4845S-13

Date: February 2014

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 8
6274 East Avon-Lima Road, Avon, New York 14414-9519
Phone: (585) 226-5353 • **Fax: (**585) 226-8139
Website: www.dec.ny.gov

Joe Martens
Commissioner

February 26, 2014

Mr. Mike McAlpin
OBI, LLC
255 Hollenbeck Street
Rochester, New York 14621

Dear Mr. McAlpin;

Re: OBI, LLC Site #828188
Soil Vapor Intrusion Evaluation of On-Site Structures Work Plan;
February 2014
245-265 & 271 Hollenbeck Street and 50 Balfour Drive
City of Rochester, Monroe County

The New York State Departments of Environmental Conservation (NYSDEC) and Health (NYSDOH), collectively referred to as the Departments, have completed their review of the document entitled "*Soil Vapor Intrusion Evaluation of On-Site Structures Work Plan"* (the Work Plan) dated February 2014 and prepared by Day Environmental, Inc for the OBI, LLC site in the City of Rochester, Monroe County. Based on the information and representations provided in the Work Plan, the Departments have determined that the Work Plan, with modifications, substantially addresses the requirements of the Order on Consent. The modifications are outlined as follows:

1. The sample collection period for the sub-slab soil vapor, indoor air, and ambient (outdoor) air samples will be 8 hours (instead of 2 hours). An 8-hour sampling period will provide results that are more representative of a typical workplace exposure period.

2. Given the size of the site, two ambient air samples will be collected. The two ambient air samples will be collected at on-site locations that are upwind of the indoor samples and far enough apart to evaluate differences in upwind air quality affecting different areas of the site.

3. The sample collection schedule will be adjusted, as needed, based on weather conditions so that the samples are collected on a heating season day.

4. For the samples collected inside the western doorway of the cafeteria in Building Slab 3, make sure the SS/IA samples are far enough from the door to ensure that the opening and closing of the door will not affect the integrity for sample collection.

With the understanding that the above noted modifications are agreed to, the Work Plan is hereby approved. With the exception of the Community Air Monitoring Plan, this approval does not extend to the Health and Safety Plan as the Departments are not responsible for the health and safety of remediation workers.

If OBI, LLC chooses not to accept the modifications proposed by the Department, you are required to notify this office within 20 days after receipt of this letter. In this event I suggest a meeting be scheduled to discuss your concerns prior to the end of this 20 day period.

Prior to the start of field work, please attach this letter to the Work Plan and distribute as follows:

- Frank Sowers (NYSDEC, Avon) - 2 hard copies;
- Jacquelyn Nealon (NYSDOH, Albany) – 1 hard copy and 1 electronic copy on CD;
- John Frazer (MCHD) - 1 electronic copy; and
- Lincoln Branch Library - 1 hard copy.

The hard copies should be submitted double-sided.

Based on the schedule in the approved Work Plan, field activities are scheduled to begin by March 28, 2014. Please notify me at least 7 days in advance of the start of field activities.

Thank you for your cooperation in this matter and please contact me at (585) 226-5357 if you have any questions.

Sincerely,

Frank Sowers

Frank Sowers, P.E.
Environmental Engineer II

ec:
B. Putzig
J. Mahoney
J. Nealon
P. Sylvestri
R. Kampff
N. Simon
J. Frazer

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OBI, LLC SITE
245-265 & 271 HOLLENBECK STREET AND 50 BALFOUR DRIVE
ROCHESTER, NEW YORK

NYSDEC SITE #828188

I, Nathan E. Simon certify that I am currently a NYS registered professional engineer and that this Soil Vapor Intrusion Evaluation of On-site Structures Work Plan was prepared in accordance with applicable statutes and regulations and in substantial conformance with DER Technical Guidance for Site Investigation and Remediation (DER-10).

Nathan E. Simon, P.E.
Project Manager (NYS P.E. License #087172)
Day Environmental, Inc.

Raymond L. Kampff
Associate Principal
Day Environmental, Inc.

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1.0 INTRODUCTION

Day Environmental, Inc. (DAY) prepared this *Soil Vapor Intrusion Evaluation of On-site Structures Work Plan* (the Work Plan) on behalf of OBI, LLC. The Work Plan describes studies proposed as part of the remedial investigation (RI) of the OBI, LLC site located at 245-265 & 271 Hollenbeck Street and 50 Balfour Drive, Rochester, New York (Site) to evaluate volatile organic compound (VOC) impact within the soil vapor and the potential for intrusion of VOCs into structures located on the Site. A Project Locus Map is included as Figure 1, and a Site Plan is presented as Figure 2.

1.1 BACKGROUND

Previous studies completed at the Site included the advancement of test borings and test pits (refer to Figure 3), installation of groundwater monitoring wells (refer to Figure 4), and the subsequent testing of soil and groundwater samples. A summary of the detected VOCs measured in the soil samples tested to date is provided in Table 1, and a summary of the halogenated VOCs detected in groundwater samples tested to date is included in Table 2.

As shown on Table 1, none of the soil samples tested to date contained concentrations of VOCs that exceeded the Industrial Use Soil Cleanup Objective (SCO) referenced in 6 NYCRR Part 375. The concentrations of tetrachloroethene, trichloroethene, and/or total xylenes measured in 6 of the 47 soil samples tested to date exceeded the Unrestricted Use SCO referenced in 6 NYCRR Part 375.

As shown in Table 2, the groundwater samples tested to date contain halogenated VOCs (typically tetrachloroethene, trichloroethene, cis-1,2-dichloroethene, and/or vinyl chloride). The concentrations measured in some of the samples tested exceed NYSDEC groundwater standards and guidance values presented in NYSDEC Division of Water Technical Operations and Guidance Series (TOGS) 1.1.1.

1.2 APPLICABLE PROJECT STANDARDS, CRITERIA AND GUIDANCE

The requirements, applicable standards, criteria and guidance documents that will be used for this soil vapor intrusion study of on-site structures are outlined below:

- Guidelines referenced in NYSDEC document titled “DER-10 Technical Guidance for Site Investigation and Remediation”, dated May 2010 (DER-10).

- Guidelines referenced in the New York State Department of Health (NYSDOH) document titled “Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York” dated October 2006 (Guidance Document).

1.3 PURPOSE

The purpose of the work presented herein is to complete sub-slab soil vapor and co-located indoor air sampling in select interior locations of the on-site structures to evaluate VOC concentrations above and below the slabs of the structures on the Site. The data generated will be used to make decisions on appropriate actions to address potential exposures, if such work is determined to be necessary.

2.0 SCOPE OF WORK

Based on a cursory historical document review (i.e., Sanborn Maps, facility layout drawings, etc.) and a Site visit conducted on January 31, 2014, it appears that:

- six "slab-on-grade" additions have been completed at the building currently addressed 50 Balfour Drive since the building's initial construction in 1923 (i.e., the current 50 Balfour Drive building contains seven distinct building slabs); and

- the building at 245-265 Hollenbeck Street is a single "slab-on grade" structure that was constructed in 1971.

The proposed vapor intrusion sample locations to be completed as part of the studies described in the Work Plan are included on the Site Plan presented as Figure 2. At least one sub-slab and co-located indoor air sample will be collected from each building slab and one background outdoor air sample will be collected in a location representative of both buildings.

2.1 SOIL VAPOR INTRUSION INVESTIGATION SAMPLING

This soil vapor intrusion investigation will consist of the following work completed in accordance with applicable provisions outlined by the NYSDOH Guidance Document, including Section 2.7 (Sampling Protocols) and Section 2.8 (Quality Assurance/Quality Control); refer to Appendix A (Soil Vapor Sampling Guidance).

This task will initially include the completion of the NYSDOH Indoor Air Quality Questionnaire and Building Inventory including a chemical inventory of the interior areas of the buildings. In addition, screening for VOCs will be conducted using a part per billion (ppb) RAE photoionization detector (PID).

After the building inspection and product inventory is completed, DAY will collect sub-slab vapor, indoor and background (i.e., outdoor) air samples for subsequent analytical laboratory testing. In accordance with the NYSDOH Guidance Document, the soil vapor intrusion samples will be collected during the heating season (i.e., November 15 through March 31).

As indicated on Figure 2 and the table below, and in conformance with the NYSDOH Guidance Document, sub-slab vapor and indoor air samples will be collected from nine locations in the 50 Balfour Drive building and one location in the 245-265 Hollenbeck Street building. Due to the proximity of the 50 Balfour Drive and 245-265 Hollenbeck Street structures one background outdoor air sample will be collected.

The approximate location of the sub-slab (designated SS) vapor and indoor air (designated IA) samples to be collected for this study are summarized on following table.

Sample Designation	Date of Slab Construction	Sample Location Description (refer to Figure 2 for Locations)
SS-01/IA-01	Addition - 1950	Inside the Front Office area (Slab 1)
SS-02/IA-02	Original Building Slab - 1923	Between two Auto-Plating Lines (Slab 2)
SS-03/IA-03	Addition - 1964	Along the north wall of the Tool/Storage Area in proximity of the former TCE degreaser location (Slab 3)
SS-04/IA-04	Addition - 1964	Inside the western doorway of the Cafeteria (Slab 3)
SS-05/IA-05	Addition - 1968	Inside Wastewater Treatment Area (Slab 4)
SS-06/IA-06	Addition - 1973	In proximity to the single Dock Area (Slab 5)
SS-07/IA-07	Addition - 1987	In the CNC Blanking Area behind the dust collector (Slab 6)
SS-08/IA-08	Addition - 1998	Between the Assembly and Robotic Welding Areas (Slab 7)
SS-09/IA-09	Original Building Slab - 1923	In the center portion of the below-grade boiler room.
SS-10/IA-10	Original Building Slab - 1971	In the center portion of the 245-265 Hollenbeck Street building (Slab 8)

[Note: The boiler room (Slab 1) and a small portion of the waste water treatment room (Slab 4) are approximately six feet lower than the surrounding slab-on-grade construction. Both spaces are only occupied during maintenance activities associated with the boilers and the waste water treatment system, respectively. A sample location is proposed for the boiler room (SS-09/IA-09), but due to the configuration of the below grade portion of wastewater treatment area and access restrictions sampling is not proposed within this area.]

Although it is not anticipated that the field locations will be significantly different than those presented above and on Figure 2, the final locations may vary due to factors such as the presence of underground utilities. The final sample locations will be located using a GPS unit with sub-meter accuracy, tape measurements from permanent building features (i.e., support columns, load bearing wall intersections, etc.) or by a licensed surveyor. The sample locations will be located using the coordinate system (i.e., World Geodetic System of 1984 datum (WGS84) or NAD83) and reference datum (i.e., mean sea level) required by EQuIS.

The sub-slab vapor samples will be collected from a temporary probe installed through the slab-on-grade floors and into the subsurface. Specifically, a small diameter hole (approximately 0.25-inches in diameter) will be advanced through the building slab and approximately 2-inches into the subsurface. After drilling through the slab, the slab thickness will be measured and recorded. Thereafter food grade quality tubing (i.e., polyethylene, Teflon, nylon, etc.) slotted at the bottom, will be placed into the hole and extending above the floor surface. The annulus around the slotted tubing will be backfilled with sand and a bentonite seal will be installed above the sand pack extending to the floor surface. Prior to collecting the sub-slab vapor samples, a minimum of

three vapor probe volumes will be purged at a rate not to exceed 0.2 liters per minute (L/min) from each sub-slab air sampling locations. Reusable equipment will be decontaminated, as required, by washing with an Alconox detergent solution and rinsing with distilled water.

For each sub-slab vapor sample a corresponding indoor air sample will be collected in proximity to the sub-slab vapor sample location approximately three to five feet above the floor surface. The indoor air samples will be collected simultaneously with the sub-slab vapor samples. If possible, the air sampling event will be scheduled following a period of sustained employee inactivity to minimize the potential impact of employee operations upon the indoor air quality results.

The background outdoor air sample will be collected approximately three to five feet above the ground surface from an upwind exterior location, as determined at the time of sample collection. The outdoor air sample will be collected simultaneously with indoor air samples and the sub-slab vapor samples to evaluate the potential influence, if any, of outdoor air on indoor air quality. To aid in the interpretation of the sampling results, pertinent information that may interfere or affect the sampling event will be documented. Such information may include, but is not limited to, wind direction, the location of potential interferences (e.g., gasoline stations, factories, small engine use, etc.), weather conditions (e.g., precipitation and outdoor temperature), odors, readings from field instrumentation (e.g., PID), and significant activities in the vicinity (e.g., operation of heavy equipment).

Sub-slab vapor, indoor and the background air samples will be collected using laboratory-certified "clean" 6-liter Summa Canisters. The Summa Canister air flow-rate will be controlled with pre-calibrated 2-hr regulators supplied by the laboratory. Vacuum gauges on the regulators will be monitored during sample collection to check for proper operation of the Summa Canister (i.e., slow changes in vacuum), and to verify that the sample collection rate does not exceed 0.2 liters per minute. The vacuum reading will be recorded at the start of the test and monitored throughout the test. Additionally, a PID will be used to screen the air space above the Summa Canisters to establish background conditions prior to sampling and during the sampling event to identify VOC fluctuations that may occur during the sampling interval.

The sub-slab vapor samples and the indoor/outdoor air samples will be submitted under chain-of-custody documentation to a NYSDOH ELAP-certified analytical laboratory for analysis of VOCs via USEPA Method TO-15 using applicable ASP protocol. At the conclusion of the sampling, the tubing associated with the sub-slab vapor probes will be removed and the resulting annulus will be backfilled and capped with concrete.

2.2 INVESTIGATION DERIVED WASTES MANAGEMENT AND DISPOSAL

It is anticipated that solid and liquid investigation-derived wastes will be generated during the studies presented herein. Investigation derived wastes will be managed in accordance with applicable provisions set forth of DER-10 Section 3.3(e). Potentially contaminated liquid wastes will likely consist of decontamination water. Storage of liquid IDW will be generally collected in 5-gallon buckets and placed on-site in a New York State Department of Transportation

(NYSDOT) 55-gallon drum. The anticipated location of this storage drum is on the northern portion of the Site.

It is anticipated that liquid IDW will either be discharged to the Monroe County Pure Waters sanitary sewer system under a sewer use permit or characterized and disposed of in accordance with applicable regulations. Sampling of IDW necessary to obtain a sewer use permit will be incorporated into the Report of Findings. A copy of the Monroe County Pure Waters sewer use permit will be provided to the NYSDEC prior to any discharge to the sanitary sewer system.

It is anticipated that solid investigation-derived wastes will be generated during the studies presented herein. Investigation derived wastes will be managed in accordance with applicable provisions set forth of DER-10 Section 3.3(e). Potentially contaminated solid wastes will likely include disposable sampling equipment and personal protective equipment (PPE). It is anticipated that the solid IDW will be placed in NYSDOT 55-gallon drums stored on the northern portion of the Site. The IDW solids will be characterized and disposed of off-site in accordance with the applicable rules and regulations.

2.3 ANALYTICAL LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

Spectrum Analytical Inc. of Warwick, Rhode Island (Spectrum) will be retained to complete the analytical laboratory testing. Spectrum is a NYSDOH ELAP certified laboratory (ELAP ID LAI00329). Refer to Appendix B for a copy of Spectrum's Quality Assurance Plan. The proposed analytical laboratory testing program for the samples collected as part of the studies conducted during the Work Plan is presented on Table 3 Proposed Analytical Laboratory Testing Program.

The analytical laboratory results will be provided in an ASP Category B data package. The analytical laboratory will be requested to meet the minimum reporting limit of 0.25 $\mu g/m^3$ for TCE and vinyl chloride, and 3 $\mu g/m^3$ for PCE and the remaining TO-15 list VOCs for the indoor/outdoor air samples. The analytical laboratory will be requested to meet the standard method detection limits for the sub-slab vapor samples. The analytical laboratory data will be submitted to an independent party for review and preparation of a DUSR. The DUSR will comply with NYSDEC requirements, and be submitted to EQuIS within 90 days of receipt of the analytical laboratory data. [Note: Preliminary analytical laboratory results will be submitted to the NYSDEC and NYSDOH upon receipt from the laboratory, and reviewed by DAY. Final laboratory results will be submitted to the NYSDEC with the applicable monthly progress report.]

It is anticipated that Dr. Maxine Wright-Walters of Environmental Data Validation Inc. (EDV) of Pittsburgh, Pennsylvania will be retained to complete a DUSR on the Category B deliverables analytical laboratory data that is generated as part this work plan. The DUSR will be conducted in accordance with the provisions set forth in Appendix 2B of DER-10 Technical Guidance for Site Investigation and Remediation dated May 2010. The findings of the DUSR will be incorporated in the Report of Findings. Refer to Appendix C for a copy of EDV's Quality Assurance/Quality Control Plan and a copy of Dr. Maxine Wright-Walters curriculum vitae.

2.4 HEALTH AND SAFETY

The implementation of this soil vapor intrusion evaluation work plan will follow the site-specific Health and Safety Plan (HASP) and Community Air Monitoring Program (CAMP) dated January 2014. The CAMP (as revised per the requirements outlined in Section 2.5) will be implemented during intrusive soil vapor intrusion evaluation activities (i.e., during sampling port installation). The HASP and CAMP will be reviewed by DAY employees assigned to this project before starting work.

2.5 CAMP MONITORING SPECIFIC TO THE SUB-SLAB VAPOR POINT INSTALLATION

In addition to the requirements described in the January 2014 CAMP, the requirements presented in this section will also be implemented.

Establishment of CAMP Monitoring Stations

Due to the distance between sub-slab vapor sample locations, new monitoring stations will be set up around the work zone for each location. The specific locations will be determined based upon indoor activities being conducted by facility workers at the time of fieldwork. CAMP stations will be placed between the area of intrusive activities and the immediate receptors (e.g., the nearest facility worker). As such, a minimum of one CAMP monitoring station will be placed near the work zone, and the background CAMP station located outside of the work zone will be periodically monitored to document background levels. CAMP monitoring will be conducted only during the sub-slab vapor point installations.

2.6 REPORT OF FINDINGS

Upon receipt of the DUSR, a report describing the work completed, and presenting conclusions and recommendations will be submitted. This report will include copies of the pre-sampling building inspection and product inventory; analytical laboratory test results and executed chain-of-custody documentation; tables comparing test results to applicable guidance values and standards; a copy of the DUSR; an updated Site Plan; and other applicable documentation. [Note: Preliminary analytical laboratory results will be submitted to the NYSDEC and NYSDOH upon receipt from the laboratory, and review by DAY. In addition, analytical laboratory results will be submitted with as part of the monthly progress reports.

3.0 SCHEDULE

The schedule for the studies outlined the Work Plan is as follows:

Soil Vapor Intrusion Testing and Sampling: The work will commence within 30 calendar days of the approval of the Work Plan by the NYSDEC and NYSDOH. The indoor/background air and sub-slab vapor samples will be submitted to the analytical laboratory within 14 calendar days of the initiation of the fieldwork.

Laboratory Testing: The preliminary results of laboratory testing will be provided to the NYSDEC and NYSDOH within 15 workdays of sample submittal to the analytical laboratory.

DUSR: A DUSR will be submitted within 90 calendar days of receipt of the laboratory testing report, and the validated data will also be submitted to EQuIS within 90 calendar days of receipt.

Report of Findings: A draft report will be submitted to the NYSDEC and NYSDOH within 30 calendar days of the receipt of the DUSR.

DAY will coordinate and communicate with the NYSDEC and NYSDOH project managers and their staff regarding implementation of the various aspects of this project. This includes, but is not limited to, participation in progress meetings, presentation of field findings and analytical laboratory results.

FIGURES

Date: 02-12-2014	day **DAY ENVIRONMENTAL, INC.** **Environmental Consultants** **Rochester, New York 14606** **New York, New York 10170**	Project Title: 245-265, & 271 HOLLENBECK STREET AND 50 BALFOUR DRIVE ROCHESTER, NEW YORK SOIL VAPOR INTRUSION EVALUATION OF ON-SITE STRUCTURES	Project No. 4845S-13
Drawn By: CPS		Drawing Title: Project Locus Map	FIGURE 1
Scale: AS NOTED			

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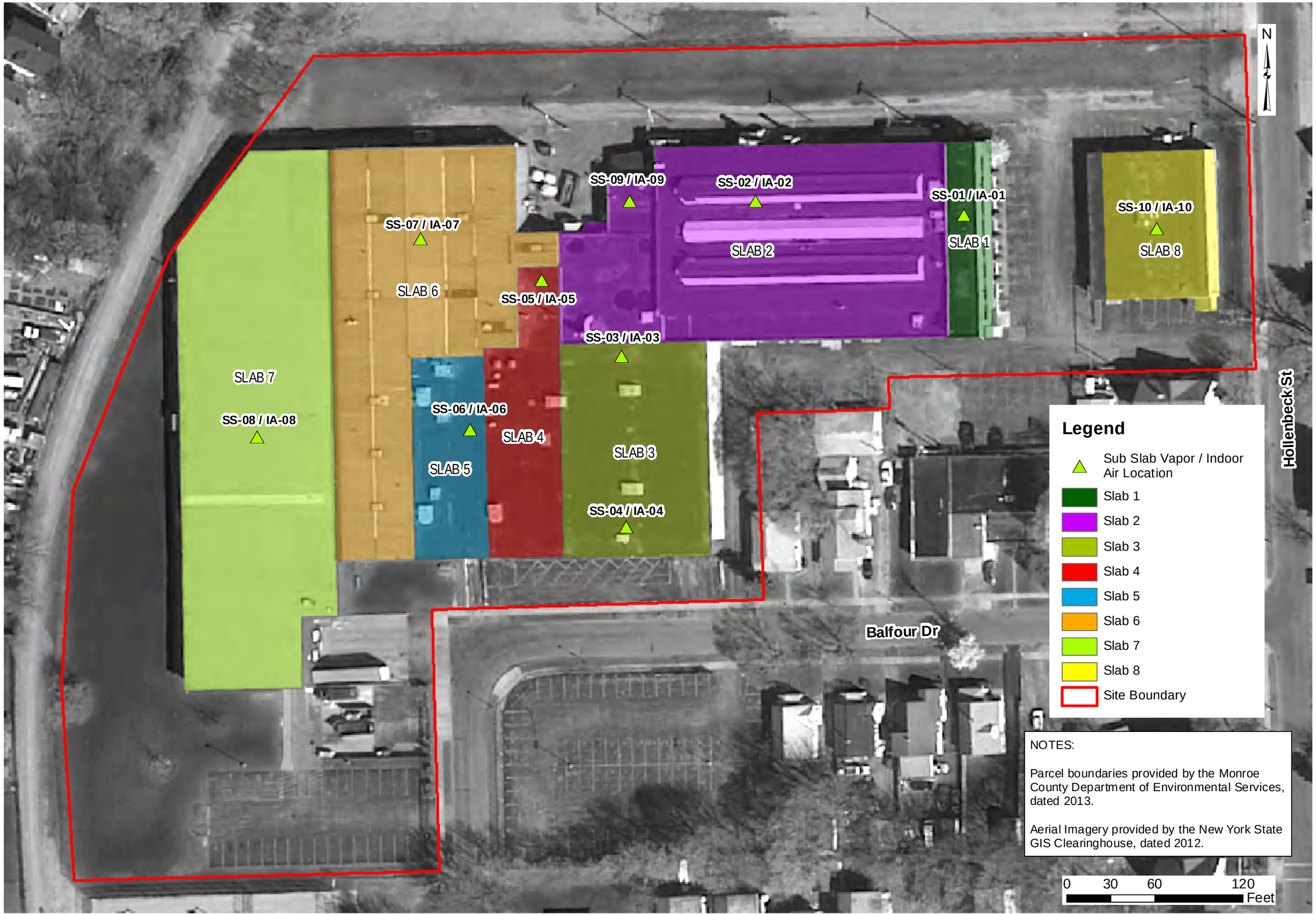

DESIGNED BY	DATE
RLK	02-2014
DRAWN BY	DATE DRAWN
CPS	02-2014
SCALE	DATE ISSUED
AS NOTED	02-06-2014

day
DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14606
New York, New York 10170

Project Title
245-265 AND 271 HOLLENBECK STREET
AND 50 BALFOUR DRIVE
ROCHESTER, NEW YORK

SOIL VAPOR INTRUSION EVALUATION OF ON-SITE STRUCTURES

Drawing Title
Site Plan with Proposed Soil Vapor and Indoor Air Sample Locations

Project No.
4845S-13

FIGURE 2

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Last Date Saved: 12 Feb 2014 Document Path: E:\GIS\GIS Mapping\Mxds\pln4845S-13Mxd\pln4845S-12 - Test Pits and Test Borings.mxd

DESIGNED BY	RLK
DATE	02-2014
DRAWN BY	CPS
DATE DRAWN	02-2014
SCALE	AS NOTED
DATE ISSUED	02-11-2014

day
DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14606
New York, New York 10170

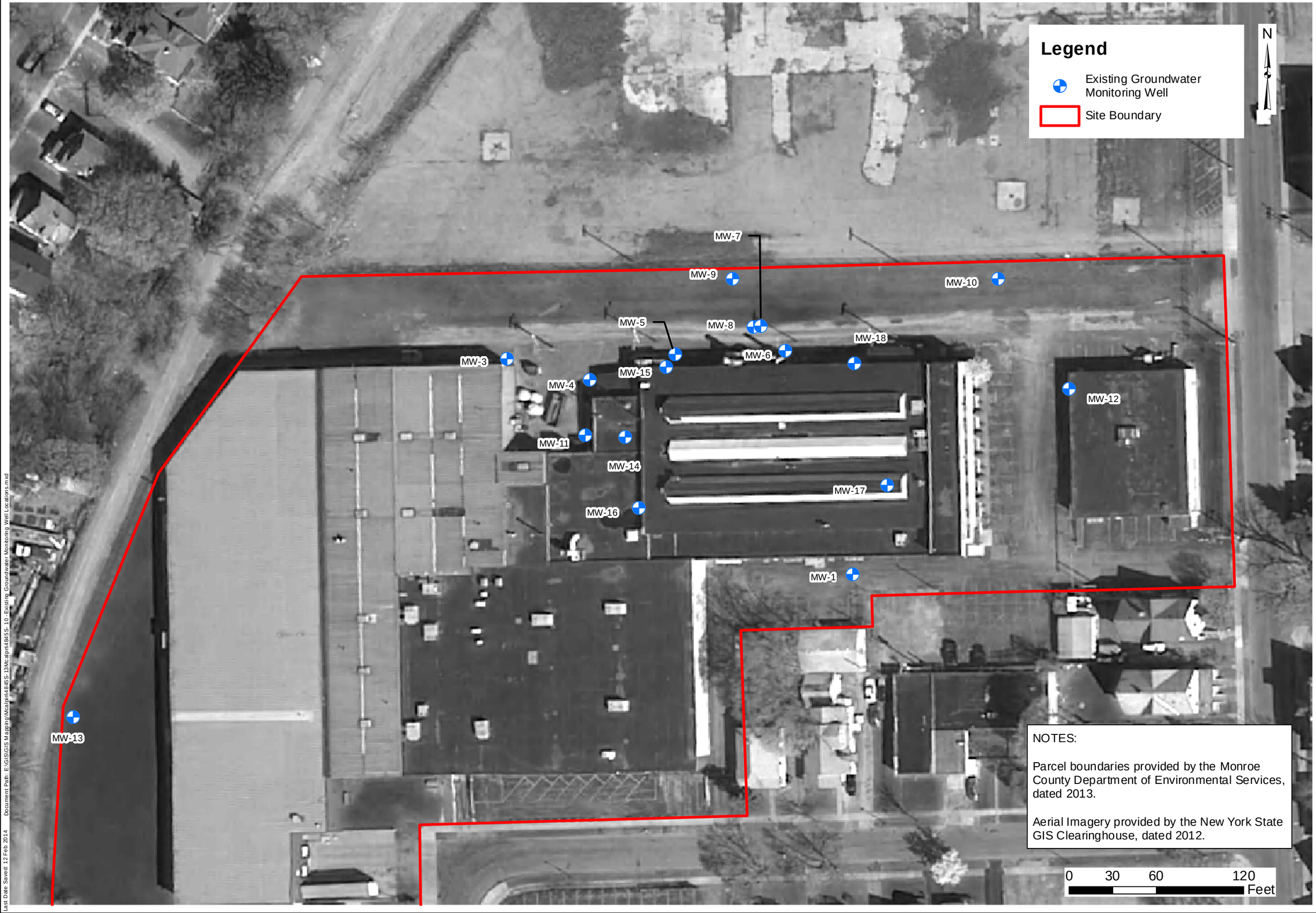
Project Title
245-265 AND 271 HOLLENBECK STREET
AND 50 BALFOUR DRIVE
ROCHESTER, NEW YORK

SOIL VAPOR INTRUSION EVALUATION OF ON-SITE STRUCTURES

Drawing Title
Completed Test Boring and Test Pit Locations

Project No.
4845S-13

FIGURE 3



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RLK	02-2014	CPS	02-2014	AS NOTED	02-06-2014

day
DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14606
New York, New York 10170

Project Title
245-265 AND 271 HOLLENBECK STREET
50 BALFOUR DRIVE
ROCHESTER, NEW YORK
SOIL VAPOR INTRUSION EVALUATION OF ON-SITE STRUCTURES

Drawing Title
Existing Groundwater Monitoring Well Locations

Project No.
4845S-13

FIGURE 4

TABLES

TABLE 1

245-265 AND 271 HOLLENBECK STREET AND 50 BALFOUR DRIVE
ROCHESTER, NEW YORK
NYSDEC SITE #828188

SUMMARY OF DETECTED VOLATILE ORGANIC COMPOUNDS - SOIL SAMPLES

Compound	Unrestricted Use SCO[(1)]	Industrial Use SCO[(2)]	Sample Designation and Date of Collection																						
			BH-01 (6-8')	TP-7 (9.5-10.5')	BH-04 (6-8')	BH-09 (4-6')	TP-2 (9-10')	BH-11 (0-2)	BH-13 (6-8')	BH-15 (9-11')	TB-2 (12-12.5')	TB-6 (4-8')	TB-6 (8-10')	TB-8 (8-10')	TB-101 (6.5')	TB-102 (11.7')	TB-104 (11.0')	TB-106 (9.3')	TB-109 (9.6')	TB-110 (9.3')	TB-114 (9.3')	TB-115 (10.7')	TB-117 (9.9')	TB-119 (3.5')	TB-119 (10.5')	TB-120 (12.0')
			08/22/97	08/25/97	08/22/97	08/25/97	08/25/97	09/17/97	09/17/97	09/18/97	4/22/98	4/22/98	4/22/98	4/22/98	02/01/05	02/01/05	02/01/05	02/01/05	02/01/05	02/01/05	02/02/05	02/02/05	02/02/05	02/02/05	02/02/05	02/02/05
PCE	1.3	300	ND	ND	ND	ND	NT	**2.797**	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NT	ND	ND
TCE	0.47	400	**63.394**	ND	ND	0.267	NT	**124.582**	**23.400**	**2.284**	0.210	0.093	NT	0.022	**1.500**	ND	ND	0.0581	0.0207	0.071	ND	ND	**0.555**	NT	0.0754	0.0086
trans 1,2-DCE	0.19	1000	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NT	ND	ND
Cis 1,2-DCE	0.25	1000	NT	NT	NT	NT	NT	NT	NT	NT	0.060	ND	NT	ND	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
VC	0.02	27	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NT	ND	ND
acetone	0.05	1000	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	NT	ND	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
2-hexanone	NS	NS	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	NT	ND	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Methylene Chloride	0.05	1000	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NT	ND	ND
n-Butylbenzene	12	1000	ND	ND	NT	NT	NT	NT	NT	NT	ND	ND	NT	ND	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
sec-Butylbenzene	11	1000	ND	ND	NT	NT	NT	NT	NT	NT	ND	ND	NT	ND	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
n-propylbenzene	3.9	1000	ND	ND	NT	NT	NT	NT	NT	NT	ND	ND	NT	ND	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Isopropylbenzene	2.3*	NS	ND	ND	NT	NT	NT	NT	NT	NT	ND	ND	NT	ND	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
1,2,4-Trimethylbenzen	3.6	380	ND	ND	NT	NT	NT	NT	NT	NT	ND	0.100	NT	ND	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Naphthalene	12	1000	ND	ND	NT	NT	NT	NT	NT	NT	ND	ND	NT	ND	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Toluene	0.7	1000	ND	ND	0.114	ND	NT	ND	ND	ND	ND	ND	NT	ND	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Total Xylenes	0.26	1000	**1.262**	ND	ND	ND	NT	ND	ND	ND	ND	ND	NT	ND	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
TOTAL VOCs	NS	NS	64.656	--	0.114	0.267	--	127.379	23.400	2.284	0.270	0.193	--	0.022	1.500	--	--	0.0581	0.0207	0.071	--	--	0.555	N/A	0.0754	0.0086
Total TICs	NS	NS	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	10.309	8.611	0.883	0.291	26.19	ND	27.23	1.732	NT	ND	ND

Compound	Unrestricted Use SCO[(1)]	Industrial Use SCO[(2)]	Sample Designation and Date of Collection																						
			TB-121 (6.5')	TB-122 (11.0')	TB-200 (4.0')	TB-200 (8.0')	TB-201 (8.0')	TB-202 (10.5')	TB-203 (4.0')	TB-203 (8.0')	TB-203 (12.0')	TB-204 (12.0')	TB-205 (0-2')	TB-206 (0-2')	TB-207 (0-2')	TB-208 (0-2')	TB-209 (0-2')	TB-210 (11.9')	TB-211 (11.0')	TB-212 (11.5')	TB-213 (11.9')	TB-214 (11.0')	TB-215 (8.0')	TB-215 (11.9')	TB-402 (11')
			02/02/05	02/02/05	08/09/06	08/09/06	08/09/06	08/09/06	08/09/06	08/09/06	08/09/06	08/09/06	08/10/06	08/10/06	08/10/06	08/10/06	08/10/06	08/10/06	08/10/06	08/10/06	08/10/06	08/10/06	08/10/06	08/10/06	03/07/11
PCE	1.3	300	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCE	0.47	400	NT	ND	0.192	0.0733	ND	ND	ND	0.348	ND	0.014	ND	ND	ND	ND	ND	ND	ND	0.281	ND	0.154	ND	ND	0.129
trans 1,2-DCE	0.19	1000	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis 1,2-DCE	0.25	1000	NT	NT	ND	ND	ND	**2.34**	ND	ND	ND	0.0151	ND	ND	ND	ND	ND	0.0312	ND	ND	0.148	0.0476	ND	0.021	ND
VC	0.02	27	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
acetone	0.05	1000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	NT	NT	NT	ND	NT	NT	ND
2-hexanone	NS	NS	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	NT	NT	NT	ND	NT	NT	ND
Methylene Chloride	0.05	1000	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02	ND	0.219	ND	ND	ND	ND
n-Butylbenzene	12	1000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	NT	NT	NT	0.0261	NT	NT	ND
sec-Butylbenzene	11	1000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	NT	NT	NT	0.0175	NT	NT	ND
n-propylbenzene	3.9	1000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	NT	NT	NT	0.0238	NT	NT	ND
Isopropylbenzene	2.3*	NS	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	NT	NT	NT	0.0104	NT	NT	ND
1,2,4-Trimethylbenzen	3.6	380	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	NT	NT	NT	0.0753	NT	NT	ND
Naphthalene	12	1000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	NT	NT	NT	0.109	NT	NT	ND
Toluene	0.7	1000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	NT	NT	NT	ND	NT	NT	ND
Total Xylenes	0.26	1000	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	ND	NT	NT	NT	ND	NT	NT	ND
TOTAL VOCs	NS	NS	N/A	--	0.192	0.0733	--	2.34	--	0.348	--	0.0291	--	--	--	--	--	0.312	0.02	0.281	0.367	0.4637	--	0.021	0.129
Total TICs	NS	NS	NT	20.912	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Notes:
(1) = Soil Cleanup Objective (SCO) for Unrestricted Use as referenced in 6 NYCRR Part 375 dated 12/14/06.
(2) = Soil Cleanup Objective (SCO) for Industrial Use as referenced in 6 NYCRR Part 375 dated 12/14/06.
PCE = tetrachloroethene TCE = trichloroethene Trans 1,2-DCE = trans 1,2-dichloroethene
Cis 1,2 DCE = Cis 1,2-dichloroethene VC = vinyl chloride TIC = Tentatively Identified Compound NT = Not Tested NS = No Standard
Results and SCOs are reported as parts per million (ppm) or mg/Kg
Bold Type = Concentration exceeds the respective Unrestricted Use SCO. ND = Not Detected at a concentration greater than the method detection limit.

TABLE 2

245-265 AND 271 HOLLENBECK STREET AND 50 BALFOUR DRIVE
ROCHESTER, NEW YORK
NYSDEC SITE #828188

SUMMARY OF DETECTED HALOGENATED VOLATILE ORGANIC COMPOUNDS - GROUNDWATER SAMPLES

COMPOUND	NYSDEC Standard or Guidance Value[(1)]	SAMPLE LOCATIONS AND SAMPLE DATES																											
		MW-1										MW-2	MW-3								MW-4		MW-5							
		10/2/97	10/15/04	6/7/06	6/28/07	5/1/08	8/21/08	4/14/10	10/25/10	9/22/11	11/29/12	10/2/97	10/2/97	10/15/04	6/7/06	5/1/08	8/21/08	10/25/10	9/22/11	11/29/12	10/2/97	8/21/08	10/2/97	10/15/04	6/7/06	7/31/07	5/1/08	8/21/08	1/23/09	3/31/09
PCE	**5**	**11.9**	**5.4**	3.85	ND (20)	ND (2.0)	2.34	**7.61**	**8.87**	**7.02**	4.1	ND (2.0)	**9.7E**	**7.1**	ND (2.0)	ND (2.0)	2.70	ND (20.0)	ND (10)	4.15	ND (2.0)	ND (2.0)	ND (10)	ND (2.5)	ND (200)	ND (200)	ND (200)	ND (50)	ND (20)	ND (40)
TCE	**5**	**546.9**	**78**	**112**	**216**	**23.2**	**46.3**	**123**	**119**	**97.2**	**61.1**	206.3	**607.4**	**170**	**95.4**	**28.9**	**98.3**	**156**	**190**	**214**	**11.2**	ND (2.0)	**909.5**	**5.5**	ND (200)	ND (200)	ND (200)	ND (50)	ND (20)	**136**
trans 1,2-DCE	**5**	ND (10)	ND (1.0)	ND (2.0)	ND (20)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (10)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (20.0)	ND (10)	ND (2.0)	**6.4**	ND (2.0)	**15.0**	4.0	ND (200)	ND (200)	ND (200)	ND (50)	ND (20)	ND (40)
Cis 1,2-DCE	**5**	**14.8E**	**15**	**19.1**	**45.2**	**5.46**	**13.5**	**21.6**	**18.6**	**22.3**	**39.4**	**38.2E**	**39.9E**	**33**	**17.7**	**8.29**	**25.2**	**40.8**	**47.1**	**57.7**	**295E**	ND (2.0)	**2,840E**	**260**	**11,300**	**2,130**	**4,020**	**3,600**	**845**	**2,820**
VC	**2**	ND (10)	ND (2.0)	ND (2.0)	ND (20)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (10)	ND (4.0)	ND (2.0)	ND (2.0)	2.35	ND (20.0)	ND (10)	2.79	**229.6**	ND (2.0)	**654.8**	**43**	**1,080**	**457**	**289**	**764**	**179**	**168**
TOTAL VOCs	--	573.6	98.4	134.95	261.2	28.66	62.14	152.21	146.47	126.52	104.6	244.5	657	210.1	113.1	37.19	128.55	196.8	237.1	278.64	542.2	0	4,419.30	312.5	12,380	2,587	4,309	4,364	1,024	3,144

COMPOUND	NYSDEC Standard or Guidance Value[(1)]	SAMPLE LOCATIONS AND SAMPLE DATES																											
		MW-5									MW-6									MW-7 (ROCK)									
		5/8/09	7/20/09	9/14/09	3/24/10	4/14/10	10/26/10	9/22/11	11/29/12	1/4/13	10/2/97	10/1/08	3/31/09	9/14/09	3/24/10	10/26/10	9/22/11	11/29/12	1/4/13	6/27/07	7/31/07 (14-15')	7/31/07 (25.5-	5/1/08	8/21/08	3/31/09	9/14/09	3/24/10	10/26/10	9/22/11	11/29/12
PCE	**5**	ND (20)	ND (20)	ND (20)	ND (100)	ND (50)	ND (20)	ND (10)	ND (400)	ND (50)	ND (50)	ND (200)	ND (400)	ND (100)	ND (100)	ND (400)	ND (200)	ND (2.0)	ND (2.0)	ND (20)	ND (10)	ND (2.0)	ND (5.0)	ND (5.0)	ND (5.0)	3.84	**6.19**	ND (5.0)	ND (5.0)	ND (4.0)
TCE	**5**	**51.7**	ND (20)	ND (20)	**632**	**205**	ND (20)	ND (10)	ND (400)	ND (50)	**4,917.1**	ND (200)	ND (400)	ND (100)	ND (100)	ND (400)	ND (200)	ND (2.0)	ND (2.0)	**175**	**282**	**127**	**367**	ND (5.0)	**183**	**135**	**160**	**108**	**42.3**	**204**
trans 1,2-DCE	**5**	ND (20)	ND (20)	ND (20)	ND (100)	ND (50)	ND (20)	ND (10)	ND (400)	ND (50)	**43.5E**	ND (200)	ND (400)	ND (100)	ND (100)	ND (400)	ND (200)	ND (2.0)	ND (2.0)	ND (20)	ND (10)	ND (2.0)	ND (5.0)	ND (5.0)	ND (5.0)	ND (2.0)	ND (2.0)	ND (5.0)	ND (5.0)	ND (4.0)
Cis 1,2-DCE	**5**	**1,880**	**2,150**	**240**	**6,330**	**5,800**	**736**	**909**	**10,000**	**4,600**	**4,390E**	**6,230**	**11,500**	**7,200**	**7,960**	**6,040**	**5,410**	**42.7**	**5.3**	**103**	**144**	**78.2**	**135**	**139**	**69**	**117**	**86**	**130**	**114**	**330**
VC	**2**	**192**	**365**	**129**	**412**	**447**	**126**	**153**	**668**	**390**	**837**	**4,300**	**4,730**	**5,400**	**4,110**	**3,570**	**4,440**	**24.8**	ND (2.0)	ND (20)	**37.6**	**21.4**	**25.4**	**19.7**	**10.2**	**27**	**15**	**31**	**47.9**	**107**
TOTAL VOCs	--	2,124	2,515	369	7,374	6,452	862	1,062	10,668	4,990	10,187.6	10,530	16,230	12,600	12,070	9,610	9,850	67.5	5.3	278	463.2	226.8	527.4	158.7	261.8	282.8	267.5	269.0	204.2	641.0

COMPOUND	NYSDEC Standard or Guidance Value[(1)]	SAMPLE LOCATIONS AND SAMPLE DATES																											
		MW-8										MW-9									MW-10									
		6/27/07	5/1/08	8/21/08	3/31/09	7/20/09	9/14/09	3/24/10	10/26/10	9/22/11	11/29/12	6/27/07	5/1/08	8/21/08	3/31/09	9/14/09	3/24/10	10/25/10	9/22/11	11/29/12	6/27/07	5/1/08	8/21/08	3/31/09	9/14/09	3/24/10	10/25/10	9/22/11	11/29/12
PCE	**5**	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	ND (200)	ND (10)	ND (20)	ND (20)	ND (20)	ND (20)	ND (2.0)	ND (2.0)	ND (20)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (20)	ND (2.0)	ND (2.0)	ND (20)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)
TCE	**5**	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	ND (200)	ND (10)	ND (20)	ND (20)	ND (20)	**57.6**	**47.5**	**79.9**	**45.0**	**87.8**	**56.4**	ND (2.0)	ND (2.0)	ND (2.0)	**86.3**	**37.9**	**62.0**	**33.0**	**56.9**	**32.7**	ND (2.0)	ND (2.0)	ND (2.0)
trans 1,2-DCE	**5**	ND (20)	ND (20)	ND (20)	ND (20)	ND (20)	ND (200)	ND (10)	ND (20)	ND (20)	ND (20)	ND (20)	ND (2.0)	ND (2.0)	ND (20)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (20)	ND (2.0)	ND (2.0)	ND (20)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)
Cis 1,2-DCE	**5**	**1,220**	**220**	**862**	**1,460**	**2,330**	**1,600**	**727**	**841**	**1,080**	**808**	ND (20)	**15.2**	**32.3**	**26.8**	**30.9**	**24.9**	ND (2.0)	ND (2.0)	ND (2.0)	**202**	**158**	**196**	**106**	**122**	**76**	ND (2.0)	ND (2.0)	ND (2.0)
VC	**2**	**321**	**102**	**352**	**479**	**1,250**	**1,030**	**506**	**845**	**1,560**	**1,050**	ND (20)	ND (2.0)	**3.48**	ND (20)	**4.18**	2.4	ND (2.0)	ND (2.0)	ND (2.0)	**227**	**96.5**	**103**	**59.8**	**116**	**51.4**	ND (2.0)	ND (2.0)	**2.78**
TOTAL VOCs	--	1,541	322	1,214	1,939	3,580	2,630	1,233	1,686	2,640	1,858	57.6	62.7	115.68	71.80	122.88	83.70	0	0	0	515.3	292.4	361	198.8	294.9	160.2	0	0	2.78

COMPOUND	NYSDEC Standard or Guidance Value[(1)]	SAMPLE LOCATIONS AND SAMPLE DATES																											
		MW-11			MW-12							MW-13						MW-14	MW-16			MW-17			MW-18				
		6/27/07	5/1/08	8/21/08	6/27/07	5/1/08	8/21/08	4/14/10	10/25/10	9/22/11	11/29/12	6/27/07	5/1/08	8/21/08	10/25/10	9/22/11	11/29/12	12/3/08	3/28/11	9/22/11	11/29/12	3/28/11	9/22/11	11/29/12	3/28/11	9/22/11	11/29/12	1/4/13
PCE	**5**	ND (20)	ND (2.0)	ND (2.0)	ND (20)	ND (2.0)	2.81	ND (20)	ND (20)	ND (10)	ND (10)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	3.26	ND (20)	ND (10)	ND (10)	2.68	ND (2.0)	ND (2.0)	ND (20)	ND (20)	ND (20)	ND (2.0)
TCE	**5**	**50.3**	ND (2.0)	ND (2.0)	**289**	**196**	**229**	**218**	**314**	**170**	**83.6**	**5.48**	3.99	4.54	**21.9**	**12.8**	ND (2.0)	**18.9**	**495**	**282**	**18.8**	**103**	**63.6**	ND (2.0)	ND (20)	ND (20)	ND (20)	ND (2.0)
trans 1,2-DCE	**5**	ND (20)	ND (2.0)	ND (2.0)	ND (20)	ND (2.0)	ND (2.0)	ND (20)	ND (20)	ND (10)	ND [10]	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (20)	**26.9**	**32.4**	4.92	4.79	**5.14**	ND (20)	ND (20)	ND (20)	ND (2.0)
Cis 1,2-DCE	**5**	**101**	ND (2.0)	ND (2.0)	**83.6**	**53.7**	**85.6**	**133.0**	**128.0**	**83.9**	**60.8**	**6.40**	3.97	**11.1**	**16.9**	**13.0**	ND (2.0)	**10.9**	**156**	**253**	**280**	**49.3**	**62.4**	**78.4**	**1,080**	**384**	**11.8**	**33**
VC	**2**	ND (20)	ND (2.0)	ND (2.0)	ND (20)	**18.4**	**27.5**	**36.4**	**53.6**	**47.8**	**35.4**	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	ND (2.0)	**4.54**	**28.1**	**29.2**	**60.7**	**8.85**	**27.3**	**26.9**	**1,520**	**1,200**	**29.1**	**75**
TOTAL VOCs	--	151.3	0	0	372.6	268.1	344.91	387.4	495.6	301.70	179.8	11.88	7.96	15.54	38.80	25.80	0	37.6	679.1	591.1	391.9	168.75	158.09	110.04	2,600	1,584	40.9	108

Notes

(1) NYSDEC Division of Water Technical Operations and Guidance Series (1.1.1): Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations; Class GA (source of drinking water from groundwater)
Concentrations are shown in ug/l or parts per billion (ppb) PCE = tetrachloroethene TCE = trichloroethene Cis 1,2 DCE = Cis 1,2-dichloroethene Trans 1,2-DCE = trans 1,2-dichloroethene VC = vinyl chloride
ND(200) - constituent not detected at the concentration shown in parenthesis E = Denotes an estimated concentration

TABLE 3

245-265 AND 271 HOLLENBECK STREET AND 50 BALFOUR DRIVE
ROCHESTER, NEW YORK
NYSDEC SITE #828188

ANALYTICAL LABORATORY TESTING PROGRAM

TASK	ANALYTICAL LABORATORY	PARAMETERS	METHOD	SAMPLE MATRIX	MAXIMUM ANTICIPATED # OF FIELD SAMPLES
Sub-Slab Vapor	Spectrum	TCL VOCs	TO-15	Vapor	10
Indoor Air	Spectrum	TCL VOCs	TO-15	Air	10
Outdoor Air	Spectrum	TCL VOCs	TO-15	Air	1
Waste Characterization - Investigation Derived Waste (IDW)	Spectrum	Solid IDW waste characterization program will be determined prior to disposal, based on quantity and the testing requirements of the disposal facility.			
		Liquid IDW waste characterization program will be determined prior to disposal, based on quantity and in accordance with the requirements necessary to obtain a Monroe County Pure Water sanitary sewer use permit.			

APPENDIX A

Soil Vapor Intrusion Sampling Guidance

FINAL

Guidance for Evaluating Soil Vapor Intrusion in the State of New York

October 2006

Prepared by:

NEW YORK STATE DEPARTMENT OF HEALTH
Center for Environmental Health
Bureau of Environmental Exposure Investigation

2.7.2 Sub-slab vapor

During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time. Prior to installation of the sub-slab vapor probe, the building floor should be inspected and any penetrations (cracks, floor drains, utility perforations, sumps, etc.) should be noted and recorded. Probes should be installed at locations where the potential for ambient air infiltration via floor penetrations is minimal.

Sub-slab vapor probe installations [Figure 2.3] may be permanent, semi-permanent or temporary. A vacuum should not be used to remove drilling debris from the sampling port. Sub-slab implants or probes should be constructed in the same manner at all sampling locations to minimize possible discrepancies. The following procedures should be included in any construction protocol:

a. permanent recessed probes should be constructed with brass or stainless steel tubing and fittings;

b. temporary probes should be constructed with inert tubing (e.g., polyethylene, stainless steel, nylon, Teflon®, etc.) of the appropriate size (typically 1/8 inch to 1/4 inch diameter), and of laboratory or food grade quality;

c. tubing should not extend further than 2 inches into the sub-slab material;

d. porous, inert backfill material (e.g., glass beads, washed #1 crushed stone, etc.) should be added to cover about 1 inch of the probe tip for permanent installations; and

e. the implant should be sealed to the surface with non-VOC-containing and non-shrinking products for temporary installations (e.g., permagum grout, melted beeswax, putty, etc.) or cement for permanent installations.

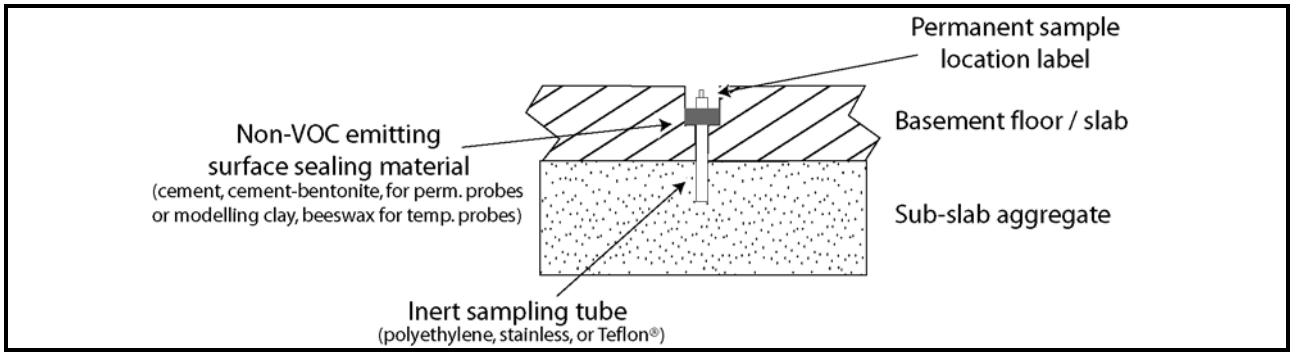

Figure 2.3

Schematic of a generic sub-slab vapor probe

[Note: Many variations exist and may be proposed in a work plan. Proposed installations should meet the sampling objectives and requirements of the analytical methods.]

To obtain representative samples that meet the data quality objectives, sub-slab vapor samples should be collected in the following manner:

a. after installation of the probes, one to three volumes (i.e., the volume of the sample probe and tube) must be purged prior to collecting the samples to ensure samples collected are representative;

b. flow rates for both purging and collecting must not exceed 0.2 liters per minute to minimize ambient air infiltration during sampling; and

c. samples should be collected, using conventional sampling methods, in an appropriate container — one which

    i. meets the objectives of the sampling (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation),

    ii. is consistent with the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and

    iii. is certified clean by the laboratory;

d. sample size depends upon the volume of that will achieve minimum reporting limits [Section 2.9], the flow rate, and the sampling duration; and

e. ideally, samples should be collected over the same period of time as concurrent indoor and outdoor air samples.

When sub-slab vapor samples are collected, the following actions should be taken to document conditions during sampling and ultimately to aid in the interpretation of the sampling results [Section 3]:

a. historic and current storage and uses of volatile chemicals should be identified, especially if sampling within a commercial or industrial building (e.g., use of volatile chemicals in commercial or industrial processes and/or during building maintenance);

b. the use of heating or air conditioning systems during sampling should be noted;

c. floor plan sketches should be drawn that include the floor layout with sampling locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, HVAC system air supply and return registers, compass orientation (north), footings that create separate foundation sections, and any other pertinent information should be completed;

d. outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sampling locations (if applicable), compass orientation (north), and paved areas;

e. weather conditions (e.g., precipitation and indoor and outdoor temperature) and ventilation conditions (e.g., heating system active and windows closed) should be reported; and

f. any pertinent observations, such as spills, floor stains, smoke tube results, odors and readings from field instrumentation (e.g., vapors via PID, ppbRAE, Jerome Mercury Vapor Analyzer, etc.), should be recorded.

Additional documentation that could be gathered to assist in the interpretation of the results includes information about air flow patterns and pressure relationships obtained by using smoke tubes or other devices (especially between floor levels and between suspected

contaminant sources and other areas), the barometric pressure and photographs to accompany floor plan sketches.

The field sampling team should maintain a sample log sheet summarizing the following:

a. sample identification,
b. date and time of sample collection,
c. sampling depth,
d. identity of samplers,
e. sampling methods and devices,
f. soil vapor purge volumes,
g. volume of soil vapor extracted,
h. if canisters used, vacuum of canisters before and after samples collected,
i. apparent moisture content (dry, moist, saturated, etc.) of the sampling zone, and
j. chain of custody protocols and records used to track samples from sampling point to analysis.

2.7.3 Indoor air

[Reference: NYSDOH's *Indoor Air Sampling & Analysis Guidance (February 1, 2005)*]

During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time. If possible, prior to collecting indoor samples, a pre-sampling inspection [Section 2.11.1] should be performed to evaluate the physical layout and conditions of the building being investigated, to identify conditions that may affect or interfere with the proposed sampling, and to prepare the building for sampling. This process is described in Section 2.11.1.

In general, indoor air samples should be collected in the following manner:

a. sampling duration should reflect the exposure scenario being evaluated without compromising the detection limit or sample collection flow rate (e.g., an 8 hour sample from a workplace with a single shift versus a 24 hour sample from a workplace with multiple shifts). To ensure that air is representative of the locations sampled and to avoid undue influence from sampling personnel, samples should be collected for at least 1 hour. If the goal of the sampling is to represent average concentrations over longer periods, then longer duration sampling periods may be appropriate. Typically, 24 hour samples are collected from residential settings;
b. personnel should avoid lingering in the immediate area of the sampling device while samples are being collected;
c. sample flow rates must conform to the specifications in the sample collection method and, if possible, should be consistent with the flow rates for concurrent outdoor air and sub-slab samples; and
d. samples must be collected, using conventional sampling methods, in an appropriate container — one which

i. meets the objectives of the sampling (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation),

ii. is consistent with the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and

iii. is certified clean by the laboratory.

At sites with tetrachloroethene contamination, passive air monitors that are specifically analyzed for tetrachloroethene (i.e., "perc badges") are commonly used to collect indoor and outdoor air samples. If site characterization activities indicate that degradation products of tetrachloroethene also represent a vapor intrusion concern, perc badges may be used to indicate the likelihood of vapor intrusion (i.e., by using tetrachloroethene as a surrogate) followed, as appropriate, by more comprehensive sampling and laboratory analyses to quantify both tetrachloroethene and its degradation products. Perc badge samples ideally should be collected over a twenty-four hour period, but for no less than eight hours.

The following actions should be taken to document conditions during indoor air sampling and ultimately to aid in the interpretation of the sampling results [Section 3]:

a. historic and current uses and storage of volatile chemicals should be identified, especially if sampling within a commercial or industrial building (e.g., use of volatile chemicals in commercial or industrial processes and/or during building maintenance);

b. a product inventory survey documenting sources of volatile chemicals present in the building during the indoor air sampling that could potentially influence the sample results should be completed [Section 2.11.2];

c. the use of heating or air conditioning systems during sampling should be noted;

d. floor plan sketches should be drawn that include the floor layout with sampling locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, HVAC system supply and return registers, compass orientation (north), footings that create separate foundation sections, and any other pertinent information should be completed;

e. outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sampling locations (if applicable), compass orientation (north), and paved areas;

f. weather conditions (e.g., precipitation and indoor and outdoor temperature) and ventilation conditions (e.g., heating system active and windows closed) should be reported; and

g. any pertinent observations, such as spills, floor stains, smoke tube results, odors and readings from field instrumentation (e.g., vapors via PID, ppbRAE, Jerome Mercury Vapor Analyzer, etc.), should be recorded.

Additional documentation that could be gathered to assist in the interpretation of the results includes information about air flow patterns and pressure relationships obtained by using smoke tubes or other devices (especially between floor levels and between suspected contaminant sources and other areas), the barometric pressure and photographs to accompany floor plan sketches.

The field sampling team should maintain a sample log sheet summarizing the following:

a. sample identification,
b. date and time of sample collection,
c. sampling height,
d. identity of samplers,
e. sampling methods and devices,
f. depending upon the method, volume of air sampled,
g. if canisters are used, vacuum of canisters before and after samples collected, and
h. chain of custody protocols and records used to track samples from sampling point to analysis.

2.7.4 Outdoor air

Outdoor air samples should be collected simultaneously with indoor air samples to evaluate the potential influence, if any, of outdoor air on indoor air quality. They may also be collected simultaneously with soil vapor samples to identify potential outdoor air interferences associated with infiltration of outdoor air into the sampling apparatus while the soil vapor was collected. To obtain representative samples that meet the data quality objectives, outdoor air samples should be collected in a manner consistent with that for indoor air samples (described in Section 2.7.3).

The following actions should be taken to document conditions during outdoor air sampling and ultimately to aid in the interpretation of the sampling results [Section 3]:

a. outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sampling locations, the location of potential interferences (e.g., gasoline stations, factories, lawn movers, etc.), compass orientation (north), and paved areas;
b. weather conditions (e.g., precipitation and outdoor temperature) should be reported; and
c. any pertinent observations, such as odors, readings from field instrumentation, and significant activities in the vicinity (e.g., operation of heavy equipment or dry cleaners) should be recorded.

2.7.5 Tracer gas

When collecting soil vapor samples as part of a vapor intrusion evaluation, a tracer gas serves as a quality assurance/quality control measure to verify the integrity of the soil vapor probe seal. Without the use of a tracer, there is no way to verify that a soil vapor sample has not been diluted by outdoor air.

Depending on the nature of the contaminants of concern, a number of different compounds can be used as a tracer. Typically, sulfur hexafluoride (SF_6) or helium are used as tracers because they are readily available, have low toxicity, and can be monitored with portable measurement devices. Butane and propane (or other gases) could also be used as a tracer in some situations. Compounds other than those mentioned here may be appropriate, provided they meet project-specific data quality objectives. Where applicable, steps should

be taken to ensure that the gas used by the laboratory to clean the air sampling container is different from the gas used as a tracer during sampling (e.g., helium).

The protocol for using a tracer gas is straightforward: simply enrich the atmosphere in the immediate vicinity of the area where the probe intersects the ground surface with the tracer gas, and measure a vapor sample from the probe for the presence of high concentrations (> 10%) of the tracer. A cardboard box, a plastic pail, or even a garbage bag can serve to keep the tracer gas in contact with the probe during the testing. If there are concerns about infiltration of ambient air through other parts of the sampling train (such as around the fittings, not just at the probe/ground interface), then consideration should be given to ensuring that the tracer gas is in contact with the entire sampling apparatus. In these cases, field personnel may prefer to use a liquid tracer — soaking paper towels with a liquid tracer and placing the towels around the probe/ground interface, around fittings, and/or in the corner of a shroud.

There are two basic approaches to testing for the tracer gas:

1. include the tracer gas in the list of target analytes reported by the laboratory; or
2. use a portable monitoring device to analyze a sample of soil vapor for the tracer prior to and after sampling for the compounds of concern. (Note that the tracer gas samples can be collected via syringe, Tedlar® bag etc. They need not be collected in Summa® canisters or minicans.)

The advantage of the second approach is that the real time tracer sampling results can be used to confirm the integrity of the probe seals prior to formal sample collection.

Figure 2.4 depicts common methods for using tracer gas. In examples a, b and c, the tracer gas is released in the enclosure prior to initially purging the sample point. Care should be taken to avoid excessive purging prior to sample collection. Care should also be taken to prevent pressure build-up in the enclosure during introduction of the tracer gas. Inspection of the installed sample probe, specifically noting the integrity of the surface seal and the porosity of the soil in which the probe is installed, will help to determine the tracer gas setup. Figure 2.4a may be most effective at preventing tracer gas infiltration, however, it may not be appropriate in some situations depending on site-specific conditions. Figures 2.4b and 2.4c may be sufficient for probes installed in tight soils with well-constructed surface seals. Figure 2d provides an example of using a liquid tracer. In all cases, the same tracer gas application should be used for all probes at any given site.

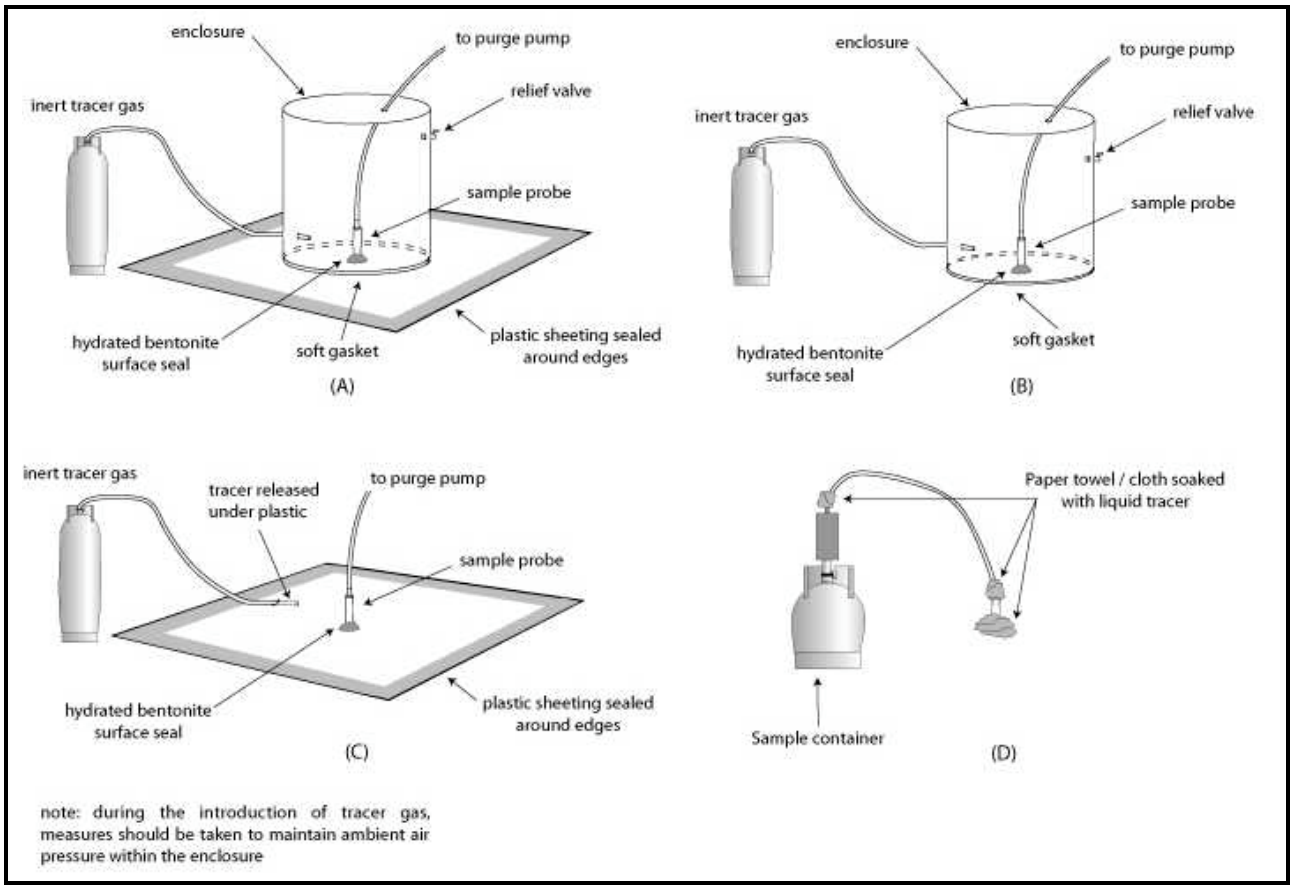

Figure 2.4
Schematics of generic tracer gas applications when collecting soil vapor samples

Because minor leakage around the probe seal should not materially affect the usability of the soil vapor sampling results, the mere presence of the tracer gas in the sample should not be a cause for alarm. Consequently, portable field monitoring devices with detection limits in the low ppm range are more than adequate for screening samples for the tracer. If high concentrations (> 10%) of tracer gas are observed in a sample, the probe seal should be enhanced to reduce the infiltration of outdoor air.

Where permanent or semi-permanent sampling probes are used, tracer gas samples should be collected at each of the sampling probes during the initial stages of a soil vapor sampling program. If the results of the initial samples indicate that the probe seals are adequate, reducing the number of locations at which tracer gas samples are employed may be considered. At a minimum, tracer gas samples should be collected with at least 10% of the soil vapor samples collected in subsequent sampling rounds. When using permanent soil vapor probes as part of a long-term monitoring program, annual testing of the probe integrity is recommended. Where temporary probes are used, tracer gas should be used at every sampling location, every time.

APPENDIX B

Spectrum Analytical Inc. Quality Assurance Plan

SPECTRUM ANALYTICAL, INC.
Featuring
HANIBAL TECHNOLOGY
Rhode Island Division

QUALITY ASSURANCE PLAN
2012

Approved By:

Digitally signed by Hanibal C. Tayeh
Date: 2012.10.09 14:40:39 -04'00'

Hanibal C. Tayeh, Ph. D.
President, and CEO — 10/09/2012 Date

Yihai Ding
Laboratory Director — 10/09/2012 Date

Sharyn B. Lawler
Quality Assurance Director — 10/09/2012 Date

EFFECTIVE DATE: 10/26/2012

646 Camp Ave. North Kingstown Rhode Island 02852 401-732-3400 · FAX 401-732-3499
www.spectrum-analytical.com

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3.0 INTRODUCTION

Spectrum Analytical, Inc. Featuring Hanibal Technology Rhode Island Division (formerly MITKEM and referenced as Spectrum Analytical, Inc. RI Division throughout this document going forward) is an environmental testing laboratory dedicated to providing high quality analytical data and exceptional customer service.

Opened in 1994, as Mitkem Corporation, and purchased by Spectrum Analytical, Inc. in 2007, Spectrum Analytical, Inc. RI Division's laboratory facility is designed for high throughput and efficient laboratory operations. Separate secure areas are dedicated to sample receipt and storage. Spectrum Analytical, Inc. RI Division has individual sample preparation laboratories for organic and inorganic analyses and individual instrumentation rooms for extractable organics, volatiles, metals and wet-chemistry analyses.

Spectrum Analytical, Inc. RI Division recognizes the importance of controlling in-house cross contamination. The organic preparation area and the volatile organic instrument room are in separate areas, at opposite ends of the building to minimize solvent contamination of the volatile analysis. The air handling system in the volatiles laboratory is completely isolated from the remainder of the facility. A floor plan of the facility is included (Figure 3-1).

Spectrum Analytical, Inc. RI Division has placed a priority on obtaining and operating a large fleet of the latest, most sophisticated Hewlett-Packard, Thermo Scientific and Perkin-Elmer instruments. This emphasis on instrumentation enables the lab to operate at a high level of analytical efficiency.

Spectrum Analytical, Inc. RI Division specializes in performing laboratory analyses using the newest US EPA Contract Laboratory Program (CLP) *SOM* Organic and *ISM* Inorganic methods, as well as providing CLP-format data reports for virtually any test we perform. Spectrum Analytical, Inc. RI Division provides CLP-format reporting for EPA CLP, SW-846, MCAWW and Standard Methods analyses. Much of this work is performed by the laboratory under Department of Defense Quality Systems Manual (QSM) and ISO-17025 guidelines. Spectrum Analytical, Inc. RI Division has the flexibility to provide project-specific custom method modifications to meet the needs of a unique client or analytical requirement.

Spectrum Analytical, Inc. RI Division has participated in numerous environmental laboratory programs for both state and federal agencies including: the United States Navy, the United States Army Corps of Engineers, and the Air Force Center for Environmental Excellence. In addition Spectrum Analytical, Inc. RI Division is currently providing laboratory services under the United States Environmental Protection Agency Contract Laboratory Program. Spectrum Analytical, Inc. RI Division has been a contractor to the EPA under the CLP program continuously for over 15 years.

Spectrum Analytical, Inc. RI Division is a division of Spectrum Analytical, Inc. of Agawam, Massachusetts. Spectrum Analytical, Inc is an environmental laboratory company with laboratory locations in Agawam, MA, North Kingstown, Rhode Island and Tampa, Florida, providing analyses of soil, water and air samples for a wide variety of private and government clients.

This Quality Assurance Plan (QAP) describes the policies, organization, objectives, and quality control activities. It also specifies quality assurance functions employed at Spectrum Analytical, Inc. RI Division and demonstrates our dedication to the production of accurate, consistent data of known quality. This QAP is developed by following the guidelines discussed in the EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations, EPA QA/R-5, Reissued May 2006: EPA Requirements for Quality Management Plans, EPA QA/R-2, Reissued May 2006: Department of Defense (DOD QSM) Quality Systems Manual for Environmental Laboratories Version 4.2: and the National Environmental Laboratory Accreditation Conference (NELAC) standards, June 5, 2003 (Effective July 1, 2003)/ The NELAC Institute (TNI) Standards.

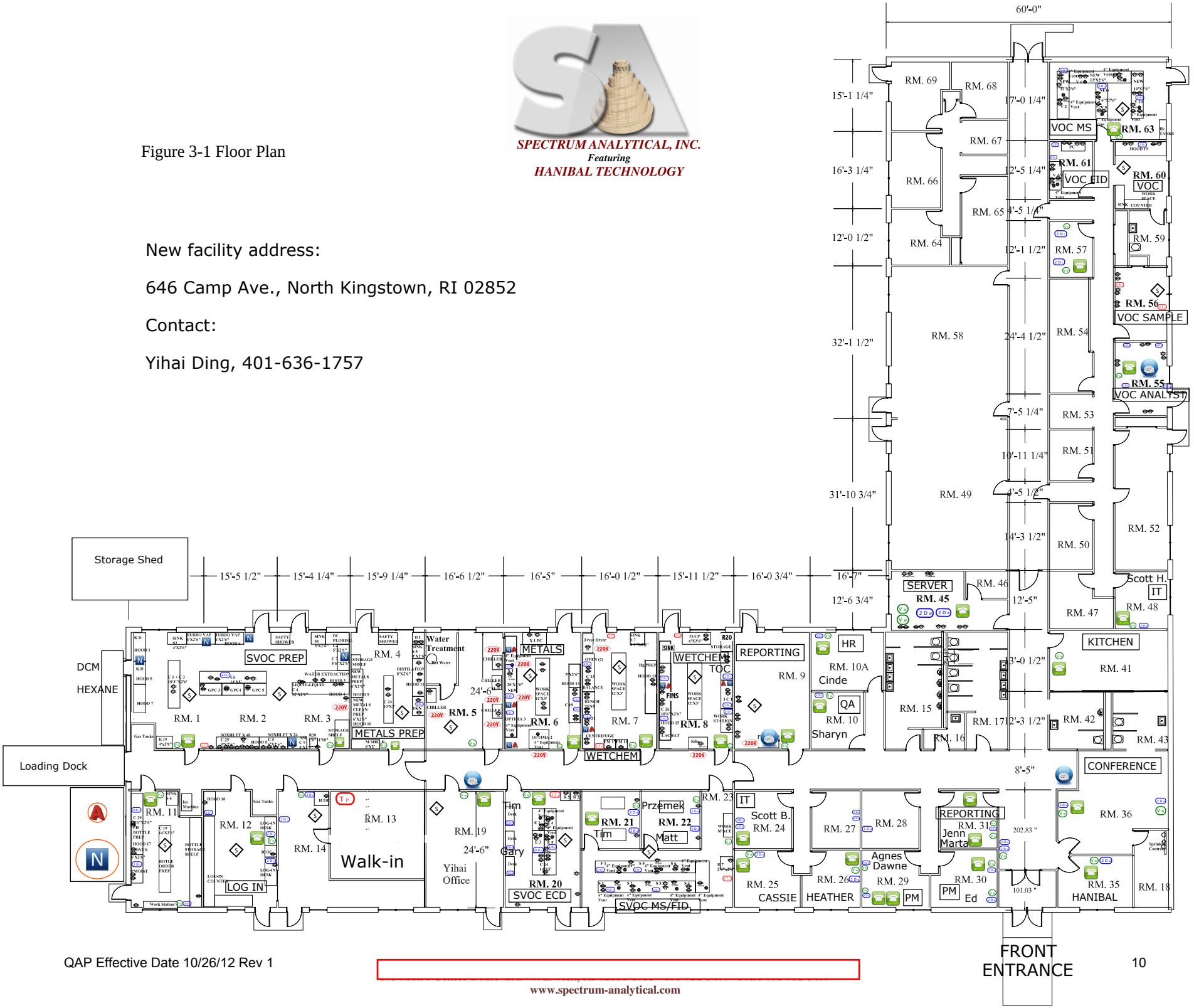
Figure 3-1 Floor Plan

New facility address:

646 Camp Ave., North Kingstown, RI 02852

Contact:

Yihai Ding, 401-636-1757



4.0 QUALITY ASSURANCE POLICY STATEMENT

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

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

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

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

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

All employees receive training in these issues as part of the initial orientation process, and are required to acknowledge that they understand their responsibilities in these areas. These issues are also discussed among all laboratory staff at company meetings and re-training sessions. The QA Officer, Technical Director and other senior management are readily available to all staff through their daily presence, "open door" policy and approachable manner. This allows any employee to readily discuss any questions, concerns or issues that may occur.

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

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

The basic components of the Spectrum Analytical, Inc. RI Division's QA/QC Program are control, evaluation and correction.

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

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

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

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

5.0 QUALITY ASSURANCE MANAGEMENT, ORGANIZATION AND RESPONSIBILITY

Quality Assurance at Spectrum Analytical, Inc. RI Division is a company-wide function that depends on:

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

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

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

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

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

The Manager of each laboratory department is responsible for ensuring thorough oversight of the quality of the data generated by the department supervisors, technicians and/or analysts. The Department Manager implements and monitors the specific QC protocols and QA programs with the laboratory to ensure a continuous flow of data meeting all control protocols and Spectrum Analytical, Inc. RI Division QA requirements. The Department Manager's responsibilities include providing the technicians and/or analysts with adequate resources to achieve the desired quality of performance.

The Spectrum Analytical, Inc. RI Division organizational structure is shown in the Organization Chart (Figure 5-1).

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

Implementation of the entire Quality Assurance Program is the responsibility of the QA Director. While interacting on a daily basis with laboratory staff members, the QA Director remains independent of the laboratories and reports directly to the Laboratory

Director. The QA Director evaluates laboratory compliance with respect to the QA program through informal and formal systems and performance audits as described in Section 13. Remedial action, to alleviate any detected problems, is suggested and/or discussed with the appropriate parties and implemented when necessary.

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

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

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

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

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

Spectrum Analytical, Inc. RI Division's personnel job descriptions:

Responsibilities of each staff area in the laboratory include:

Technician / Preparation Laboratory Areas:

- Analysis of samples through compliance with all aspects of formally approved analytical methods and laboratory SOPs.
- Carefully documenting each step of the analytical process.
- Noting in the appropriate logbook area any unusual occurrences or sample matrix problems.
- Conscientiously obtaining peer review as required.

- Promptly alerting laboratory supervisor, Department Managers and/or QA staff members to problems or anomalies that may adversely impact data quality.
- Routine housekeeping duties for their laboratory area.

Analyst / Instrument Laboratory Areas:

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

Data Reporting Specialists:

- Assemble CLP-format data reports by organizing data report forms and raw data in proper order to allow for technical data review.
- Enter data into LIMS or other data reporting computer programs, and print report forms as appropriate.
- Provide non-technical typographical review of data entered into computer systems by other individuals.
- Deliver data reports to customers by FAX or electronic mail.
- Paginate, photocopy, scan, save to CD (bookmark if required) and archive copies of customer reports or other documentation to be retained by the laboratory, or prepare paperless reports.
- Ship, or organize for courier delivery, final data reports to customers.
- Assist the QA Director in management of the document control system.
- Assist Project Managers with bottle order requests and shipment of coolers.
- Assist Project Managers in other tasks as required.

Laboratory Department Manager/Supervisors:

- Oversight of supervisors (where applicable), technicians and/or analysts in their laboratory areas.

- Monitors the status of all work in their laboratory area to insure compliance with holding time and turnaround time requirements.
- Training new scientists in the appropriate procedures and methods in the laboratory.
- Works with Laboratory Director and the QA staff to review, revise and implement SOPs.
- Insures adequate resources to perform the needed tasks by working with administrative personnel to order needed supplies.
- Insures all supplies and reagents meet the QC requirements of their intended task prior to their use in the laboratory.
- Insures all staff are using proper safety protocols.
- Works with Laboratory Director on the annual review of personnel performance.
- Interviews prospective new employees to insure they have the minimal level of qualifications, experience, education and skills necessary to perform their tasks, as well as the appropriate work ethic and social skills necessary for proper teamwork and productivity.
- Review of analytical data to insure compliance with method/SOP requirements prior to release to the client.
- Documents any non-compliance or other unusual occurrences noted during sample analysis and data review such that these can be included in the report narrative and explained to the client.

Data Reviewer:

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

Laboratory Director:

- Works with Department Managers to coordinate laboratory areas in the completion of analytical projects.
- Review of analytical data to insure compliance with method/SOP requirements prior to release to the client.
- Works with QA Director to implement new SOPs and to annually review and revise existing SOPs.
- Works with the QA Director, Department Managers and Supervisors to develop and implement corrective action when needed.

- Works with management and supervisory staff to continuously improve the quality and efficiency of all company procedures.
- Assists Department Managers in the annual review of personnel performance.
- Supervises all Management, QA and Supervisory staff to insure compliance with company QA policies and other company procedures.
- Provides technical assistance to all areas of the laboratory staff.
- Acts as technical consultant for chemistry related issues that arise in the lab.
- Provides assistance with instrument optimization or performance issues as needed.
- Offers input on the purchase and operation of new instrumentation.
- Trains other analysts in procedures and methodologies.

Director of Business Development

- Pursues new contracts/projects as well as clients.
- Works with Spectrum Marketing to prepare Bids.
- Ensures laboratory is aware of specific requirements of new projects/contracts.
- Works with clients to insure all questions and concerns are addressed and answered.
- Works with clients to insure their understanding of complex technical issues.
- Works with Quality Services Department staff to continuously improve the quality and efficiency of all company procedures.

Data Reporting Supervisor:

- Works with Laboratory Director, Department Managers and Supervisors to prioritize and coordinate laboratory areas in the timely completion of analytical projects.
- Review of analytical data to insure compliance with method/SOP requirements prior to release to the client.
- Writes project report narratives to document any unusual occurrences noted during sample analysis.
- Works with management and supervisory staff to continuously improve the quality and efficiency of all company procedures.
- Works with Laboratory Director on the annual review of personnel performance.

Project Manager:

- Works with the client to completely understand the requirements of all incoming work.
- Evaluates the client’s requirements as compared to the abilities of the laboratory as stated in Standard Operating Procedure (SOP) #110.0023 Project Management.
- Works with the Data Reporting staff to continuously improve the quality and efficiency of all company procedures.

- Communicates the customer's requirements to all laboratory staff working on the project.
- Works with the customer to determine the number and type of sample containers required for the project.
- Works with the Sample Custodian to resolve and communicate to the client any problem or discrepancies with incoming samples.
- Maintains open, responsive and continuous communication with the customer.
- Follows up with the client to assess level of satisfaction, and insure all project goals have been accomplished.
- Assist Business Development and Marketing Staff in other tasks as required.

Information Technology Director:

- Oversees the operations of the three divisions of Spectrum Analytical, Inc. (MA, FL and RI). The IT Director's role is technical guidance, IT long term planning, coordination/communication between the divisions, oversees and makes the necessary decision to support the overall IT function.

Information Technology Manager:

Primary function is to oversee the operations of the Spectrum Analytical, Inc. RI Division's IT department.

- Oversee the operations of the network, including servers and workstations.
- Plan for hardware and software updates
  1) Support users IT needs.
  2) Support client IT needs.
  3) Oversee security of network
- Development and expansion of LIMS.
  1) Program new functionality into LIMS including program based protocols requirements
  2) hard copy reports
  3) electronic reports
  4) processing of data to web site
  5) tracking of data
  6) maintenance of LIMS
  7) security of LIMS
- Generate and troubleshoot more complex EDDs
- Provide backup for the Information Technology Specialist when out and support when it is needed.

Secondary function is to work with the other divisions to try and make transfer of information as seamless as possible. Lend technical support to other divisions and help to bring technical help from other divisions to Spectrum Analytical, Inc. RI Division IT department.

Information Technology Specialist:

- Primary duty is to generate and review EDDs using EDD module.
  a) Generate and validate EDDs using EDD specific tools (CRA, Tetra Tech, CH2M Hill, etc…).
  b) Generate all SEDD files for the EPA SOM contract, and work with the chemists to resolve any defects, if possible.
- Perform server room duties.
  a) Monitor the servers and troubleshoot (if needed)
  b) Perform backup/archive of data on servers
  c) File grooming at the end of the month
  d) Monitor event logs of the servers for issues.
  e) Monitor status of centralized anti-viral program (AVG). Includes monitoring AVG status of workstations
  f) Monitor centralized Windows System Update Server (WSUS). Includes monitoring WSUS status of workstations.
- Handles user issues with printer/scanner/copier systems from Ikon. Based on evaluation, schedule service calls or replaces consumable parts.

Quality Assurance Director:

- Implements the entire QA program.
- Interacts on a daily basis with laboratory staff.
- Evaluates compliance with the QA program through formal and informal reviews of data and processes.
- Implements the corrective action system.
- Maintains a master list of all SOPs and monitors review schedules.
- Works with Department Managers and Supervisors to implement new SOPs and to annually review and revise existing SOPs.
- Controls all master and controlled-copies of SOPs and QAP as per SOP #80.0012; Production of Standard Operating Procedures.
- Posts to intranet, and archives all old and edited revisions of SOPs and QA manual as per SOP# 80.0012; Production of Standard Operating Procedures.
- Interfaces with certification authorities and agencies to maintain existing certifications and programs, and obtain new certifications.
- Maintains records of employee training and certification as per SOP# 80.0016; Training Procedures and Tracking.
- Instructs laboratory personnel on ethics in the workplace.
- Oversees analytical trends that need to be evaluated and corrected.
- Oversees the implementation of MDLs and control limit studies.
- Directs the internal audit program as per SOP# 80.0006; Internal Audits.
- Coordinates all external audit corrective action reports and investigations.
- Maintains certification of NIST thermometers and weights.

- Schedules annual hood inspections and balance calibrations.

In Spectrum Analytical, Inc. RI Division's organizational structure, the Laboratory Director has the ultimate authority for all chemistry-related aspects of the company.

The QA Director reports directly to the Laboratory Director. She has the authority within the management system to bring any issue to the highest levels of the company management and ownership, as well as to halt the release of data she believes to be questionable or suspend the performance of an analysis she believes to be unreliable.

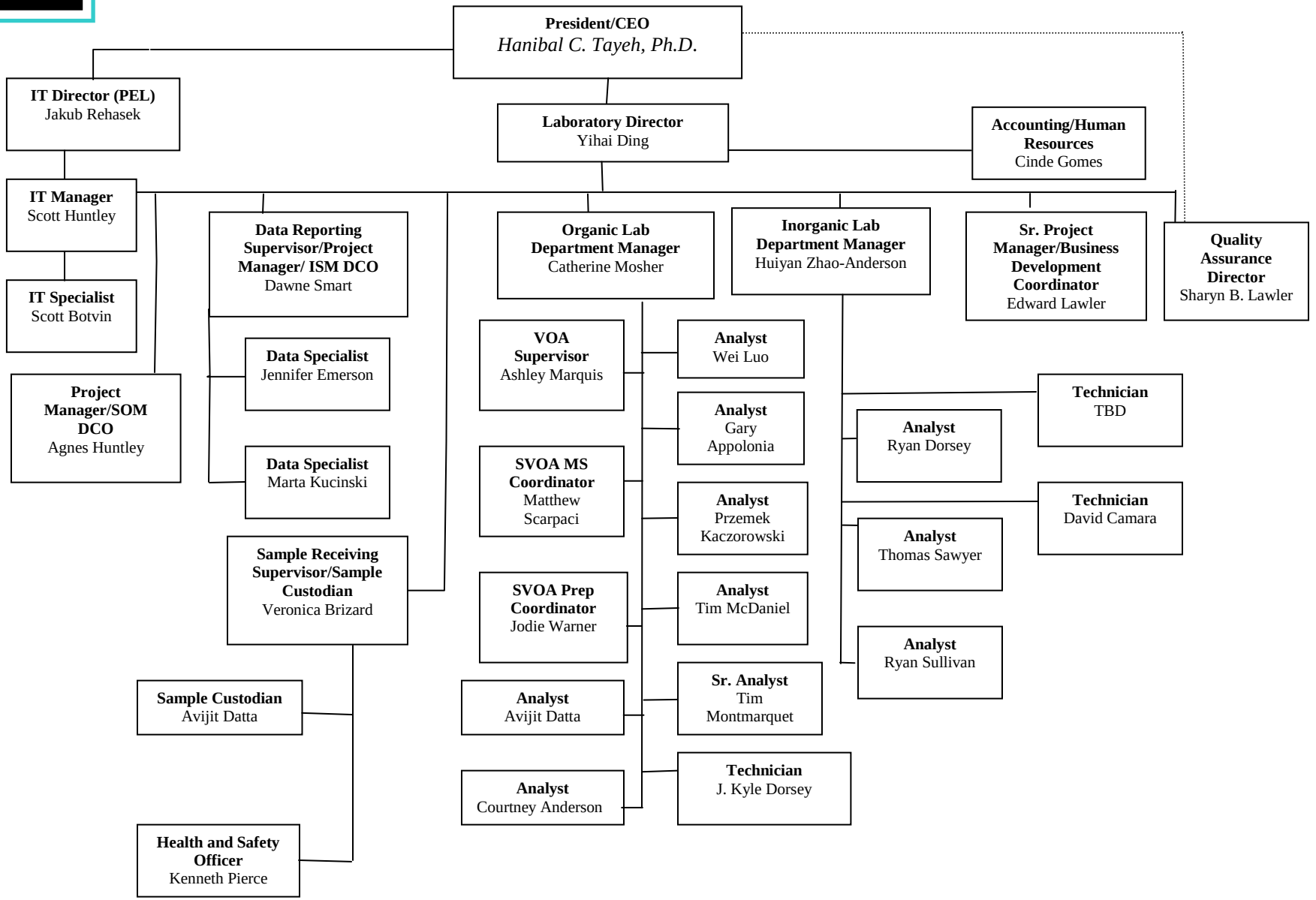
The Director of Business Development works with the project managers and marketing staff and with the Department Managers and Supervisors to prioritize and coordinate work within the laboratories.

The personnel training records are located in the QA department on-site as well as additional training documents being saved in pdf form on the Spectrum network. All individual training is documented including new employee training, individual training, annual retraining procedures, and Health and Safety training.

Figure 5-1
SPECTRUM ANALYTICAL, INC. RI Division's Organizational Chart

Spectrum
Analytical RI

Organizational Chart



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

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

- Precision: the agreement of reproducibility among individual measurements of the same property usually made under identical conditions.

- Accuracy: the degree of agreement of a measurement with the true or accepted value.

- Representation: the degree to which data accurately and precisely represent a characteristic of a population, parameter variations of a sample of a finite process condition, or of a finite environmental condition.

- Completeness: a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions.

- Comparability: an expression of the confidence with which one laboratory data set can be compared with another laboratory data set in regard to the same property and laboratory sample population.

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

6.1 Precision and Accuracy:

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

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

6.2 Representation:

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

6.3 Completeness:

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

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

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

6.4 Comparability:

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

6.5 QA Reporting

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

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

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

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

7.0 SAMPLING PROCEDURES

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

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

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

Representative portions of samples are taken for analysis by following Spectrum Analytical, Inc. RI Division's SOP 110.0039 Standard Operating Procedure for Sub-Sampling.

Table 7-1

Recommended Container, Preservation Techniques and Holding Times For SW-846 Analyses

Analytes	Method	Containers	Required* Volume	Preservation	Holding Times
Volatile Organics					
Solid	8260, 5030	Amber glass jar with Teflon lining	Minimal head-space in jar	4°C	14 days
Solid [a]	8260, 5035	40mL vial or Encore with Teflon lining	5.0gram ± 0.5	4°C, unpreserved	48 hours
				DI Water -10 to –20^{0}C	14 days
				Sodium bisulfate -10 to –20^{0}C, 4^{0}C	14 days
				Methanol 4^{0}C	14 days
Aqueous	8260, 5030	40mL VOA Vials with Teflon septum	40mL	4°C HCl, pH<2	14 days
Semivolatile Organics					
Solid	3540, 3550 8270	Amber glass jar with Teflon lining	30gram	4°C	Extraction within 14 days Analysis within 40 days
Aqueous	3510, 3520 8270	Amber glass bottles with Teflon lining	1L	4°C	Extraction within 7 days Analysis within 40 days
Polychlorinated Biphenyls					
Solid	3540, 3550 8082	Amber glass jar with Teflon lining	30gram	4°C	Extraction within 14 days Analysis within 40 days
Aqueous	3510, 3520 8082	Amber glass bottle with Teflon lining	1L	4°C	Extraction within 7 days Analysis within 40 days
Organochlorine Pesticides					
Solid	3540, 3550 8081	Amber glass jar with Teflon lining	30gram	4°C	Extraction within 14 days Analysis within 40 days
Aqueous	3510, 3520 8081	Amber glass bottle with Teflon lining	1L	4°C	Extraction within 7 days Analysis within 40 days
Chlorinated Herbicides					
Solid	8151	Amber glass jar with Teflon lining	30gram	4°C	Extraction within 14 days Analysis within 40 days
Aqueous	8151	Amber glass bottle with Teflon lining	1L	4°C	Extraction within 7 days Analysis within 40 days

Table 7-1 (cont'd)

Recommended Containers, Preservation Techniques and Holding Times
For
SW846 Analyses

Analytes	Method	Containers	Required* Volume	Preservation	Holding Times
Total Petroleum Hydrocarbons					
Gasoline Range Organics, including Maine-GRO**					
Solid	8015, 5030 ME 4.1.17	Amber glass jar With Teflon lining	Minimal head-space in jar	4°C	14 days
Solid [a]	8015, 5035	40mL vial or Encore with Teflon lining	5.0gram ± 0.5	4°C, unpreserved	48 hours
				4°C, Methanol	14days
Aqueous	8015, 5030 ME 4.1.17	40mL VOA vials With Teflon septum	40mL	4°C HCl, pH<2	14 days
Diesel Range Organics, including Maine-DRO					
Solid	3540, 3550 8015 ME 4.1.25	Amber glass jar with Teflon lining	30gram	4°C	Extraction within 14 days Analysis within 40 days
Aqueous	3510, 3520 8015 ME 4.1.25	Amber glass bottle with Teflon lining	1L	4°C H_2SO_4, pH<2	Extraction within 7 days Analysis within 40 days
Total Metals except Mercury and Chromium (VI)					
Solid	3050 6010	Amber glass jar with Teflon lining	10g	4°C	180 days
Aqueous	3005, 3010	Polyethylene bottle	100mL	HNO_3, pH<2	180 days
Chromium (VI)					
Solid	3060, 7196	Amber glass jar with Teflon lining	10g	4°C	Digestion within 30 days Analysis within 96 hours
Aqueous	7196	Polyethylene bottle	25mL	4°C	24 hours
Mercury					
Solid	7471	Amber glass jar	10g	4°C	28 days
Aqueous	7470	Polyethylene bottle	100mL	4°C HNO_3, pH<2	28 days
Cyanide					
Solid	9012	Amber glass jar with Teflon lining	10g	4°C	14 days
Aqueous	9012	Polyethylene bottle	50mL	4°C NaOH, pH≥12	14 days
Flashpoint					
Aqueous	1010	Amber glass bottle	30mL	4°C	28 days

Table 7-1 (cont'd)

Recommended Containers, Preservation Techniques and Holding Times
For
SW846 Analyses

Analytes	Method	Containers	Required* Volume	Preservation	Holding Times
Chloride					
Aqueous	9056	Polyethylene bottle	50mL	4°C	28 days
Nitrate					
Aqueous	9056	Polyethylene bottle	50mL	4°C	48 hours
Nitrite					
Aqueous	9056	Polyethylene bottle	50mL	4°C	48 hours
Orthophosphate					
Aqueous	9056	Polyethylene bottle	50mL	4°C	48 hours
Sulfates					
Aqueous	9056	Polyethylene bottle	50mL	4°C	28 days

Table 7-2

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

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

Table 7-2 (cont'd)

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

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

Table 7-3

Recommended Containers, Preservation Techniques and Holding Times for Other Analyses

Analytes	Method	Containers	Required* Volume	Preservation	Holding Times
Volatile Organics					
Aqueous	624	40mL VOA vials with Teflon septum	40mL	4°C HCl, pH<2	14 days
Semivolatile Organics					
Aqueous	3510, 3520 625	Amber glass bottle with Teflon lining	1L	4°C	Extraction within 7 days Analysis within 40 days
Organochlorine Pesticide/PCB					
Aqueous	3510, 3520 608	Amber glass bottle with Teflon lining	1L	4°C	Extraction within 7 days Analysis within 40 days
EDB/DBCP					
Aqueous	8011	40mL VOA vials with Teflon septum	35mL	4°C HCl, pH<2	28 days
MA Extractable Petroleum Hydrocarbons (EPH)					
Solid	3540, 3550 MADEP	Amber glass jar with Teflon lining	10gram	4°C	Extraction within 7 days Analysis within 40 days
Aqueous	3510, 3520 MADEP	Amber glass bottle with Teflon lining	1L	4°C HCl, pH<2	Extraction within 14 days Analysis within 40 days
MA Volatile Petroleum Hydrocarbons (VPH)					
Solid	MADEP	Amber glass jar with Teflon lining	10gram	4°C 10mL Methanol	14 days
Aqueous	MADEP	40mL VOA vial with Teflon lining	40mL	4°C HCl, pH<2	14 days
Total Metals excluding Mercury					
Aqueous	200.7, 200.8	Polyethylene bottle	100mL	HNO_3, pH<2	180 days
Mercury					
Aqueous	245.1	Polyethylene bottle	100mL	HNO_3, pH<2	28 days
Cyanide					
Aqueous	335.4	Polyethylene bottle	50mL	NaOH, pH>12	14 days

Table 7-3 (cont'd)

Recommended Containers, Preservation Techniques and Holding Times
for
Other Analyses

Analytes	Method	Containers	Required Volume*	Preservation	Holding Times
Chloride	E300.0	Polyethylene bottle	50mL	4°C	28 days
COD					
Aqueous	SM5220D	Amber VOA vial	40mL	4°C H_2SO_4, pH<2	28 days
Color					
Aqueous	SM2120B	Polyethylene bottle	50mL	4°C	Immediate
Nitrate					
Aqueous	E300.0	Polyethylene bottle	50mL	4°C	48 hours
Nitrite					
Aqueous	E300.0	Polyethylene bottle	50mL	4°C	48 hours
Orthophosphate					
Aqueous	SM4500-P, E E300.0	Polyethylene bottle	50mL	4°C	48 hours
Total phosphate					
Aqueous	SM4500-P B5,E	Polyethylene bottle	50mL 50mL	4°C H_2SO_4, pH<2	28 days
Phenols					
Aqueous	SM5530B E420.1	glass	250mL	4°C H_2SO_4, pH<2	28 days
Sulfates					
Aqueous	SM426 15th Ed. SM4500-SO4 E, E300.0	Polyethylene bottle	50mL	4°C	28 days
Sulfide Total					
Aqueous	SM4500-S-D	Polyethylene bottle	50mL	4°C NaOH, pH>12 ZnAc	28 days
Reactivity					
Solid	Chapter 7 SW846	Amber glass jar	10gram	4°C	28 days
Aqueous	Chapter 7	Polyethylene bottle	250mL	4°C	28 days
Total Organic Carbon (TOC)					
Solid	Lloyd Kahn Walkley-Black	Amber glass jar	10g	4°C	14 days

Table 7-3 (cont'd)

Recommended Containers, Preservation Techniques and Holding Times
For
Other Analyses

Analytes	Method	Containers	Required* Volume	Preservation	Holding Times
Total Organic Carbon					
Aqueous	SM5310B	40mL VOA vials	40mL	4°C H_3PO_4, pH<2	28 days
TKN					
Aqueous	SM4500Norg C	Polyethylene bottle or Amber glass bottle	50mL	4°C H_2SO_4, pH<2	28 days
Total Solids (TS)					
Aqueous	SM2540B	Polyethylene bottle	200mL	4°C	7 days
Total Dissolved Solids (TDS)					
Aqueous	SM2540C	Polyethylene bottle	200mL	4°C	7 days
Total Suspended Solids (TSS)					
Aqueous	SM2540D	Polyethylene bottle	200mL	4°C	7 days
Settleable Solids					
Aqueous	SM2540F	Polyethylene bottle	200mL	4°C	48 hours
Chromium (VI)					
Aqueous	SM3500 Cr+	Polyethylene bottle	25mL	4°C	24 hours
Alkalinity					
Aqueous	SM2320B	Polyethylene bottle	100mL	4°C	14 days
Ammonia					
Aqueous	SM4500NH3B	Polyethylene bottle	100mL	4°C H_2SO_4, pH<2	28 days
Oil & Grease					
Aqueous	1664	Amber glass bottle with Teflon lining	1L	4°C HCl, pH<2	28 days

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

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

EPA SW-846 Method 5035 provides several options for preservation of soil samples for volatile organics. Certain projects have not adopted these options to-date, and continue to recommend the collection of unpreserved soil sample aliquots for volatiles analysis. Spectrum Analytical Inc., RI Division's preference for low-level analysis is to collect approximately 5 grams of soil into 5mL of organic-free DI water and to preserve by freezing within 48hours of collection. A separate container with approximately 5 grams of

soil into 5mL of methanol is also collected for potential medium-level analysis. A separate container of unpreserved soil also must be collected to perform percent moisture analysis.

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

8.0 SAMPLE CUSTODY

8.1 Chain of Custody:

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

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

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

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

Laboratory chain-of-custody is initiated as samples are received and signed for by the Sample Custodian or his/her designated representative at Spectrum Analytical, Inc. RI Division. Documentation of sample location continues as samples are signed in and out of the designated storage facility for analysis in the several laboratory departments, using the Internal Chain of Custody (IntCOC) barcode system. After analysis, any remaining sample is held in the designated storage area to await disposal. Spectrum Analytical Inc., RI Division's policy is to hold spent samples for a period of at least thirty days from submittal of final report, unless other arrangements are agreed upon with the client. USEPA samples and empty containers are held for 60 days.

8.2 Laboratory Security:

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

The entire laboratory is designated as a secure area. The doors to the laboratory are under continuous surveillance, are kept locked after regular business hours

and may only be accessed by key or keypad entry. Only authorized personnel are allowed to enter the secure areas. The laboratory facility and IT office are only accessed through keypad entry. A Spectrum Analytical, Inc. RI Division staff member must accompany visitors to the laboratory.

8.3 Duties and Responsibilities of Sample Custodian:

Duties and responsibilities of the Sample Custodian include:

8.3.1 Receiving samples.

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

8.3.2.1 Custody seals, locks, “evidence tape”, etc.;

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

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

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

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

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

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

8.3.8 Scanning samples into the ICOC system.

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

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

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

8.3.12 Monitoring storage conditions for proper sample preservation and prevention of cross-contamination.

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

8.3.14 Calibrating the non-contact infrared temperature gun quarterly.

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

8.4 Sample Receipt:

The Sample Custodian or his/her designated representative receives sample shipments at Spectrum Analytical, Inc. RI Division. Unless the shipment is a continuation of a previous workorder, a new workorder file is started for the sample.

The cooler is inspected for the following (if applicable) and findings are documented on the Sample Login Form (Figure 8.4-1) for USEPA CLP samples, and on the Sample Condition Form (Figure 8.4-2) for all other samples:

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

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

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

The Sample Custodian will perform the following:

- Remove the sample containers and arrange them in the same order as documented in the chain of custody report.
- Inspect condition of the sample containers.
- Assign laboratory sample ID and cross-reference the laboratory ID to the client ID.
- Remove tags and place in the workorder file.
- Check preservative and document in the Sample Condition Form (Figure 8.4-2) if needed. If additional preservative is needed, it is added at this time.
- Check for air bubbles in aqueous samples and for proper preservation and immersion of soil samples designated for volatile organic analysis.
- Ensure peer review occurs for proper cross-referencing and labeling of sample containers.

Any discrepancies or problems are noted in the Sample Condition Notification Form (Figure 8.4-3).

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

Samples can be rejected at Spectrum Analytical, Inc. RI Division for any of the following reasons:

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

In all instances, the client is contacted initially before any action is taken at Spectrum Analytical, Inc. RI Division.

The Sample Custodian signs the Sample Receipt Form and originates a file folder for the set of samples. The following forms are included in the file: the Sample Receipt Form, chain of custody records, shipping information, and an orange

Sample Condition Notification Form if any problems or discrepancies need to be addressed.

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

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

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

8.5 Sample Log-in Identification:

8.5.1 Sample Identification:

To maintain sample identity, each sample received at Spectrum Analytical, Inc. RI Division is assigned unique sample identification (Sample ID) numbers. Samples are logged into the laboratory via the Laboratory Information Management System (LIMS).

After inspecting the samples, the Sample Custodian logs each sample into the LIMS, which assigns a lab Sample ID Number. These Numbers are assigned sequentially in chronological order. Spectrum Analytical Inc., RI Division Sample Identification Numbers appear in the following format: **YXXXX-NNF**

In which: Y – represents the current year with A for 2002, B for 2003, C for 2004, etc.
XXXX – represents a four-digit work order number that is assigned sequentially to each submittal of samples
NN – represents the sample number within the group or workorder.

F – represents the fraction. All sample portions that are received in identical bottles with identical preservatives are grouped into one fraction.

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

The Sample ID Number is recorded on the Sample Login Form (Figure 8.4-1) for USEPA CLP samples, and on the Sample Condition Form (Figure 8.4-2) for all other samples. Information on these forms cross-reference the Sample ID Numbers with SDG numbers, sample tag numbers and/or other client identifiers. Each sample is clearly labeled with its lab Sample ID Number by the Sample Custodian. The same sample ID Number appears on the LIMS status report, on each sample preparation container and extract vial associated with the sample.

8.5.1.1 Sample Extract Identification:

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

8.5.2 Sample Login:

The sample login system at Spectrum Analytical, Inc. RI Division consists of computerized entry using LIMS (Figure 8.5-1). The information recorded onto the Workorder Report includes:

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

8.5.3 Sample Information:

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

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

8.6 Sample Storage and Disposal:

Samples at Spectrum Analytical, Inc. RI Division are stored in a central storage facility or in satellite designated areas, (see SOP 30.0003 Sample Receipt Storage Tracking and Disposal). After sample receipt and login procedures are completed, the Sample Custodian places the samples in the centralized walk-in refrigerator. Volatile Organic sample aliquots are released to the volatile organic lab with documentation (Figure 8.6-1).

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

All sample/extract refrigerators are maintained at 4°C ± 2°C. Standards are kept in freezers maintained at -10 to -20°C. The temperature is recorded electronically using temperature probes that are affixed inside all refrigerator and freezer units (see SOP #80.0020 Temperature Monitoring Systems).

When analysis is complete, any remaining sample is retained in the designated storage facility until it may be removed for disposal (see SOP 30.0024 Sample Disposal). Broken and damaged samples are promptly disposed in a safe manner. Unless there is a specific request by the client, excess, unused sample aliquots are stored for at least 30 days after the submission of compliant data (USEPA is 60 days for samples and empty containers). The samples are then disposed after such

period. USEPA and NYS ASP extracts are stored under refrigeration for at least one year. Other extracts are stored under refrigeration for up to three months, unless there is a specific agreement with the client. After such time, the extracts are disposed. All disposals are performed in a manner compliant with federal and state regulations. International samples require special disposal procedures associated with the USDA Soil Permit (see SOP #30.0024 Sample Disposal).

8.6.1 Extract Transfer:

The extracts generated during the preparation for the organic analyses are transferred from the Organic Prep Lab to the Analysis Labs. The transfer of extracts for Semivolatiles, TPH, Pesticides and PCBs, are documented electronically in the Prep Batch Log with the storage location (refrigerator ID).

Metals analysis samples that are transferred from the prep area to the analysis room are also documented in the Prep Batch Log with the storage location (ICP or Hg lab).

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

8.6.2 Extract Storage:

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

Excess Pesticide extracts, not analyzed, are stored in screw cap vials with Teflon lined septa in the Organic Prep Lab. In most instances, they consist of the remaining 8-9 mL aqueous and soil sample extracts and are stored chronologically by workorder.

8.7 Sample Tracking:

When a sample is removed from storage, the analyst must scan each jar or bottle taken, using the IntCOC program and their user ID. When the sample(s) are returned to the central storage facility, the analyst must scan the samples back into the system using the IntCOC program and their user ID, and return the physical samples to their original storage location. In addition to the individual's initials, the date and time is recorded. This system maintains the location of the sample at any point in time.

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

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

2. The ICOC document acceptance of a sample by Spectrum Analytical Inc., RI Division; and

3. The ICOC documents which analyst has custody of the sample after removal from storage.

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

Figure 8.4-1
USEPA CLP Sample Login Form

SAMPLE LOG-IN SHEET
FORM DC-1

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

* Contact SMO and attach record of resolution

Reviewed By	Logbook No.
Date	Logbook Page No.

SAMPLE LOG-IN SHEET

Lab Name: Spectrum Analytical Inc., Rhode Island Division		Page __ of ___
Received By (Print Name)		Log-in Date
Received By (Signature)		
Case Number	Sample Delivery Group No.	Mod. Ref. No.

Remarks:	
1. Custody Seal(s)	Present/Absent* Intact/Broken
2. Custody Seal NOs.	_____ _____
3. Traffic Reports/Chain of Custody Records or Packing Lists	Present/Absent*
4. Airbill	Airbill/Sticker Present/Absent*
5. Airbill No.	_____ _____
6. Sample Tags Sample Tag Numbers	Present/Absent* Listed/Not Listed on Traffic Report/Chain of Custody Record
7. Sample Condition	Intact/Broken*/ Leaking
8. Cooler Temperature Indicator Bottle	Present/Absent*
9. Cooler Temperature	_____
10. Does information on Traffic Reports/Chain of Custody Records and sample tags agree?	Yes/No*
11. Date Received at Lab	_____
12. Time Received	_____

Sample Transfer	
Fraction	Fraction
Area#	Area#
By	By
On	On

	EPA Sample #	Aqueous/ Water Sample pH	Corresponding		Remarks: Condition of Sample Shipment, etc.
			Sample Tag #	Assigned Lab #	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

* Contact SMO and attach record of resolution

Reviewed By	Logbook No.
Date	Logbook Page No.

Figure 8.4-2
Sample Condition Form

SPECTRUM ANALYTICAL, INC. RI DIVISION

Sample Condition Form

Received By:	Reviewed By:	Date:	Spectrum RI Work Order #:
Client Project:		Client:	

		Lab Sample ID		Preservation (pH)					VOA Matrix	Soil Headspace or Air Bubble ≥ 1/4"
				HNO_3	H_2SO_4	HCl	NaOH	H_3PO_4		
1) Cooler Sealed	Yes / No									
2) Custody Seal(s)	Present / Absent									
	Coolers / Bottles									
	Intact / Broken									
3) Custody Seal Number(s)										
4) Chain-of-Custody	Present / Absent									
5) Cooler Temperature										
IR Temp Gun ID										
Coolant Condition										
6) Airbill(s)	Present / Absent									
Airbill Number(s)										
7) Samples Bottles	Intact / Broken / Leaking									
8) Date Received										
9) Time Received										

Preservative Name/Lot No.:

VOA Matrix Key:

US = Unpreserved Soil	A = Air
UA = Unpreserved Aqueous	H = HCl
M = MeOH	E = Encore
N = NaHSO4	F = Freeze

See Sample Condition Notification/Corrective Action Form yes / no

Form ID: QAF.0006

Rad OK yes / no

Figure 8.4-3
Sample Condition Notification Form

Spectrum Analytical, Inc. RI Division Sample Condition Notification

Project#:_____ **Date of Receipt:**_____
Client:_____ **Received By:**_____
Client project #/name:_____

Unusual Occurance Description:

Client Contacted:

Contacted via: Phone/Fax/E-mail
Date:_____ **Time:**_____
Contacted By:_____
Name of person contacted:_____

Client Response:

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

Action Taken: _____

Form ID: QAF.0005

Figure 8.4-4
Spectrum Analytical, Inc. RI Division Chain-of-custody Form

SPECTRUM ANALYTICAL, INC.
Featuring
HANIBAL TECHNOLOGY

Page _____ of _____

CHAIN OF CUSTODY RECORD

☐ 11 Almgren Drive
Agawam, MA 01001
(413) 789-9018

☐ 8405 Benjamin Road, Ste A
Tampa, FL 33634
(813) 888-9507

☐ 175 Metro Center Blvd
Warwick, RI 02886
(401) 732-3400

Special Handling:

TAT- Indicate Date Needed: _____
· All TATs subject to laboratory approval. Min. 24-hour notification needed for rushes.
· Samples disposed of after 60 days unless otherwise instructed.

Report To: _____
_____
_____
_____
Telephone #: _____
Project Mgr. _____

Invoice To: _____
_____
_____
_____
P.O. No.: _____ RQN: _____

Project No.: _____
Site Name: _____
Location: _____ State: _____
Sampler(s): _____

1=Na_2S2O_3 2=HCl 3=H_2SO_4 4=HNO_3 5=NaOH 6=Ascorbic Acid 7=CH_3OH
8= $NaHSO_4$ 9= Deionized Water 10=H_3PO_4 11= _____ 12= _____

List preservative code below:

QA/QC Reporting Notes:

DW=Drinking Water GW=Groundwater WW=Wastewater
O=Oil SW= Surface Water SO=Soil SL=Sludge A=Air
X1= _____ X2= _____ X3= _____

G=Grab C=Composite

Lab Id:	Sample Id:	Date:	Time:	Type	Matrix	Containers: # of VOA Vials	# of Amber Glass	# of Clear Glass	# of Plastic	Analyses:								QA/QC Reporting Level

☐ Level I ☐ Level II
☐ Level III ☐ Level IV
☐ Other _____

State-specific reporting standards:
_____

Relinquished by:	Received by:	Date:	Time:	Temp°C

☐ EDD Format _____
☐ E-mail to _____

Condition upon receipt:
☐ Ambient ☐ Iced ☐ Refrigerated ☐ DI VOA Frozen ☐ Soil Jar Frozen

Figure 8.5-1
Workorder Information Form

Spectrum Analytical, Inc. Featuring Hanibal Technology -- Rhode Island Division

WorkOrder: L1458

Client ID: MITKEM_WARWICK
Project: INTERNAL TESTING
WO Name: INTERNAL TESTING
Location: WATER_TESTING, WW, 6/2012
Comments: Internal test

Case:
SDG:
PO: INTERNAL TESTING

HC Due: 07/12/12
Fax Due:
Fax Report: ☐

Report Level: LEVEL 2
Special Program:
EDD:

Lab Samp ID	Client Sample ID	Collection Date	Date Recv'd	Matrix	Test Code	Samp / Lab Test Comments	HF	HT	MS	SEL	Storage
L1458-01A	WW-6/28-G	06/28/2012 08:05	06/28/2012	Aqueous	E624	/				Y	VOA
L1458-01B	WW-6/28-G	06/28/2012 08:05	06/28/2012	Aqueous	E625	/ Needs benzidine, 1,2-diphenyhydr, n-nitrosodimethl				Y	Disposed
L1458-01C	WW-6/28-G	06/28/2012 08:05	06/28/2012	Aqueous	E335.4	/					Disposed
L1458-02A	WW-6/28-C	06/28/2012 15:00	06/28/2012	Aqueous	E200.7	/ Cd, Cr, Cu, Pb, Ni, Ag, Zn				Y	Disposed
L1458-02B	WW-6/28-C	06/28/2012 15:00	06/28/2012	Aqueous	SM5220	/					Disposed

HF = Fraction logged in but all tests have been placed on hold

HT = Test logged in but has been placed on hold

Figure 8.6-1
Volatiles Receiving Logbook Form

Spectrum Analytical, Inc. RI Division : VOLATILE SAMPLES RECEIVING LOGBOOK

VOA Log-In Date	Workorder	Client ID	Sample Numbers	Relinquished by:	Received by:	Pres. Used	F/R	Returned to R1

Logbook ID 90.0191-04/12

Reviewed By:

"Preservative Used" Key

UA = Unpreserved Aqueous **H** = HCL **A** = Air **M** = MeOH **E** = Encore

US = Unpreserved Soil **N** = $NaHSO_4$ **F** = Freeze **T** = Trace, HCL

9.0 CALIBRATION PROCEDURES AND FREQUENCIES

All purchased equipment, materials, and services must meet specific method requirements, standard requirements, or project specific requirements. These requirements are documented in the individual analytical or project SOPs.

9.1 Instruments:

Specific calibration and check procedures are given in the analytical methods referenced in Section 10. The frequencies of calibration and the concentrations of calibration standards are determined by the cited methods and any special project or contract-specific requirements. Standard calibration curves of signal response versus concentration are generated on each analytical instrument used for a project, prior to analysis of samples. A calibration curve of the appropriate linear range is established for each parameter that is included in the analytical procedure employed and is verified on a regular basis with check standards as specified in the appropriate CLP Protocols. For non-CLP work, Spectrum Analytical, Inc. RI Division adheres to the calibration criteria specified by SW-846 and/or Standard Methods for both organic and inorganic analyses. Where requested, other method specific calibration criteria are used. Refer to the individual Standard Operating Procedures listed in Figure 11.7-1 of this QAP for the specific calibration and check procedures as well as concentration and frequency requirements.

For organic analyses whenever possible, unless otherwise specified in the individual methods, the initial calibration standards (ICAL), continuing calibration verification standards (CCV), laboratory control sample spike (LCS) and matrix spike (MS) will all be from the same source. The initial calibration verification (ICV) standards are prepared from a separate source. Refer to the Standard Operating Procedures listed in Figure 11.7-1 of this QAP for the specific calibration source and procedural requirements of each method. The following are examples of calibration procedures for various instrumental systems:

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

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

Continuing calibration verification (CCV), near a mid-level concentration for all analytes, is run at intervals determined by sample number or time allowed, as required by the individual methods. If CCV values are determined outside the upper limit of the method specified range and if no analytes were detected in the samples, the run will be accepted as valid and 'Non Detects' reported for the sample. If an analyte is detected and the CCV is out at the high end, the problem will be identified and corrected and the affected samples will be re-analyzed with a compliant CCV.

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

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

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

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

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

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

Tunes are performed once every twelve (12) hours of instrument run time for all CLP-type and SW846 analyses. The GC/MS system is tuned to USEPA specifications for bromofluorobenzene (BFB) or decafluorotriphenylphosphine (DFTPP) for volatile and semivolatile analyses, respectively. Extended tune time is allowed in CLP SOM protocols where an ending CCV is acceptable as an opening CCV.

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

ICP/AES and ICP/MS – Instrument calibration, for each wavelength used, occurs at the start of each analysis. The calibration curve is constructed per method specification.

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

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

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

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

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

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

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

Other instrumentation:

IC- The Ion Chromatograph is calibrated each day of use. Calibration verification is analyzed at the beginning, end, and at least every 10 samples. The verification standard is from an independent source. If the calibration verification does not

meet method specific criteria for an analyte, it is re-analyzed once. If failure still occurs, a new calibration curve is established and any affected samples are reanalyzed.

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

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

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

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

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

SpecGenesys- manual spectrophotometer is calibrated per method specification.

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

Annual calibration and preventative maintenance is required by an outside vendor unless calibration can be performed in-house using a calibration kit.

Balances: are calibrated by an outside source on an annual basis.

The balances are calibrated externally each day of use by a lab technician with NIST traceable Class “1” or “2” weights. The weights are certified by an outside service on a regular basis, not to exceed five years.

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

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

9.2 Standards and Reagents:

Standard reference materials used for routine calibration, calibration checks, and accuracy are obtained from commercial manufacturers. These reference materials are traceable to the source and readily compared to EPA references. All standards come with a Certificate of Analysis which is kept on record in the appropriate laboratories. When a chemical standard can not be purchased in solution form, a neat source may be bought. The lab must attempt to obtain the highest purity available. If the lab can not find a neat source with at least 97% purity, the laboratory must document why. In addition, the impurity correction factor must be used when calculating the standard concentration. See SOP #80.0001, Standard Preparation, Equivalency and Traceability, for more details. While most standards are traceable to NIST; however, certain projects, especially those involving pesticide registration, may necessitate the use of reference standards supplied by the client. New standards are also routinely validated against known standards that are traceable to EPA or NIST reference materials.

Organic Preparatory Lab Surrogate and Matrix spikes are prepared in the appropriate instrument labs and then QA'd by diluting the standard and analyzing it on the GC or GC/MS. Criteria for the diluted spike analysis must meet the method or in-house criteria. If acceptable, the spike is able to be used. If unacceptable, another standard is prepared and the same steps repeated. Data from the QC analysis is retained in the laboratory for reference and traceability.

Primary, intermediate and working standards are all named using specific nomenclature as designated in the QA Department SOP# 80.0001, Standard Preparation, Equivalency and Traceability.

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

See individual analytical SOPs (listed in Figure 11.7-1), sections 7 and 8 for standards preparation procedures.

Solvents are tested for purity prior to use to ensure there is no external source of contamination. For organic solvents, each lot number of solvent is QC'd prior to use. This is accomplished by concentrating an aliquot of solvent or extracting with reagent media (such as sodium sulfate) in the same manner as the samples and analyzing it for contamination by GC/MS. Any detectable analyte could render the solvent or reagent unsuitable for use. Supervisors make the final decision as to the suitability of the solvent or reagent, and whether the lot may be used for standard or sample preparation.

Chemicals and Reagents are stored in the respective laboratories during use. Backup supplies are stored in the stockroom. Reagent grade chemicals are used in all tests. All dry chemicals and reagents are given a 5-year expiration period unless designated otherwise by the manufacturer. Sometimes the viability of the reagent does not remain throughout the entire 5-year period (as determined through investigation following poor results in a preparation method blank or bench analysis, for example). In this case, the chemical or reagent is readily discarded. Acids/caustics are given a 3-year expiration period unless designated otherwise by the manufacturer. Solvents are given a 1-year expiration period unless designated otherwise by the manufacturer.

Chemicals and reagents are logged into the laboratory and each bottle is given a unique ID. The ID is based upon the date of its arrival at the laboratory. The only exceptions include cases/cycletainers of solvents and cases of acids. For solvents and acids, the boxes/cases are labeled with received date to insure first in/first out usage. All other chemicals and reagents are named using specific nomenclature as designated in the QA Department SOP # 80.0013, Reagent Purchasing and Tracking.

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

10.0 ANALYTICAL PROCEDURES

Spectrum Analytical, Inc. RI Division uses the methods specified in Tables 10-1 through 10-6 unless otherwise specified by the client. Spectrum Analytical, Inc. RI Division performs analyses on non-potable waters, groundwater and soil/solids. The RI Division does not perform regulatory potable (drinking) water analyses with the exception of trace metals by EPA 200.8, or environmental lead (paint chips, wipes, etc. for RIDOH compliance) testing. Associated Standard Operating Procedures related to these analytical procedures can be found in Figure 11.7-1 of this QAP.

Table 10-1
Potable Water Analytical Methods

Parameter	Method Description	Method Reference
Metals	ICP-MS	200.8

Table 10-2
Non-potable Water Analytical Methods

Parameter	Method Description	Method Reference
Metals	ICP-AES	200.7
Mercury	Cold Vapor	245.1
Cyanide	Midi-distillation Automated	EPA 335.4
Alkalinity	Titration	SM2320B
Anions Chloride Sulfate Nitrate Nitrite Orthophosphate Bromide Fluoride	Ion Chromatography	EPA 300.0
Volatile Fatty Acids Acetic Butyric Lactic Propionic Pyruvic	Ion Chromatography	EPA 300.0 Mod
pH	Electrode	SM4500 H+ B
Sulfate	Turbidimetric	SM4500-SO4 E.
Ammonia	Distillation/Titration	SM4500-NH3 B, C
Total Kjeldahl Nitrogen	Digestion Distillation/Titration	SM4500- Norg C SM4500- NH3 B, C
Orthophosphate	Ascorbic, Manual	SM4500-P E
Total phosphate	Persulfate, Manual	SM4500-P B5 & E

Table 10-2
Non-potable WaterAnalytical Methods (cont.)

Parameter	Method description	Method Reference
Chemical Oxygen Demand	Spectrophotometric(Closed Reflux)	SM5220-D
Total Organic Carbon	Combustion	SM5310 B
Phenols	Distillation, 4-AAP, Direct Photometric	SM5530 B E420.1
Total Dissolved Solids	Gravimetric	SM2540 C
Total Solids	Gravimetric	SM2540 B
Total Suspended Solids	Gravimetric	SM2540 D
Total Settleable Solids	Imhoff cones	SM2540 F
Hexavalent Chromium	Diphenyl Carbazide Colorimetric	SM 3500Cr B
Volatile Organics		
Halocarbons	Purge & Trap, GC/MS	624
Aromatics	Purge & Trap, GC/MS	624
Semivolatile Organics	Extraction, GC/MS	625
Organochlorine Pesticides/ PCBs	Extraction, GC/ECD	608
Oil & Grease (HEM, SGT)	Extraction, Gravimetric	1664A

Table 10-3
SW-846 Inorganic Analytical Methods

Parameter	Method Description	Method Reference
Metals		
Aqueous	Acid digestion	Method 3005A/3010A
	ICP/AES	Method 6010C
	ICP/MS	Method 6020A
Solid	Acid digestion	Method 3050B
	ICP/AES	Method 6010C
	ICP/MS	Method 6020A
Mercury		
Aqueous	Permanganate digestion Cold Vapor analysis	Method 7470A
Solid	Permanganate digestion Cold Vapor analysis	Method 7471B
Hexavalent Chromium		
Aqueous	Colorimetric	Method 7196A
Solid	Acid Digestion Colorimetric	Method 3060A/7196A
Cyanide		
Aqueous	Midi-distillation Automated	Method 9012B
Solid	Midi-distillation Automated	Method 9012B
pH		
Solid	Electrode	Method 9045D
Ignitability (Flashpoint)		
Aqueous	Pensky-Martens closed cup	Method 1010A
Solid	Pensky-Martens closed cup	Method 1010A Mod.
Reactive Cyanide		
Solid & Aqueous	Distillation Automated	SW 846 7.3.3.2

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

Parameter	Method Description	Method Reference
Reactive Sulfide Solid & Aqueous	Distillation Colorimetric	SW 846 7.3.4.2
Anions Chloride Sulfate Nitrate Nitrite Orthophosphate Bromide Fluoride	Ion Chromatography	SW 846 9056A
Total Organic Carbon	Combustion	SW 846 9060A
Toxicity Characteristic Leaching Procedure (TCLP)		
Aqueous	Leachate by Filtration	Method 1311
Solid	Leachate Generation	Method 1311
Synthetic Precipitation Leaching Procedure (SPLP)		
Aqueous	Leachate by Filtration	Method 1312
Solid	Leachate Generation	Method 1312

Table 10-4
SW-846 Organic Analytical Methods

Parameter	Sample Preparation	Sample Analysis
Volatile Organic Compounds		
Aqueous	Method 5030B	Method 8260C
Solid	Method 5035A	Method 8260C
1,2-Dibromo-3-chloropropane 1,2-Dibromomethane	Micro extraction GC\ECD Analysis	Method 8011
Semivolatile Organic Compounds		
Aqueous	Method 3510C Method 3520C	Method 8270D
Solid	Method 3540C Method 3550B Method 3545 Method 3570	Method 8270D
Organochlorine Pesticides		
Aqueous	Method 3510C Method 3520C	Method 8081B
Solid	Method 3540C Method 3550B Method 3545 Method 3570	Method 8081B
Polychlorinated Biphenyls (Aroclors and Congeners)		
Aqueous	Method 3510C Method 3520C	Method 8082A
Solid	Method 3540C Method 3550B Method 3545 Method 3570	Method 8082A
Total Petroleum Hydrocarbons		
Aqueous	Method 3510C Method 3520C	Method 8015B,D
Solid	Method 3540C Method 3550B	Method 8015B,D

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

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

Table 10-5
CLP-Type Analytical Methods

Parameter	Method Reference
USEPA CLP Organics	OLM04.3, SOM01.2
USEPA CLP Inorganics	ILM05.4, ISM01.3
USEPA Low Level Organics	OLC03.2
NYS-ASP CLP Organics	ASP 2000/2005 SOW
NYS-ASP CLP Organics	ASP 2000/2005 SOW

Table 10-6
Other Analytical Methods

Parameter	Method Reference
Volatile Petroleum Hydrocarbons	
Aqueous	MADEP VPH 1.1
Solid	MADEP VPH 1.1
Extractable Petroleum Hydrocarbons	
Aqueous	MADEP EPH 1.1
Solid	MADEP EPH 1.1
Extractable Total Petroleum Hydrocarbons	
Aqueous	CT ETPH 99-3
Solid	CT ETPH 99-3
Diesel Range Organics	
Aqueous	ME 4.1.25
Solid	ME 4.1.25
Gasoline Range Organics	
Aqueous	ME 4.2.17
Solid	ME 4.2.17

10.1 Analytical References

1. Analysis of Extractable Total Petroleum Hydrocarbons (ETPH) Using Methylene Chloride Gas Chromatograph/Flame Ionization Detection, Environmental Research Institute, University of Connecticut, March, 1999

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

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

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

5. Federal Register. Vol. 72, No. 47, March 12, 2007.

6. Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600/R-93/100).

7. Methods for the Determination of Metals in Environmental Samples, Supplement 1 (EPA/600/R-94/111).

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

11. Standard Methods for the Examination of Water and Wastewater, 18th Edition, APHA, Washington, D. C., 1992.

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

13. Test Methods for Evaluating Solid Waste-Physical/Chemical Methods, SW-846, 3rd Edition Final Updates I through IV. Office of Solid Waste and Emergency Response, USEPA, Washington, D. C., 1998. Status table found at http://www.epa.gov/epawaste/hazard/testmethods/sw846/pdfs/methstat.pdf

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

15. USEPA Contract Laboratory Program. Statement of Work for Inorganic Analysis, USEPA ILM05.4, and ISM01.2.

16. Maine Health and Environmental Testing Laboratory. Modified GRO and DRO Methods, Method 4.2.17 and 4.1.25, September 6th 1995.

17. EPA Methods and Guidance for Analysis of Water, Version 2.0. includes MCAWW Methods and most current EPA Methods @ http://www.epa.gov/ost/methods/

11.0 DATA COLLECTION, REDUCTION, VALIDATION AND REPORTING

11.1 Data Collection:

Most of the lab's data is uploaded into the LIMS systems directly from the instruments. The exception is the GC's and GC/MS's in which data is first processed in Target and then uploaded into the LIMS.

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

Next, an employee with a technical background will perform the QA process of the uploaded data. This person is either a supervisor or someone with extensive experience in environmental chemistry. Corrections to the run are made at this step if necessary. When the review is complete, this technical person authorizes the data to be reported by "QA-ing" the run in the LIMS. For a more detailed view of the LIMS uploading/review procedure, see SOP # 110.0028, Data Validation/Self Inspection Procedures.

11.2 Data Reduction:

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

Equations are generally given within the analytical methods referenced in Section 10. Data reduction may be performed automatically by computerized data systems on the instrument, manually by the analyst, or by PCs using verified spreadsheets and/or data base software.

11.3 Data Verification:

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

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

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

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

- All manual integrations are properly performed and documented.

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

11.4 Data Validation:

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

The following analytical criteria are employed by Spectrum Analytical, Inc. RI Division in the technical evaluation of data:

- Accuracy requirements.
- Precision requirements.
- Detection limits requirements.
- Documentation requirements.

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

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

11.5 Data Interpretation and Reporting:

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

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

11.5.1 Report Formats:

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

Drinking water Metals samples have special reporting requirements and client notification criteria for results exceeding the MCL. Clients are notified via facsimile or e-mail of all samples that exceed any EPA maximum contaminant level (MCL), maximum residual disinfectant level or reportable concentration within 24 hours of obtaining valid data. Drinking water Metals analyses are reported using a custom reporting format that will list the associated MCL and certification status for each element. Additionally, the requirement for the 24 hour MCL exceedence report will be highlighted in the comment section of the Subcontract Work Order for any subcontracted potable water samples.

Commercial data reports are generated using the LIMS. All instrumental analysis data are uploaded from instruments to the LIMS by electronic data transfer. Non-instrumental analysis data or sample preparation data are manually entered into the LIMS. All manual data entry steps are double-checked to insure they are correct, and instrumental data are spot-checked to insure the proper functioning of the data upload system. All data receive a 100% review before they are released to the client as final.

CLP data reports are generated using specialized CLP report modules in the LIMS for all inorganic and most organic analyses. These reports also undergo a 100% review before they are released to the client in their final form.

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

11.6 Levels of Data Review:

Spectrum Analytical, Inc. RI Division employs five (5) levels of data review. These are based on requirements outlined in several government and other environmental analysis programs including the U. S. Army Corps of Engineers, Air Force Center for Environmental Excellence (AFCEE), Naval Facilities Engineering Service Center (NFESC), HAZWRAP, Department of Defense

ELAP (QSM), EPA Contract Laboratory Program (SOM/ISM), as well as commercial engineering firm programs.

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

The five levels of data review are detailed in SOP # 110.0028 Data Validation/Self Inspection Procedures. A Flow chart of the data review process follows in Figure 11.6-1.

11.7 Document Control:

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

Inorganic data files are uploaded into LIMS and reporting forms are printed electronically. The original instrument data files and the processed SDG are

stored on the file server where they can later be archived by the LIMS Administrator. PDF printouts for reporting forms, instrument data output and all associated preparation logbook page copies are assembled for technical data review through a custom reporting system, Package Maker.

Spectrum RI is primarily utilizing a paperless reporting system with the exception of our EPA CLP reports which require a hard copy report.

See SOP # 110.0029, Electronic Data Management for a detailed description of data management activities used to support laboratory activities.

Following technical review and generation of the report narrative, results go into the workorder file in data reporting. The original copy or electronic pdf version (dependent on client requirements) of the report is sent to the client. Spectrum offers our clients secure access to their pdf reports and EDDs via our website eServices portal. All other information associated with the report, including data review checklists are kept in the red workorder file. The non-reported data (NRD) is scanned into the optical file database for long-term archiving. As documents are scanned into the database they are recorded for permanent storage on hard drives within the fileserver. The archived electronic data is kept for a minimum of ten (10) years or according to contract/program requirements. Prior to the use of the optical file database, hardcopy reports and NRD were shipped to an offsite storage area where they will remain for a minimum of ten (10) years. After this time, these older files will be destroyed.

11.7.1 Logbooks:

All logbooks are issued and controlled by the QA Department. Logbooks are given a unique ID that includes the mm/yy the logbook was printed. Laboratory personnel must sign for the logbook when it has been released by the QA Department. When logbooks are complete, the analyst returns them to the QA Department for archiving unless still needed for reference in the lab. A new logbook is released. The archived logbooks are stored in an on-site storage box for approximately 4-6 months and then are stored in an off-site storage facility or may remain on-site depending on storage space. Refer to SOP # 80.0040, Logbook Use, Review, and Control for more detail. In addition, refer to SOP # 110.0027, Documentation Policy and Procedures for details on Spectrum Analytical, Inc. RI Division's Logbook policies. Logbooks are archived for a minimum of ten (10) years or according to contract/program requirements.

11.7.2 Workorder/Data Files:

Spectrum Analytical, Inc. RI Division is a secured, limited access building. The doors are secured with a keypad entry system. All hard copy information pertaining to the analysis of samples is maintained and stored in a workorder file folder. This information includes all login

sheets, COC, SCF, bench sheets and printed analytical data. Electronic data are also stored by laboratory workorder number on the company file server, and in the optical file database of completed reports and NRD as mentioned in section 11.7. File folders containing any remaining workorder information are stored in an off-site storage facility or may remain on-site for a total of 10 years.

The off-site storage facility referred to in the above sections is a locked storage area. Access is limited to the Laboratory Director or his designee and request to retrieve a file will be made to this person.

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

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

11.7.3 Standard Operating Procedures (SOPs):

SOPs are prepared by the Lab Supervisor and laboratory personnel in conjunction with the QA Director. The QA Director/Staff downloads a copy of the current SOP to the network at Public on 'Bernoulli'. The SOPs can be found in Q:\QA_SOPs. In addition a .pdf file of the SOP is located in Q:\QA_PUBLIC\PDF-MITKEM SOPs. A list of the current SOPs in use at Spectrum Analytical, Inc. RI Division is given in Figure 11.7-1.

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

The QA Department is notified that revisions are completed. The QA Director/Staff moves the revised copy of the SOP to the QA directory, QA Safety/SOPs Needing QA Revision. The QA Director makes changes to the document to include revision number and date and title clarification, if necessary. Changes from the last revision are clearly marked using 'Track Changes' in Microsoft Word.

The QA Director prints a searchable pdf copy of the SOP. At this time, hard copies of several pages are printed for original signatures of the Laboratory or Technical Director, and the QA Director. The effective date is then added to the SOP and the signed pages are scanned and inserted into the pdf document. If an older version of the SOP exists, it is moved to its archive location. The new version will be moved into the Spectrum Analytical, Inc. RI Division Intranet SOP Database as the only version accessible by laboratory personnel. Each analyst who performs any duties related to the SOP must review the new version and enter electronically that he or she has read and understands the material there.

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

Minor changes to the SOP between revision dates can be done as needed. Minor changes are recorded in the Revision Record that is a part of the master copy. Edits are clearly marked. This allows readers quick access to the changes.

11.7.4 Quality Assurance Manual:

The lab will review the QA Manual annually at a minimum. Past versions of the QA Manual are maintained and archived by the QA Director in the same manner as SOPs. Edits to the QA Manual are made by the QA Director in conjunction with the laboratory management. Spectrum Analytical, Inc. RI Division will amend the QAP and any affected SOPs within 14 days when technical changes (or any of the circumstances outlined in the USEPA SOW for SOM or ISM, Exhibit E, section 5.3.2) occur. The revised QAP with visible markups will be sent to the USEPA as per section 5.3.2.1.

11.7.5 Method Updates:

In most cases it is the laboratory's policy to implement new revisions of frequently used methods within six months of the date the method revision is promulgated or published as a final method (non-CLP methods, for CLP methods see below). The QA Director, Deputy Director for Quality Services, Technical Director and Laboratory Director make the final decision on when a method revision will be adopted by the laboratory. Additionally, if a client specifically requests or mandates that an "older" method, Spectrum Analytical, Inc. RI Division will advise the client that it is not the most recent method. If the client still insists upon the older method, the lab will comply and make a note in the narrative.

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

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

Revisions to USEPA CLP methods are required to be implemented within 14 days of notification when the EPA modifies the technical requirements of the statement of work, or the contract. At this same time, the QAP will be amended as necessary as noted in section 11.7.4.

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

Figure 11.6-1
Data Review Flow Diagram

Spectrum Analytical, Inc. RI Division
Review Process Flow Diagram

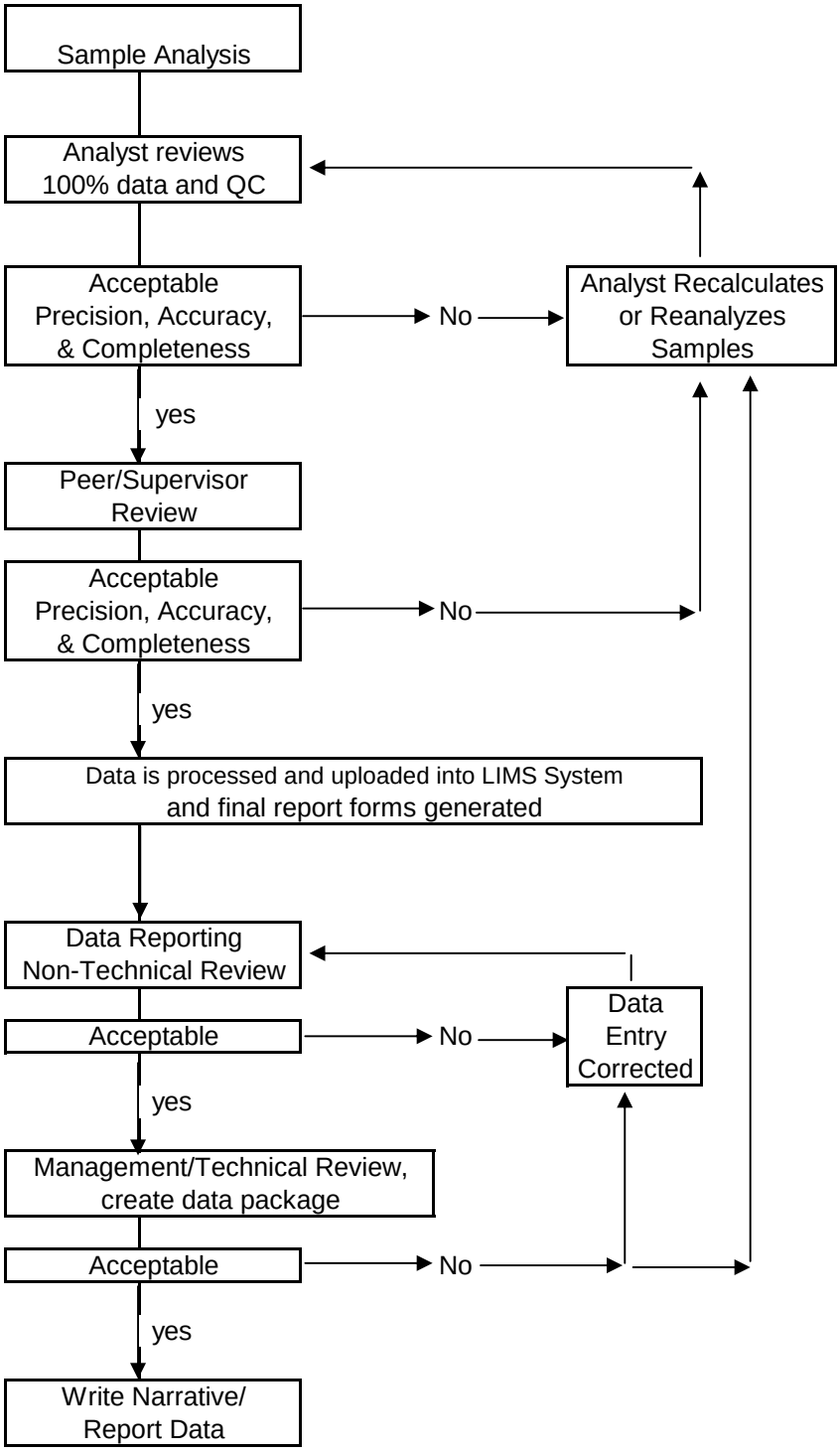

Figure 11.7-1
Standard Operating Procedures (SOPs)

Spectrum Analytical, Inc. Rhode Island Division

Standard Operating Procedures (SOPs)

Master List

SOP #	Title
10.0016	Assembly of Inorganic CLP and CLP-type Reports
10.0017	Assembly of Organic CLP and CLP-type Reports
10.0018	Assembly of Commercial Data Reports
10.0021	Data Report Options
10.0036	EPA/SOM Organic Data PDF Bookmarking
10.0037	EPA/ISM Inorganic Data PDF Bookmarking
20.0003	Logging Workorders into Omega
20.0005	Level 2 LIMS report preparation
30.0002	Bottle order preparation
30.0003	Sample Receipt, Storage, Tracking and Disposal
30.0024	Sample and Waste Disposal
30.0030	ICOC Procedures using IntCOC program
50.0004	Glassware Cleaning - Organics
50.0027	Organic Preparation of Aqueous/Soil Samples for Chlorinated Herbicides by SW-846 Method 8151A
50.0030	SOM01.2 Sulfur Cleanup
50.0031	SW-846 Method 3665A Acid Cleanup
50.0032	Gel Permeation Chromatography by SW-846 Method 3640A
50.0033	SW-846 Method 3620B Florisil Cleanup
50.0034	SW-846 Method 3630C Silica Gel Cleanup
50.0035	Oil&Grease (HEM&SGT) by Method 1664 Revision A
50.0036	SW-846 Method 3660B Sulfur Cleanup

Spectrum Analytical, Inc. Rhode Island Division

Standard Operating Procedures (SOPs)

Master List

SOP #	Title
50.0050	Organic Preparation of Aqueous Samples by Continuous Liquid-Liquid (Method 3520)
50.0051	Organic Preparation of Aqueous Samples by Separatory Funnel (Method 3510)
50.0052	Organic Preparation of Soil Samples by Sonication (Method 3550)
50.0053	Organic Preparation of Soil Samples by Soxhlet (Method 3540)
50.0054	Organic Extract Filtration and Concentration Techniques
50.0060	Organic Preparation of Aqueous Samples by Continuous Liquid-Liquid for Pesticides/Aroclors for SOM01.2
50.0061	Organic Preparation of Aqueous Samples by Separatory Funnel for Pesticides/Aroclors for SOM01.2
50.0062	Organic Preparation of Solid Samples by Sonication for Pesticides/Aroclors for SOM01.2 by Method 3550B
50.0063	Organic Preparation of Aqueous Samples by Continuous Liquid-Liquid for Semivolatiles for SOM01.2
50.0064	Organic Preparation of Solid Samples by Sonication for Semivolatiles for SOM01.2
50.0100	Preparation of Soil Samples by MSE by Method 3570
50.0101	Preparation of Soil Samples by PFE by Method 3545
50.0102	Percent Lipid Determination in Tissue Samples
60.0002	Pesticide/PCB Analysis by EPA Method 608
60.0003	Determination of Polychlorinated Biphenyls by Gas Chromatography/Electron Capture Detector Analysis by SW846 Method 8082A
60.0006	Determination of Pesticides by Gas Chromatography/Electron Capture Detector Analysis by SW846 Method 8081B
60.0007	EDB/DBCP by EPA Method 504.1 and SW-846 8011

Spectrum Analytical, Inc. Rhode Island Division

Standard Operating Procedures (SOPs)

Master List

SOP #	Title
60.0034	Determination of Chlorinated Herbicides by Gas Chromatography/Electron Capture Detector Analysis by
60.0048	Aroclor Analysis GC/ECD by USEPA SOW SOM01.2
60.0049	Pesticide Analysis GC/ECD by USEPA SOW SOM01.2
60.0050	Total Petroleum Hydrocarbons by GC-FID using EPA SW-846 Methods 8015/State Methods
60.0053	PCB Congeners by SW-846 Method 8082 (MOD)
60.0054	PCB Homologs by E680 GC/MS SIMS (MOD)
70.0011	Determination of Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) Analysis by SW846 Method 8270D
70.0030	Screeening for Semivolatile Organic Analysis by Gas Chromatography/Mass Spectrometry for SOM01.2
70.0033	SIM Analysis by GC/MS (Modified EPA Method 8270D)
70.0035	Semivolatile Organic Analysis by SIM Gas Chromatography/Mass Spectrometry for SOM01.2
70.0048	Semivolatile Organic Analysis by Gas Chromatography/Mass Spectrometry for SOM01.2
70.0051	Semivolatile Organics by GC/MS for Aqueous Samples by EPA Method 625
80.0001	Standard Equivalency/Traceability
80.0002	Client Complaint Policies
80.0004	QA Data Pkg Review
80.0005	Method Detection Limit Determination
80.0006	Internal Audit Procedures
80.0007	Corrective Action Procedures

Spectrum Analytical, Inc. Rhode Island Division

Standard Operating Procedures (SOPs)

Master List

SOP #	Title
80.0009	Newly Implemented Methods (Demonstration of Acceptable Performance)
80.0010	Control Chart Generation and Use
80.0012	The Production of Standard Operating Procedure
80.0013	Reagent Purchasing & tracking
80.0016	Training Procedures and Tracking
80.0020	Temperature Monitoring Systems
80.0030	Labware Volume Verification
80.0040	Logbook Use, Review, and Control
80.0050	Performance Testing Procedures
90.0012	Determination of Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) Analysis by SW846 Method 8260C
90.0035	Low/Med Volatile OrganicsAnalysis GC/MS by USEPA SOM01.2
90.0036	Trace Volatile OrganicsAnalysis GC/MS for USEPA SOM01.2
90.0038	Gasoline Range Organics by GC/FID using Methods SW-846 8015 and Maine 4.2.17
90.0040	Trace Volatile OrganicsAnalysis GC/MS using SIM for USEPA SOM01.2
90.0052	Volatile Organics by GC/MS for Aqueous Samples by EPA Method 624
90.0060	Methane, Ethane, and Ethene by GC/FID Method RSKSOP-175
100.0001	Glassware Cleaning - Inorganics
100.0002	Alkalinity (by Standard Method 2320)
100.0003	Sample Preparation of Aqueous Samples by Acid Digestion ICP (3005/3010)
100.0004	Total Cyanide by Automated Colorimetric with Midi-distillation by SW846 9012B

Spectrum Analytical, Inc. Rhode Island Division

Standard Operating Procedures (SOPs)

Master List

SOP #	Title
100.0005	Determination of Metals and Trace Elements in Water and Waste by ICP - Atomic Emission Spectrometry by EPA Method 200.7
100.0006	ICAP 3000XL/4300DV Operation
100.0007	Aqueous sample Prep E200.8
100.0010	Nitrite Analysis by Standard Method 4500-NO2 B
100.0011	pH Value by Standard Methods 4500-H+ B
100.0012	Mercury Analysis in Aqueous Samples by Flow Injection Analysis System for Atomic Analysis by Method 7470A/7471B
100.0013	Total and Ortho Phosphate using Ascorbic Acid Method by Standard Method 4500-P E
100.0014	Mercury (Manual Cold Vapor Technique) by EPA Method 245.1
100.0015	The Preparation of Waste Samples for reactive Cyanide and Sulfide; Determination of Reactive Cyanide by Automated Colorimetric Method and Reactive Sulfide by Spectrophotometric Method SW-846 Methods 7.3.3.2 and 7.3.4.2
100.0016	Preparation of Soil Samples for Sulfide Analysis by Modified SW-846 Method 9031
100.0017	Inorganic Analysis of Sulfates in Aqueous Samples by SM 426 C 15th Ed and SM4500 SO4 E-.
100.0018	Inorganic Analysis of Sulfides in Aqueous Samples (Methylene blue method)
100.0019	Total Dissolved Solids Dried at 180°C by Standard Method 2540 C
100.0020	Total Solids Dried at 103-105°C by Standard Method 2540 B
100.0021	Total Suspended Solids Dried at 103-105°C by Standard Method 2540 D
100.0022	TKN Distillation and Determination by Manual Spectrophotometric Analysis by Standard Method 4500-N
100.0023	Color Analysis by Visual Comparison by Modified Standard Methods 2120B
100.0024	Flashpoint Analysis by SW846 Method 1010A
100.0025	Total Organic Carbon by Methods SW-846 9060A and SM5310B

Spectrum Analytical, Inc. Rhode Island Division

Standard Operating Procedures (SOPs)

Master List

SOP #	Title
100.0026	Settleable Solids by Standard Method 2540 F
100.0027	Paint Filter Liquids Test by SW-846 Method 9095A
100.0028	Carbon Dioxide (CO2) and Forms of Alkalinity by Calculation by Standard Method 4500-CO2 D
100.0029	Ferrous Iron Analysis by Standard Method 3500-Fe B, Phenanthroline Method
100.0030	Phenols Analysis by EPA Method 420.1 and Standard Method 5530 B & D, Cleanup and Direct Photometric Method
100.0032	Total Volatile Solids for Solids by SM 2540 E, E160.4; Fixed and Volatile Solids Ignited at 550 C
100.0033	Total Cyanide by Auto-Colorimetric with Midi-Distillation by EPA Method 335.4
100.0053	ISM01.3 ICP-AES Analysis
100.0054	ISM01.3 ICP-MS Analysis
100.0055	Mercury Preparation and Analysis by ISM01.3
100.0056	Cyanide Preparation and Analysis by ISM01.3
100.0100	Sample Preparation of Soils by Acid Digestion for ICP/MS (3050B/6020A)
100.0103	AVS and SEM
100.0104	Sample Preparation of Soils by Acid Digestion for ICP/AES (3050B/6010C)
100.0106	Chemical Oxygen Demand Determination SM5220D
100.0110	Determination of Metals in Water and Wastes by Inductively Coupled Argon Plasma Mass Spectrometry by SW846 Method 6020A
100.0111	Determination of Metals in Water and Wastes by Inductively Coupled Argon Plasma Atomic Emission Spectrometry by SW846 Method 6010C
100.0112	pH in Soil Samples by SW846 9045D/SOM1.2
100.0113	Determination of Metals and Trace Elements in Water by ICP - MS by EPA Method 200.8
100.0121	ICP Aqueous Preparation by ISM01.3

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Standard Operating Procedures (SOPs)

Master List

SOP #	Title
100.0122	Prep of Soil, Wipe/Air Filter for ICP Analysis by ISM01.3
100.0201	Ammonia Distillation & Determination SM4500-NH3 B&C
100.0208	Inorganic Analysis of Hexavalent Chromium in Soil Samples by SW846 Methods 3060A & 7196A
100.0209	Mercury Speciation…SW846 Method 3200
100.0308	Inorganic Analysis of Hexavalent Chromium in Aqueous Samples by SM 3500 Cr +6 B
100.0400	Inorganic Anions by IC EPA 300.0 and 9056A
100.0410	TOC in Soil by Lloyd-Kahn and SW-846 9060
100.0420	Volatile Fatty Acids by IC using EPA 300.0 (modified)
100.0430	Walkley Black TOC in Soil
100.0440	Total, Fixed and Volatile Solids in solid/semisolid samples by SM2540G
110.0006	Thermometer Calibration
110.0007	Balance Calibration
110.0008	Manual Integration of GC, IC and GC/MS Chromatograms
110.0012	Laboratory Security
110.0013	North Carolina Samples
110.0021	Bids and Proposals
110.0023	Project Management
110.0025	Toxicity Characteristic Leaching Procedure by SW846 Method 1311
110.0026	Handling of Evidentiary Materials
110.0027	Documentation Policy and Procedures
110.0028	Data Validation-Self Inspection Procedures
110.0029	Electronic Data Management
110.0031	Synthetic Precipitation Leaching Procedure by SW-846 Method 1312
110.0032	ASTM Leachate Procedure D3987-06

Spectrum Analytical, Inc. Rhode Island Division

Standard Operating Procedures (SOPs)

Master List

SOP #	Title
110.0034	Sample Data Control for Inorganic CLP (ILM/ISM)
110.0035	Sample Data Control for Organic CLP (SOM)
110.0038	Percent Solids Determination as Required for Various SW-846 and EPA Methods
110.0039	Sub-Sampling for Soil and Solid Samples
110.0040	Instrument Maintenance
110.0041	Multiple Extraction Procedure by SW846 EPA Method 1320
110.0043	Standard Elutriate Preparation
110.0060	Tissue Sample Preparation

12.0 LABORATORY QUALITY CONTROL CHECKS

Spectrum Analytical, Inc. RI Division's analytical procedures are based on sound quality control methodology, which derives from three primary sources:

1. Specific EPA and other approved analytical methods, and

2. "Handbook for Analytical Quality Control in Water and Wastewater Laboratories" (EPA 600/4-79-019).

3. Standards for Good Laboratory Practice.

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

Each of the Spectrum Analytical, Inc. RI Division laboratory departments have an individual QC program, which includes, but is not limited to, the practices described below.

12.1 Method Detection Limit Determination/Verification:

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

MDLs are determined for all test methods where required by specific program or state regulations. Methods analyzed for the State of Massachusetts which do not detail MDL requirements within the published method, require preparation and analysis of the MDL samples over a minimum of three days. This is believed to

better mirror real world samples and day to day variability of preparatory and analytical steps.

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

Following an MDL study, the determined limits are verified by the analysis of an MDL Verification Standard. This standard is analyzed at approximately 2 to 3 times the calculated MDL for single analyte tests or 1-4 times the calculated MDL for tests with multiple analytes. This spike concentration is also referred to as the Limit of Detection in Department of Defense Quality Systems Manual (DoD QSM). DoD QSM requires quarterly verification of the LOD. For more details refer to SOP 80.0005 Determination of Method Detection Limits.

12.2 Personnel Training:

Chemists who begin their employment at Spectrum Analytical, Inc. RI Division are to be instructed under the lab's Safety Training Program within the first month. The Safety Training Program includes laboratory basics, safety video and testing, and MSDS instruction.

Before performing any analyses, a chemist is required to read the appropriate protocols and SOPs. The chemist is required to sign off on all documents read in the electronic SOP database located on our lab Intranet.

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

The accuracy and precision study is also commonly referred to as a Demonstration of Capability exercise. Upon the successful completion of the Initial Demonstration of Capability exercise, the QA Department issues a Demonstration of Capability Certificate (IDOC) which is signed by both the QA Director and Laboratory Director.

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

Annually thereafter the employee must perform an acceptable demonstration of capability study to document continued acceptable performance in his/her

particular preparatory or analytical method specialty. This is referred to as the On-going DOC. All DOCC documentation is filed in the employee's personnel folder, which is stored in the QA Department/or in the electronic personnel folder as the system has transitioned to a paperless filing system for DOCC.

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

Data integrity training topics will include the need for honesty and full disclosure in all analytical reporting, how and when to report integrity issues and what those issues could be. Employees will understand that infractions of data integrity procedures can result in an investigation that could lead to serious consequences which include immediate termination, and civil or criminal prosecution. At the start of employment all new employees read, discuss and sign a Confidentiality, Ethics and Data Integrity Agreement. Annually, an on-going integrity training session is held. An attendance sheet will be generated for every integrity session. These sheets are filed in the QA Office under "Training". Another option for the annual training session is having all staff review refresher materials online and documents their having done so. This is done within the framework of the SOP database on the lab's intranet.

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

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

12.3 Control Charts:

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

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

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

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

In which:

SD = Standard Deviation
N = number of data points

Warning Limits = Average ± 2 * SD

Control Limits = Average ± 3 * SD

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

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

Data from each laboratory is uploaded into the LIMS. The compounds, recoveries, and date analyzed for each test are recorded in the system. In order for LIMS generated control limits to be valid, all data, including data not meeting existing recovery criteria, must be uploaded. A control chart is then printed for review by the QA Director and by the Lab Supervisor. Out of control situations noted on the control chart are discussed with the Supervisor or Laboratory Director by the QA Director.

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

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

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

12.4 General QC Protocols:

12.4.1. Organics Laboratory:

- Trip blanks and holding blanks, when applicable, are analyzed to detect contamination during sample shipping, handling and storage.
- Method blanks, at a minimum of one in every 20 samples, are analyzed to detect contamination during analysis.
- Volatile organic method blanks are analyzed once during each analytical sequence.
- One blank spike (Laboratory Control Sample or LCS) consisting of an analytical sample of laboratory water, anhydrous sodium sulfate, or Ottawa sand with every batch of 20 or fewer samples, is analyzed to determine accuracy.
- Sample spikes and spike duplicates, as requested, are analyzed to determine accuracy and the presence of matrix effects. The Relative Percent Difference (RPD) is also determined for matrix spike/matrix spike duplicates to measure precision. The criteria followed are stated in the individual methods. For batches without a sample duplicate (for example, if insufficient sample volume is provided), a duplicate blank spike (LCSD) is performed to provide for precision measurement.

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

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

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

- Analysis of EPA traceable standards (ICV) to verify working standard accuracy and instrument performance.

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

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

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

- Quarterly analysis of LOD and/or LOQ check samples to verify low level detection and reporting limits for Department of Defense QSM programs.

- Annual Verification of MDL for NELAC/TNI.

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

12.4.2. Inorganic Laboratory:

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

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

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

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

- Metals analysis instruments are calibrated for every analytical run.

- Analysis of EPA traceable standards (ICV) to verify working standard accuracy and instrument performance.

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

- Quarterly analysis of LOD and LOQ check samples to verify low level detection and reporting limits for Department of Defense QSM programs.

- Annual Verification of MDL for NELAC/TNI.

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

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

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

12.5.1. For inorganic analyses the wet chemistry and metals labs use a US Filter mixed-bed deionization system followed by particle and carbon filters. This is followed by a polishing system using Barnstead E-Pure cartridges optimized for removal of inorganic constituents. Purity is monitored using an in-line electrical resistivity meter with integral cell. Finished Inorganic reagent water is tested for conductance on a routine basis (at least annually), through the use of an external conductivity meter.

12.5.2. For organic analyses, the extractable organics laboratory uses a Barnstead E-Pure system optimized for removal of organic constituents. As organic contaminants are not measured by a resistivity meter, this is not a relied-upon method to monitor the quality of organic analyte-free water. Instead, laboratory method blanks are used, typically several per working day, to monitor the acceptability of the water for its intended use. Any analyte detected above (half of) the reporting limit is investigated. If this can be traced to the water purification system as its source, maintenance is performed on the water purification system. The volatile organics laboratory uses a Whirlpool Model WHER25 Reverse Osmosis Drinking water system to provide analyte free water.

Figure 12.3-1
Example Control Chart

Test Code: SW8081_W Analyte: 4,4´-DDD

SampType	Sample ID	Analysis Date	Batch ID	Low Limit	High Limit	% Recovery
LCSD	LCSD-65227	3/23/2012	65227	25	150	94.0
LCS	LCS-65227	3/23/2012	65227	25	150	88.6
LCS	LCS-65354	4/3/2012	65354	25	150	93.9
LCS	LCS-65320	4/3/2012	65320	25	150	91.4
LCSD	LCSD-65320	4/3/2012	65320	25	150	84.5
LCS	LCS-65743	4/26/2012	65743	25	150	92.8
LCS	LCS-65925	5/7/2012	65925	25	150	91.6
LCS	LCS-66030	5/14/2012	66030	25	150	75.4
LCS	LCS-66116	5/15/2012	66116	25	150	93.2
LCSD	LCSD-66116	5/15/2012	66116	25	150	92.7
LCS	LCS-66132	5/16/2012	66132	25	150	92.8
LCS	LCS-66631	6/12/2012	66631	25	150	94.4
LCSD	LCSD-66631	6/12/2012	66631	25	150	99.1
LCS	LCS-66758	6/18/2012	66758	25	150	90.8
LCSD	LCSD-66767	6/18/2012	66767	25	150	82.5
LCSD	LCSD-66758	6/18/2012	66758	25	150	79.9
LCS	LCS-66767	6/18/2012	66767	25	150	89.5
LCS	LCS-66817	6/19/2012	66817	25	150	92.8
LCSD	LCSD-66817	6/19/2012	66817	25	150	92.6
LCS	LCS-66801	6/20/2012	66801	25	150	99.0
LCSD	LCSD-66801	6/20/2012	66801	25	150	98.6
LCS	LCS-66899	6/28/2012	66899	25	150	80.5
LCSD	LCSD-66899	6/28/2012	66899	25	150	83.1
LCSD	LCSD-67208	7/19/2012	67208	25	150	84.8
LCS	LCS-67208	7/20/2012	67208	25	150	89.5
LCS	LCS-67206	7/20/2012	67206	25	150	80.6
LCS	LCS-68027	9/13/2012	68027	25	150	96.9
LCS	LCS-68082	9/13/2012	68082	25	150	100.3

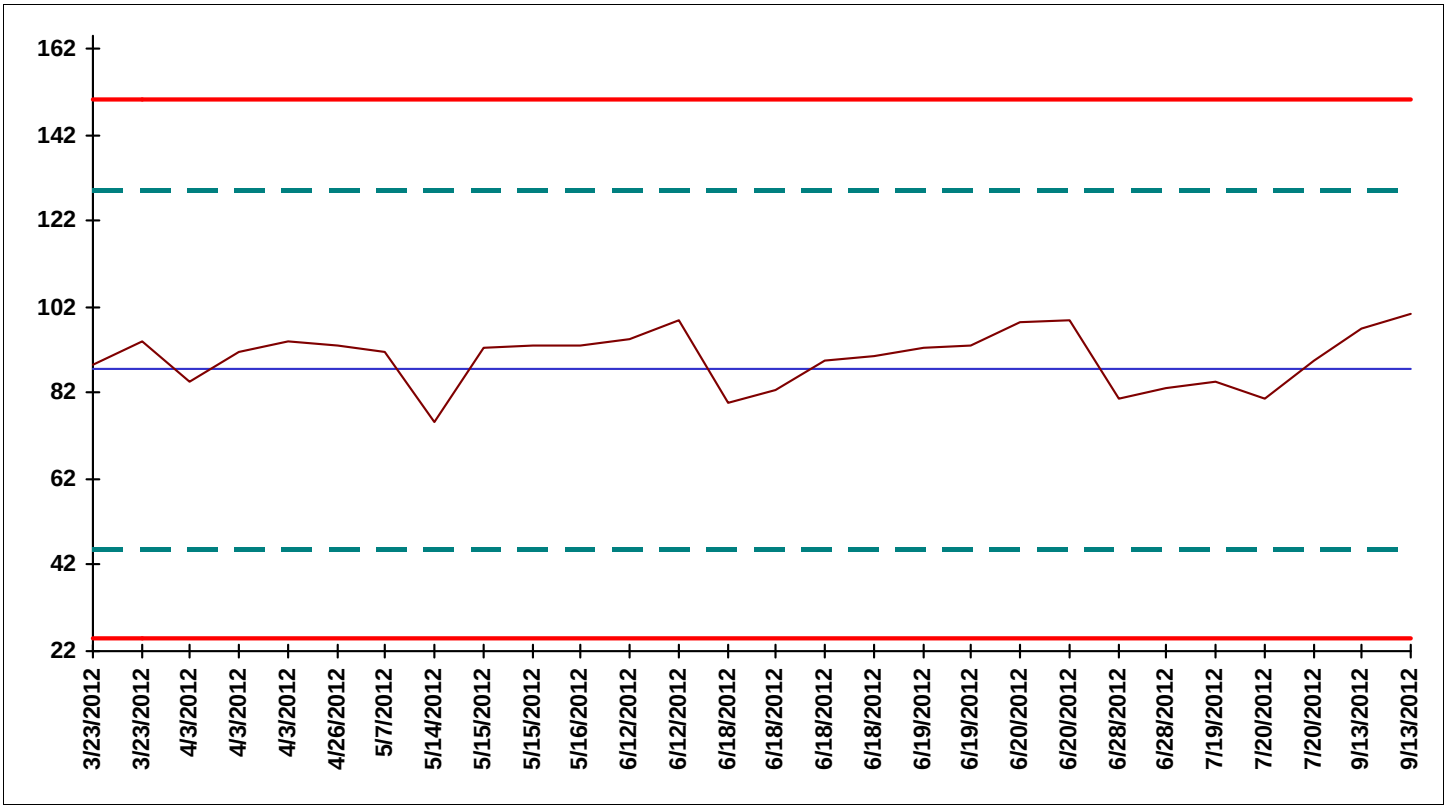
Spectrum Analytical, Inc. Featuring Hanibal Technology

REC QUALITY CONTROL CHART

Date: ***24-Sep-12***

Test Code: SW8081_W Analyte: 4,4´-DDD

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



13.0 QUALITY ASSURANCE SYSTEMS AUDITS, PERFORMANCE AUDITS AND FREQUENCIES, PEER REVIEW

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

13.1 System Audits:

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

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

Upon the completion of the internal audit, a formal audit report is presented to the laboratory supervisor who is given a specific timeframe to respond in writing to the deficiencies. The QA Department will do a follow up audit to check that at least the major deficiencies have been corrected. The follow-up audit occurs within 30-45 days from the date of the audit response.

13.2 Performance Audits:

Spectrum Analytical, Inc. RI Division participates in external Performance Test (PT) studies under the National Environmental Accreditation Program (NELAP) through the New Jersey Department of Environmental Protection (Primary Accreditation Authority). The QA department administers the Performance Evaluation Samples for Wastewater/Solid Waste (WW/SHW). Additionally, performance samples are administered for test methods not certified through the New Jersey program, such as specific state methods. PT samples are handled (i.e., managed, analyzed, and reported) in the same manner as real environmental samples utilizing the same staff, methods as used for routine analysis of that analyte, procedures, equipment, facilities, and frequency of analysis. When analyzing a PT sample, a laboratory shall employ the same calibration, laboratory quality control and acceptance criteria, sequence of analytical steps, number of replicates and other procedures as used when analyzing routine samples. PT

samples are reported electronically via the vendor's website (ERA, RTC…), and results are sent directly to all applicable state or agency certification programs.

Clients also send performance evaluation samples (PES) to Spectrum Analytical, Inc. RI Division as part of their own quality control program. Spectrum Analytical, Inc. RI Division is blind to the true values of the PES. The USEPA CLP program provides quarterly blind (QB) studies for all tests and matrices. The lab is informed of their performance after the study has been graded through an Individual Laboratory Summary Report. When results in any section are less than 90.0%, the lab is required to complete a formal corrective action report to the EPA.

Spectrum Analytical, Inc. RI Division also participates in external electronic data QA monitoring audits and data package audits through the USEPA CLP program. On request, the Spectrum Analytical, Inc. RI Division CLP Project Manager submits instrument data tapes and all applicable documentation for tape audits, including a copy of the data package. All original documentation generated during sample analyses may be requested. The results of the tape audit are sent to Spectrum Analytical, Inc. RI Division in report format in the same manner as an on-site audit (see below). A formal response is required.

Several times a year outside agencies (federal, state, or private) may schedule an audit at Spectrum Analytical, Inc. RI Division in order to check the laboratory's processes. Most often these audits begin and end with a meeting between auditors and laboratory management. Each individual laboratory is examined. The QA Director and/or Senior Management Staff are most likely to remain with the auditors at all times during the audit.

Sometime after the audit, the lab receives a formal audit report to which it must respond. The audit report is initially reviewed by the QA Director who copies and distributes the report to each laboratory supervisor. The supervisors are required to respond in writing to the findings that pertain to his or her department. The QA Officer compiles the formal response that could be tweaked several times before the auditing authority accepts the results. A specific timeframe is set by the individual agency involved.

The QA Officer then sends a memo to each supervisor to detail what needs to be done in each department within a specific timeframe. The QA Department then follows up with the labs to ensure procedures have been modified and the corrective actions are in place.

Internally, performance is monitored on a daily basis at Spectrum Analytical, Inc. RI Division through the use of surrogate and internal standards, and LCS and MS/MSD samples. Check samples from independent commercial sources are employed routinely in each of the Spectrum Analytical, Inc. RI Division laboratory departments and ensure continuing high-level performance. The QA

Director may distribute internal blind PE samples to each laboratory department as needed. These blind PE samples can also be used to show on-going analyst proficiency in lieu of 4 LCS studies.

13.3. Peer Review:

Peer review is used as a vital quality control tool within all areas of the laboratory, and at all levels. Peer review allows defects in the acquisition, evaluation and reporting of sample data to be identified before moving on to the next step in the process of preparing and analyzing samples. Several steps of peer review are included at Spectrum Analytical, Inc. RI Division to prevent and catch mistakes, whether caused by human error or a system malfunction. As soon as samples enter the laboratory they are logged into the LIMS system and given unique sample identifiers that correspond to the client's IDs listed on the chain of custody. The individual jars or bottles are labeled and the technician employs a peer review of this labeling process. A project manager or peer technician visually inspects each jar or bottle for proper identification and matching lab/client IDs. Once the samples are sent into the labs for test preparation, they again undergo peer review as they are set up for extraction, digestion or distillation... This time the samples are inspected to confirm the samples at the bench match the identifications written into the lab preparation logbooks. Once the concentrated extract, digestate or distillate is ready for analysis and set up on the analytical instrument, an analyst will perform another peer review of the autosampler set up to avoid any misplacements of sample vials. In some lab areas this review may occur after instrument analysis, to verify all sample data were acquired electronically. Every analytical instrument sequence (GC/ECD, GC/FID, GC/MS, ICP/MS, ICP/AES, CVAA, FIA, IC) undergoes a technical peer review by a qualified analyst to verify positive and false positive results as well as manual integrations. Data reports are also reviewed at length according to the 5 level review processes described in Section 11 of the QAP as well as in SOP No. 110.0028 Data Validation/Self Inspection Procedures. At each point in the process, the peer review is documented.

Figure 13.1-1
QA Systems Audit Checklist

Quality Assurance Department
Spectrum Analytical, Inc. RI Division
.

Quality Review of Laboratory Department

Auditor:
Date:

Purpose

The Quality Review is a necessary tool to assess a department's quality and service functions. Each department will undergo a review of their process and procedures to evaluate their needs and areas of possible improvement. Each department will be tracked for quality, safety, compliance, reoccurring errors and process improvement.

Process

Each department will be broken down into several categories or areas of review. Each category will be reviewed and assessed for compliance. The categories will include at a minimum:

Personnel Training and Knowledge
Equipment
SOP Updates and Review
Logbook Review and Control
Chemicals/Standard Storage and Preparation
Sample Procedures and Method Compliance
QA/QC Procedures
Corrective Actions in process

Each category will be reviewed and a listing of any deficiency or findings will be documented for response and correction. The department Supervisor (s) will be required to respond to each deficiency or finding within 30 days of receipt of this report. All deficiencies or findings must have its correction(s) documented. For example, logbook deficiencies will require a photocopy of the correction(s). All other responses will require a written response or adequate explanation. Deficiencies will be tracked for reoccurrence. All documentation should be forward to the QA department for evaluation. A follow up audit may be scheduled.

Findings:

Personnel Training and Knowledge

.

Equipment

SOP Updates and Review

Logbook Review and Control

Chemicals/Standard Storage and Preparation

Sample Procedures and Method Compliance

QA/QC Procedures

Corrective Actions in process

Items marked with an* asterisk will require a written response by the lab supervisor or his designee to the QA Dept. This response must be submitted to the QA Department by *mm/dd/yyyy*. The response can be entered directly into this document in a different font color. Please note date that the CA was completed.

Auditor _____ Date _____

14.0 PREVENTIVE MAINTENANCE

Preventive maintenance is a routine practice at Spectrum Analytical, Inc. RI Division for all instrumentation. Scheduled preventive maintenance minimizes instrument downtime and subsequent interruption of analysis.

Only those equipment items meeting or exceeding applicable performance requirements are used for data collection. This includes items such as laboratory balances as well as major analytical instruments such as ICPs, ICP/MS, GCs and GC/MSs. All major instrumentation and equipment, as well as backup alternatives, are listed in Appendix A. Spectrum Analytical, Inc. RI Division SOP No. 110.0040, Instrument Maintenance, describes routine maintenance in detail. Individual analytical standard operating procedures describe maintenance as well (See Figure 11.7-1 for SOP listing).
When new software is purchased or developed, it is loaded onto one workstation with copies of data that have been previously processed using older software, and known to be correct. The data is then reprocessed using the new software and then the new results are compared to the original results for defects. If the software was purchased and found to contain a defect, the vendor is contacted and a solution and/or patch are requested. If the software was developed in-house, the problems are identified and corrected. This process is applicable to all software including enhancements made to customize the LIMS and network servers.

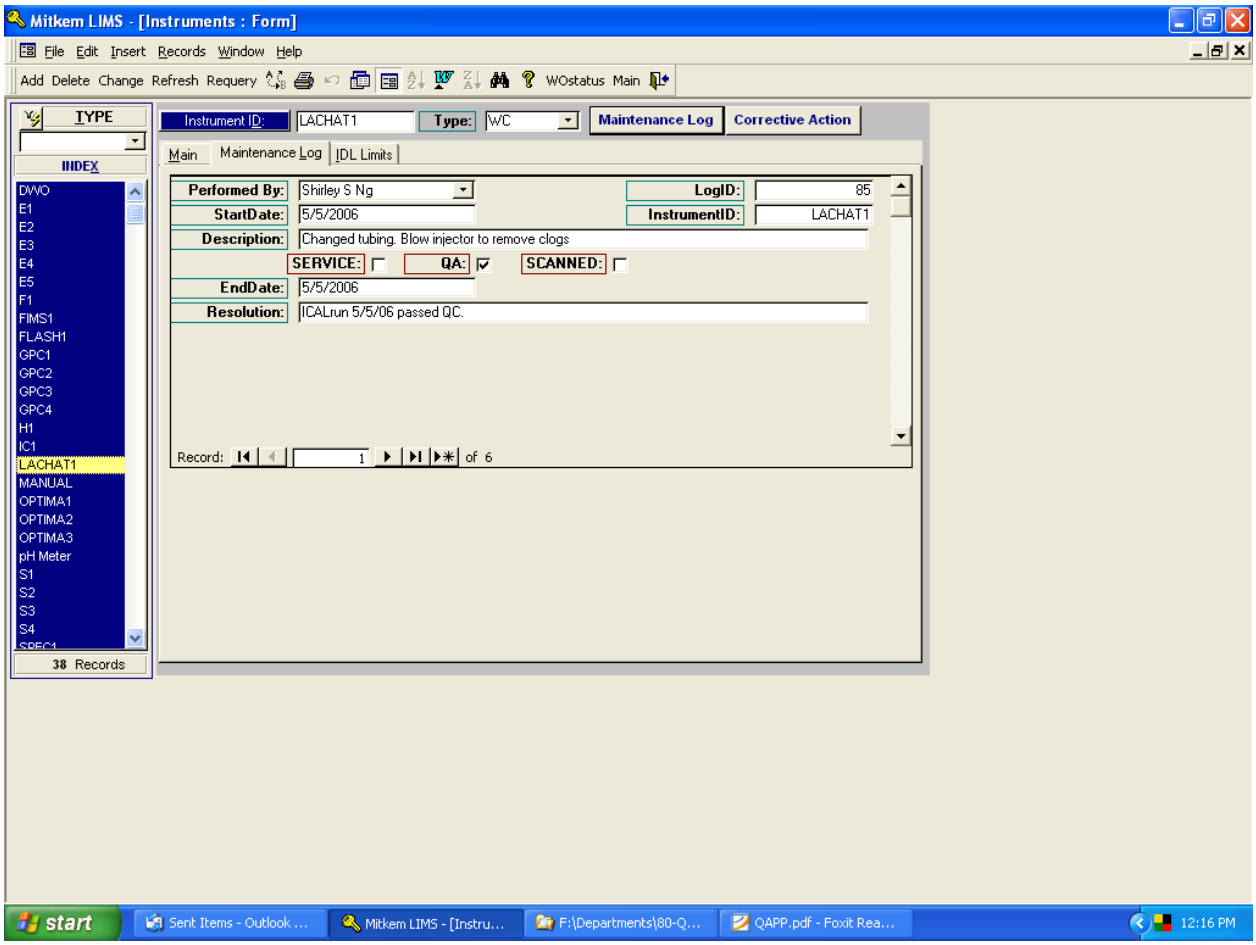
Spectrum Analytical, Inc. RI Division's laboratory personnel are familiar with the routine and non-routine maintenance requirements of the instruments they operate. This familiarity is based on education, hands-on experience and manufacturer's training courses. As needed, major equipment may under-go extensive maintenance or service by a contracted technician.

Instrument maintenance logs are kept for each instrument in the LIMS (figure 14-1). All employees have password protected access to the LIMS. The person performing the maintenance is required to provide the following information in the online log:

- Equipment identifier
- The inspection, maintenance, calibration or corrective action(s) performed.
- The trigger(s) for the maintenance action(s)
- The identity of the person(s) performing the maintenance
- The date on which the work was performed
- The need for a service call
- The condition of the equipment upon completion of the work (may include resolution of problems, date and type of ICAL run or other method of determining that the system is in good working order), and
- The presence of any scanned paperwork associated to the maintenance

Spectrum Analytical, Inc. RI Division maintains an inventory of replacement parts required for preventive maintenance and spare parts that often need replacement, such as filaments for GC/MS systems and the more mundane electrical fuses and GC column ferrules. To control cost, the appropriate supervisor shall decide the types and numbers of spare parts kept on hand for each equipment item.

Figure 14-1



Example of Instrument Maintenance Log

15.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, COMPLETENESS, METHODS DETECTION LIMIT AND LINEAR DYNAMIC RANGE

These mathematical equations represent the means of calculating analytical figures of merit on a routine basis at Spectrum Analytical, Inc. RI Division. However, they may be supplanted with other calculations if requested by the client. Precision, accuracy and completeness are also discussed in Section 6.

15.1 Precision:

Precision is frequently determined by the comparison of replicates, where replicates result from an original sample that has been split for identical analyses. Standard deviations, *s*, of a sample are commonly used in estimating precision.

Sample standard deviation, *s*:

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

where a quantity, x_i (e.g. a concentration), is measured *n* times with a mean, $\bar{x}$.

The relative standard deviation, *RSD* (or sample coefficient of variation, *CV*), which expresses standard deviation as a percentage of the mean, is generally useful in the comparison of three or more replicates (although it may be applied in the case of n = 2).

$$\%RSD = 100\ (s\ /\ \bar{x}\ )$$

or

$$CV = 100\ (s\ /\ \bar{x}\ )$$

In which: *RSD* = relative standard deviation, or
CV = coefficient of variation
s = standard deviation
$\bar{x}$ = mean

For duplicates (samples that result when an original sample have been split into two for identical analyses), the relative percent difference (*RPD*) between the two samples may be used to estimate precision.

$$RPD = \frac{2(D_1 - D_2)}{(D_1 + D_2)} \times 100\%$$

In which: D_1 = first sample value
D_2 = second sample value (duplicate)

15.2 Accuracy:

The determination of accuracy of a measurement requires knowledge of the true or accepted value for the signal being measured. Accuracy may be calculated in terms of bias as follows:

$$Bias = X - T$$

$$\%Bias = 100\frac{(X - T)}{T}$$

In which: X = average observed value of measurement
T = "true" value

Accuracy also may be calculated in terms of the recoveries of analytes in spiked samples:

$$\%\,\mathrm{Recovery}(\%R) = 100 \times \frac{(SSR - SR)}{SA}$$

where: SSR = spikes sample result
SR = sample result
SA = spike added

15.3 Completeness:

Determine whether a database is complete or incomplete may be quite difficult. To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. Less obvious is whether the data are sufficient to achieve the goals of the project. All data are reviewed in terms of goals in order to determine if the data set is sufficient.

Where possible, the percent completeness for each set of samples is calculated as follows:

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

15.4 Method Detection Limit:

The method detection limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is not zero. It is computed as follows from data obtained by repeatedly determining an analyte in a given sample matrix:

1. Analyze at least seven samples of a homogeneous matrix spike that contains the analyte(s) of interest at concentrations of three to five times the expected MDL. The entire sample preparation and analysis protocol must be applied in each analysis; simply preparing one sample and repeating a measurement three or more times on the sample in not acceptable.

2. Upload the acceptable data into LIMS.

3. The LIMS will compute the standard deviation of the results for each analyte using the following equation:

$$MDL = t_{(n-1,\ \alpha=0.99)}\ (s)$$

Where *t* is the one-sided student's *t* value appropriate for the number of samples analyzed, *n*; α is the statistical confidence level; and *s* is the standard deviation.

The one-sided *t*-values are presented below:

Number of samples	*t*-value
7	3.14
8	2.996
9	2.90
10	2.82

4. The MDL is then checked against 40CFR136 requirements by the QA Department. If the MDL is acceptable then it is uploaded into the LIMS by either the QA Department or LIMS Administrator.

5. Immediately following the determination of the MDL, MDL check samples are analyzed at a concentration approximately equal to 2-3 x the new MDL for SW846 tests. The analyte of interest must be detected at this concentration, or the raising the MDL may be required. Once the MDL check is acceptable, the detection limit (DL) has been established.

6. An elevated MDL can be uploaded if necessary into the LIMS as long as documentation is available to show that the applicable method can produce an MDL at least that low. This can commonly occur for ICP

analysis in which extremely low MDLs can cause method compliance issues. When appropriate, the MDL study may be prepared and analyzed over several days to increase the variability of the preparation and/or analytical steps.

7. More detail on MDLs can be found in SOP 80.0005 Method Detection Limit Determination.

15.5 Linear Dynamic Range:

The linear dynamic range is the concentration range over which the instrument response is linear. It is determined by analyzing a series of standard solutions that extends beyond the non-linear calibration region at both the low and high extremes, and selecting that range of standards which demonstrates a linear relationship between instrument response and concentration.

For ICP analysis, the linear dynamic range is determined by analyzing each metal at 3 different concentrations. The concentration which produces results within a 10% error is determined to be the linear dynamic range. This procedure must be performed per individual method requirements.

ILM5.4 requires the analysis of the linear dynamic range be determined quarterly, with a 5 % error.

16.0 CORRECTIVE ACTION

An essential element of the QA Program, Corrective Action provides systematic, active measures taken in the resolution of problems and the restoration of analytical systems to their proper functioning.

Corrective actions for laboratory problems are described in Spectrum Analytical, Inc. RI Division's laboratory standard operating procedures (SOP). Personal experience often is most valuable in alerting the bench scientist to questionable results or the malfunctioning of equipment. Specific QC procedures are designed to help the analyst determine the need for corrective actions (see Section 11, Data Reduction, Validation and Reporting). Corrective actions taken by scientists in the laboratory help avoid the collection of poor quality data. The lab's corrective action program divides these issues into routine and non-routine corrective actions as described below.

Routine Corrective Action – A routine corrective action is taken when the out-of-control event encountered is one that is detected at the appropriate level in the QA process. Routine corrective actions are defined in the analytical SOP with specific steps to be taken as corrective action (i.e., low surrogate recovery, continuing calibration verifications, project specific protocols that do not meet acceptance criteria, etc.) Routine corrective actions must be documented as described in the analytical SOP, but do not require further documentation in the corrective action logbook. Examples of routine corrective action situations: surrogate/surrogates out, LCS out, CCV out, ICV out, IS area/areas out, typographical errors, random blank contamination, or false positive hit/spectral ID match corrected during data review.

Non-Routine Corrective Action – A non-routine corrective action is taken when the out-of-control event encountered is not typical for the method. For example, QC failures that passes through the final review to the client, procedural errors – not following the SOP, or a situation not being detected by normal QA procedures that could adversely impact the accuracy, precision, etc. of a result. Non-routine corrective actions must be documented in the Corrective Action Request (CAR) system, located within the LIMS. The analyst, using his/her own judgement, may deem any corrective action situation non-routine and formally document it in a CAR. When in doubt about a corrective action, the analysts are instructed to err on the side of formal CAR documentation. Examples of non-routine corrective action situations include: bad standard, expired standard mix being used, incorrect equation, "client-detected" problems, not following SOP protocols, using bad or contaminated lot of chemical/reagent/solvent, deciding to release data not conforming to SOP requirements, compound retention time outside of range, or improper library spectrum that leads to re-occurring mis-identification of compounds.

The essential steps in Spectrum Analytical, Inc. RI Division's corrective action system are:

1. Identify and define the problem.

2. Assign responsibility for investigating the problem. Usually this individual is the department supervisor.

3. Investigate and determine the root cause of the problem.

4. Determine a corrective action to eliminate the problem and prevent recurrence. Any changes that result from the corrective action investigation must be documented.

5. Assign and accept responsibility for implementing the corrective action.

6. Establish effectiveness of the corrective action and implement it.

7. Verify that the corrective action has eliminated the problem.

8. Both the laboratory and the QA Department need to monitor the corrective action to ensure it is effective.

9. Any corrective actions that cast doubt on the laboratory's compliance with its own policies and procedures may require an internal audit by the QA Department.

This scheme is generally accomplished through the use of Corrective Action Report Forms available to each of the laboratory areas within the LIMS system. Use of this report notifies the QA Department of a potential problem as described in SOP No. 80.0007. The QA Director initiates the corrective action by relating the problem to the appropriate laboratory managers and/or project managers who then investigate or assign responsibility for investigating the problem and determine its cause. Once determined, the QA Director will approve appropriate corrective action. Its implementation is later verified through an internal laboratory audit. Once the QA Director feels the system has returned to control, s/he will finalize the CAR using a password protected QA step.

Information contained on corrective action reports is kept confidential within Spectrum Analytical, Inc. RI Division and is generally limited to the individuals involved. Severe problems and difficulties may warrant special reports to the President of Spectrum Analytical Inc., who will ensure that the appropriate corrective actions are taken.

Nonconformance:

Any breech of standard protocols is a nonconformance item that is documented on the Corrective Action Request Form and management informed immediately. The following are nonconformance items:

1. Sample holding time exceeded.

2. Hoods, Class “1” weights, NIST Thermometers, balances, automatic pipettes, being used but not certified.

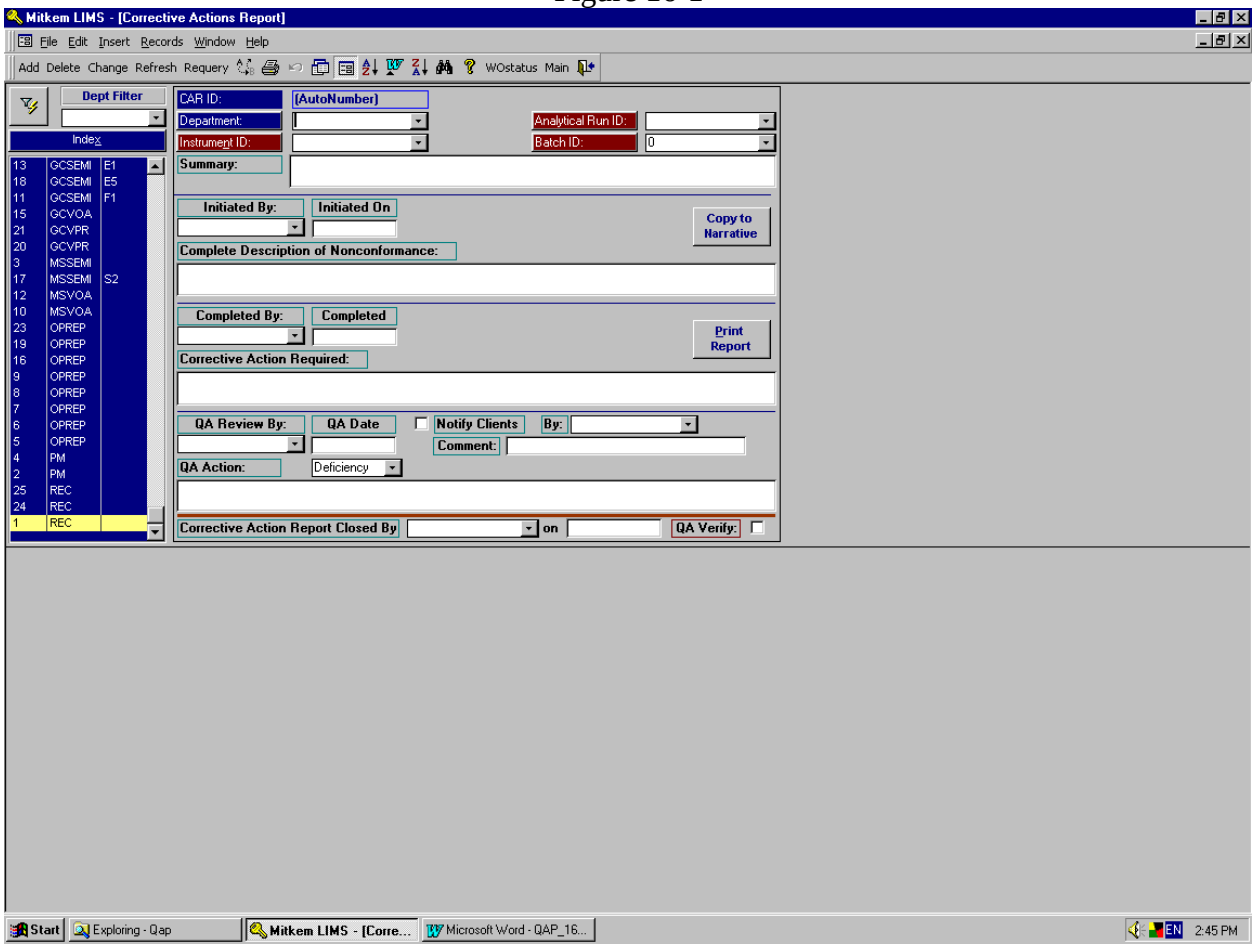
3. Expired standards being used.

4. Manual integration being misrepresented.

16.1 Client Complaints:

Spectrum Analytical, Inc. RI Division ensures client complaints are dealt with quickly and completely. The policies are stated in the laboratory Client Complaint Standard Operating procedure (SOP No. 80.0002).

Figure 16-1



Quality Assurance Corrective Action Request Form

17.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Spectrum Analytical, Inc. RI Division Quality Assurance Director submits a QA report annually to upper management. The report should be completed and submitted no later than the 15th of July in any calendar year.

The report contains detailed laboratory information and QA activities during the previous twelve months. Items to include are the status of internal and external audits, client complaints, quality control activities, resources and staffing. See the following pages for the report format.

Management will review the QA report and respond to outstanding issues. Management will add a review of the suitability of policies and procedures, and any other relevant issues**.** The response report is due within 30 days of the QA Report receipt.

A copy of the report is kept on file in the QA department.

In case of a severe problem or difficulty, a special report is prepared by the QA Director and submitted immediately to management.

Figure 17-1

SPECTRUM ANALYTICAL, INC. RI DIVISION
Annual Quality Assurance Report to Management

1. Status of Internal Audits.

2. Status of External Audits.

3. Identification of Quality Control issues in the laboratory.

4. Discussion of corrective action issues.

5. Proficiency Testing.

6. Changes in volume and type of work undertaken.

7. Client Feedback.

8. Reports from management and supervisory personnel.

18.0 SAFETY

Spectrum Analytical, Inc. RI Division maintains safety through a program managed by the Safety Officer and the Safety Committee. Responsibilities include many activities needed to comply with the Right-to-Know Laws.

- Training seminars with information on OSHA safety instruction for new employees.
- Introductory training to include location of fire extinguishers, first aid supplies, etc.
- Health and Safety manual review when hired.
- Annual Health and Safety Manual review and revision as needed.
- Monthly Safety Committee meetings.
- Centralized MSDS information.
- Maps with safety equipment and all exits noted.
- Posted safety rules.

If a chemical spill occurs, proper actions are described in Spectrum Analytical, Inc. RI Division's Contingency Plan. Additionally, the local fire department (North Kingstown) and hospital (Kent County) also have a copy in case a need arises. Each new hire is required to read the Contingency Plan and sign off on this. An annual meeting is held as a refresher for all employees. A copy of the Contingency Plan is located on the company Intranet and is available to all personnel.

Emergency equipment, such as spill control kits, fire extinguishers and fire blankets are located throughout the laboratory areas. The Contingency Plan has instructions for evacuation, notification of emergency authorities and regulatory personnel in the event of a chemical accident.

19.0 WASTE MANAGEMENT

19.1 Pollution Prevention

The waste management option of choice is to prevent pollution by minimizing the amount or types of chemical wastes that are generated. Spectrum Analytical, Inc. RI Division's ability to minimize waste generation is limited by the chemical analysis techniques that are required by the EPA or other authors of test methods. As new test methods are utilized in the laboratory, the type and volume of chemical waste generated by the new test is considered. Analysts and Supervisors are encouraged to look for ways to reduce the amount of chemical waste, or the type of chemical waste generated during the testing process; HOWEVER, no method is allowed to be modified without discussion among the Laboratory and/or Technical Director, QA Director and other management personnel to determine the affect of the change on the resulting data.

19.2. Waste Management

Spectrum Analytical, Inc. RI Division has identified and routinely disposes of chemical wastes in several hazardous waste streams. In general these are acids, caustics, solvent wastes and various laboratory waste solids. No laboratory chemical waste is disposed in the trash or dumped down the drain. All remaining sample volume following testing, and after contract-required disposal date has past, are disposed in one of these waste streams. These wastes are fully described in Spectrum Analytical Inc., RI Division's Contingency/Waste Management Plan and in the lab's Profile Log. New England Disposal Technologies is Spectrum Analytical, Inc. RI Division's waste hauler. Other hazardous wastes are identified and properly disposed according to these documents.

Continued compliance is monitored monthly by an outside consultant to ensure all RI DEM regulations are met. Key personnel attend an annual RCRA Facility Training, which focuses on the requirements for hazardous waste disposal and its proper documentation.

20.0 DEFINITIONS, ACRONYMS, ABBREVIATIONS:

ACCURACY: The closeness of agreement between an observed value and an accepted reference value.

ALIQUOT: A measured portion of a field sample, standard, or solution taken for sample preparation and/or analysis.

ANALYTICAL SERVICES BRANCH (ASB): The division of United States Environmental Protection Agency's (USEPA) Office of Superfund Remediation and Technology Innovation (OSRTI) responsible for the overall management of the Contract Laboratory Program (CLP).

ASTM: American Society for Testing and Materials, a developer and provider of voluntary consensus standards.

BATCH: A group of samples of the same matrix that are processed as a unit at the same time in the same location using the same method.. Unless defined differently by a specific analytical method (such as Oil & Grease by Method 1664), the maximum batch size is 20 samples.

BIAS: The deviation due to analytical or matrix effects of the measured value from a known spiked amount.

BLANK: A "clean" matrix analysis. Such as: Equipment Blank, Method Blank, and Trip Blank.

BREAKDOWN: A measure of the decomposition of certain analytes (DDT and Endrin) into by-products.

CAS: Chemical Abstracts Service, a registry where chemicals are assigned identification numbers.

CCB: Continuing Calibration Blank

CCV: Continuing Calibration Verification standard.

CLP: Contract Laboratory Program. A contract used by EPA to purchase analytical services. Also refers to the test protocols described in that contract. The CLP analyses can be used for EPA or for other clients. CLP-format data reports are arranged as described in the EPA CLP contract, including specified data report pages and all raw data.

CONTROL SAMPLE: A QC sample introduced into a process to monitor the performance of the system.

DL: Dilution, not used when the initial analysis is performed at dilution, but is used for a secondary dilution.

DoD: Department of Defense.

DUPLICATE: See Matrix Duplicate, Field Duplicate, and Matrix Spike Duplicate.

EQUIPMENT BLANK: A sample of analyte-free water that has been used during sample collection to measure any contamination introduced during sample collection.

ICB: Initial Calibration Blank

ICV: Initial Calibration Verification standard

IDL: Instrument Detection Limit. Statistical value similar to MDL, but with analyses performed on standards that have not been through the sample preparation process.

FIELD DUPLICATES: Independent samples that are collected as close as possible to the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently. These duplicates are useful in documenting the precision of the sampling process.

HT Holding Time. The maximum times that samples may be held prior to analysis and still be considered valid or not compromised (40CFR Part 136). DoD also clarifies the HT to mean the time elapsed from the time of sampling to the time of extraction or analysis , or from extraction to analysis…

LAB CONTROL SAMPLE (LCS): A blank spiked with compound(s) representative of the target analytes. This is used to document laboratory performance in a "clean" matrix.

LOD: Limit of Detection. The smallest amount of concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%), per DoD.

LOQ: Limit of Quantitation (LOQ). The lowest concentration that produces a quantitative result within specified limits of precision and bias. The LOQ

is typically set at or above the concentration of the lowest initial calibration standard.

MATRIX: The component or substrate (e.g., water, soil, air, and oil) which contains the analyte of interest.

MATRIX DUP (DUP): A sample split by the laboratory that is used to document the precision of a method in a given sample matrix.

MATRIX SPIKE (MS): An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

MATRIX SPIKE DUP (MSD): Laboratory split samples spiked with identical concentrations of target analyte(s). The spiking occurs prior to sample preparation and analysis. They are used to document the precision and bias of a method in a given sample matrix.

MCL: Maximum Contaminant Level (MCL) is the highest concentration of a contaminant that is allowed in drinking water.

METHOD BLANK(MB): An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process.

METHOD DETECTION LIMIT (MDL): The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte. For operational purposes, when it is necessary to determine the MDL in the matrix, the MDL should be determined by multiplying the appropriate one-sided 99% t-statistic by the standard deviation obtained from a minimum of seven analyses of a matrix spike containing the analyte of interest at a concentration estimated to be three to five times the MDL, where the t-statistic is obtained from standard references.

MSA: Method of Standard Additions

ND: Not Detected. Used in conjunction with the reporting limit.

ORGANIC-FREE REAGENT WATER: For volatiles, all references to water in the methods refer to water in which an interferent is not observed at the reporting limit of the compounds of interest. Organic-free reagent water

can be generated by passing tap water through a carbon filter bed containing about 1 pound of activated carbon. A water purification system may be used to generate organic-free deionized water. For semivolatiles and nonvolatiles, all references to water in the methods refer to water in which an interferent is not observed at the reporting limit of the compounds of interest.

PPB: Parts Per Billion, ug/L, ug/Kg

PPM: Parts Per Million, mg/L, mg/Kg

PQL: Practical Quantitation Limit. Equivalent to Reporting Limit.

PRECISION: The agreement among a set of replicate analyses.

PS: Post Spike. Spike added at the analysis level (as opposed to at the beginning of sample preparation) to determine interferences.

REPORTING LIMIT (RL): The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The RL is generally 5 to 10 times the MDL. However, it may be nominally chosen other than these guidelines to simplify data reporting. For many analytes the RL concentration is selected as the lowest non-zero standard in the calibration curve. Sample RLs are matrix-dependent, and are adjusted by the amount of sample analyzed, dilution, and percent moisture. Also see LOQ.

RE: Reextraction or Reanalysis

RPD: Relative Percent Difference, used to determine precision.

RRF: Relative Response Factor. Used for quantification with the internal standard procedure.

RT: Retention Time for a chromatographic peak, as calculated from the time of injection.

SAMPLE: A portion of material to be analyzed that is contained in single or multiple containers and identified by a unique sample number.

SAMPLE DELIVERY GROUP (SDG): A unit within a sample Case that is used to identify a group of samples for delivery.

SERIAL DILUTION (SD): A five-fold dilution of a sample. When corrected by the dilution factor, the diluted sample must agree with the original undiluted

sample within specified limits. Serial dilution may reflect the influence of interferents.

SAMPLE MANAGEMENT OFFICE (SMO) - A Contractor-operated facility operated under the SMO contract, awarded and administered by USEPA.

SOP: Standard Operating Procedure.

STANDARD ADDITION: The practice of adding a known amount of an analyte to a sample immediately prior to analysis. It is typically used to evaluate interferences.

STANDARD CURVE: A plot of concentrations of known analyte standards versus the instrument response to the analyte. Calibration standards are prepared by successively diluting a standard solution to produce working standards which cover the working range of the instrument. Standards should be prepared at the frequency specified in the appropriate method. The calibration standards should be prepared using the same type of acid or solvent and at the same concentration as will result in the samples following sample preparation. This is applicable to organic and inorganic chemical analyses.

SURROGATE: An organic compound that is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples.

TRIP BLANK: A sample of analyte-free media taken from the laboratory to the sampling site and returned to the laboratory unopened. A trip blank is used to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organics samples.

From EPA SW-846, Revision 4, 40CFR Part 136, DoD QSM and other sources.

SPECTRUM ANALYTICAL, INC. RI DIVISION

MAJOR INSTRUMENTATION and EQUIPMENT LIST

APPENDIX A

Laboratory Information System Equipment

1. **Data Collection**:

1.1. Seventeen- Hewlett Packard (HP) chem station software for collecting GC and GC/MS data (below) and one Perkin Elmer (PE) Total Chrom for collecting data from the GC-TCD/SCD.

- 5 GC-ECD (GCSEMI)
- 1 GC-FID (GCSEMI)
- 6 GC-MS (MSSEMI)
- 5 GC-MS (MSVOA)
- 1 GC-Hall/PID (GCVOA)
- 1 GC-FID/NPD (GCVOA)

1.2. Hardware varies but is x86 compatible

1.3. OS is Windows, Various Versions (9x, NT, 2000,Xp)

2. **Data Storage**:

2.1. Dell Poweredge servers (Windows 2003 server)

2.1.1. Bernoulli (primary file server, non-organic instrument data)
- Dual core Xeon processor
- 4 GB RAM
- 1 TB storage
- Symantec Backup Exec 12.5
- Tape drive Tandberg Data LTO-5 (1500-3000 GB)

2.1.2. Avogadro (organic instrument data)
- Dual P IV Xeon processors
- 2 GB RAM
- 105 GB storage
- Tape drive Tandberg LTO-2 (200-400 GB)

2.1.3. Planck (database server)
- Dual P IV Xeon processors
- 2 GB RAM
- 450 GB storage
- Tape drive Seagate LTO-1 (100-200 GB) not currently used

2.2. Tapes are for daily backup, long term archiving and data restoration

3. **Compound Identification**:

3.1. Fourteen - Target 4.14 chromatographic software

3.2. Hardware is Intel based for Target 4.14

3.3. OS is Windows Xp

4. **Forms Generation**:

4.1. In-house forms generation LIMS modules for SW-846, ILM and ISM metals

4.2. In-house forms generation LIMS modules for SW-846, OLC, OLM/ASP and SOM organics

4.3. Hardware varies but is x86 compatible

4.4. OS is Windows, Various Versions (2000 and Xp)

Spectrum RI
Equipment List **Department: Inorganics : Metals& Wet Chemistry**

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition New/Used	Equipment ID	Location
ICP/OES	Perkin Elmer	077N3102302	Nov-03	Nov-03	New	Optima3	Metals
ICP/AES	Perkin Elmer	069N8060801	Nov-98	Nov-98	New	Optima2	Metals
ICP/MS	ThermoScientific	SN01407C	Oct-08	Dec-09	New	X1	Metals
Mercury Analyzer	Perkin Elmer	1131	Mar-00	Mar-00	Used	FIMS1	Metals
Mercury Analyzer	Perkin Elmer	101S7071002	Feb-11	Feb-11	new	FIMS2	Metals
GPR Centrifuge	Beckman Instruments	7M149	Apr-02	Apr-02	Used	Centrifuge	WC
Conductivity Meter	WTW Inolab Cond Level 1	3370010	Apr-02	May-02	New	COND-1	WC
Total Organic Carbon Analyzer	Tekmar/Dohrmann	US03035002	Apr-03	Apr-03	Used	TOC1	WC
Flow Injection Analyzer	Lachat Instruments	A83000-1020	Apr-96	Apr-96	New	Lachat1	WC
Ion Chromatograph	Dionex	95030498E980802	May-03	May-03	New	IC1	WC
Spectrophotometer	Spectronic Instruments	3SGD332010	Apr-02	Apr-02	New	SPEC2	WC
Spectrophotometer	Milton Roy Company	3310004028	Mar-06	Mar-06	New	SPEC3	WC
Pensky Marten	Koehler 16200	5539	June-95	June-95	New	FLASH1	WC
Turbidity Meter	VWR® Model 800	Tur800 2326	April-12	Feb-13	Used	Turb1	WC

COD Reactor	Hach Company	990900019429	Nov-03	Nov-03	New	COD1	WC
COD Reactor	Hach Company	950200012193	Apr-02	Apr-02	New	COD2	WC
Deionized Water Generator	Barnstead E-Pure D4641	1090001208384	Jun-95	Jun-95	New	DI2	WC
pH meter	Oakton Instruments	875001	Jun-12	Jun-12	new	WC-03	WC

Spectrum RI
Balance List

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition New/Used	Equipment ID
TOP-LOADING Balance	OHAUS	1121230069	2000	2000	New	TL10
Analytical Balance	Denver A-250	0070742	2010	2010	Used	AB-3
TOP-LOADING Balance	OHAUS Voyager	F2921120391055	2001	2001	New	TL9
TOP-LOADING Balance	Denver	0079896	2000	2000	New	TL1
TOP-LOADING Balance	OHAUS Precision Std.	C22427176	2002	2007	New	TL6
TOP-LOADING Balance	OHAUS Navigator	1121122373	2002	2002	New	TL11
TOP-LOADING Balance	OHAUS	CD8910	2000	2000	New	TL4
TOP-LOADING Balance	OHAUS Navigator	1122173423	2003	2003	New	TL12
TOP-LOADING Balance	OHAUS Scout Pro	7126212230	2007	2007	New	TL13

Spectrum RI
Equipment List **Department: Organic Prep**

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition new/used	Equipment ID
TurboVap II	Caliper	TV0845N14899	Jan-09	Jan-09	New	TV-4
TurboVap II	Caliper	TV0902N15012	Jan-09	Jan-09	New	TV-3
TurboVap II	Caliper	4364	Mar-08	Mar-08	Used	TV-2
TurboVap II	Caliper	Unable to view	Mar-08	Mar-08	Used	TV-1
Shaker	Glas-Col	412383	Mar-08	Mar-08	New	N/A
Water Bath	Precision Scientific	9508-005	Dec-95	Jan-96	Used	N/A
Nitrogen Concentrator Bath	Organomations	16526	Jun-97	Jun-97	New	NZ1
Deionized Water Generator	Barnstead E-Pure D4641	582941018789	Jun-95	Jun-95	New	DI1
Pressurized Fluid Extractor	Dionex	98070129	Jun-00	Jun-00	New	PFE1
Gel Permeation Chromatograph	J2/AccuPrep	P26D031	Jun-05	Jul-05	New	GPC3
Gel Permeation Chromatograph	J2/AccuPrep	06D-1196-4.1	Jul-07	Aug-06	New	GPC4
Misonex Ultrasonic Disruptor	Sonic Dismembrator Fisher Model 550	Unable to view			New	OPH1
Misonex Ultrasonic Disruptor	Sonic Dismembrator Fisher Model 550	Unable to view			New	OPH2
Misonex Ultrasonic Disruptor	Sonic Dismembrator Fisher Model 500	Unable to view			New	OPH3

Misonex Ultrasonic Disruptor	Sonic Dismembrator Fisher Model 500	Unable to view			New	OPH4
Ultrasonic Cleaner FS30H	Fisher Scientific	RTB030721702	Apr-07	Apr-07	New	N/A
Centrifuge Centra CL-2	International Equipment Company	42606943			Used	N/A

Spectrum RI
Equipment List **Department: GC-Semivolatiles**

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition New/Used	Equipment ID	Location
GC/ECD	Hewelett Packard	3336A59890	Oct-94	Oct-94	New	E2	GC-SVOA
GC/ECD	Hewelett Packard	US00032017				E4	GC-SVOA
GC/ECD	Hewelett Packard	US00037060				E5	GC-SVOA
GC/ECD	Hewelett Packard	US00029100	13-Feb	13-Feb	used	E6	GC-SVOA
GC/FID	Hewelett Packard	US00001898				F1	MS-SVOA

Spectrum RI
Equipment List **Department: Receiving**

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition New/Used	Equipment ID	Location
Dry Weight Oven	Thello	600011006			used	DWO	REC
Walk in Cooler		Not Applicable			new	R1	REC
Gyrotary Shaker table	New Brunswick Sci. Co.	unable to read			used	n/a	REC
pH meter	Oakton Instruments	1446253	Dec-08	Dec-08	new	WC-02	REC
Kiln model TNF24-3	Paragon Touch n Fire	324341				n/a	WC
Stoppering tray dryer	FTS Systems Dura-Stop M	TD-12-90-133				n/a	WC
Freeze Dryer	FTS Systems Dura-Dry MP	unable to see				n/a	WC
Dessicator	Sanplatec Corp	none	June-06	June-06	New	DryKeeper	REC

Spectrum RI
Equipment List **Department: SVOA**

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition New/Used	Equipment ID	Location
GC/MS	Hewelett Packard	US00011367 / US72821130	Nov-99	Nov-99	Used	S3	MS-SVOA
GC/MS	Hewelett Packard	CN10315002/ VS30945365	May-03	May-03	New	S4	MS-SVOA
GC/MS/FID	Hewelett Packard	CN107223014 / US73317299	Jan-08	Jan-08	New	S5	MS-SVOA
GC/MS	Hewelett Packard	CN10261100	Nov-10	Nov-10	Used	S6	MS-SVOA

Spectrum RI
Equipment List **Department: VOA**

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition New/Used	Equipment ID	Location
GC/MS	Hewelett Packard	3336A55963				V1	VOA
Auto sampler	OI	13193				V1	VOA
Concentrator	OI	J651460769				V1	VOA
GC/MS	Hewelett Packard	3336A58222				V2	VOA
Auto sampler	OI	13091				V2	VOA
Concentrator	OI	H340460074				V2	VOA
GC/FID/PID	Hewelett Packard	2843A21041				V4	VOA
Auto sampler	Tekmar/Dohrmann	90312004				V4	VOA
Concentrator	Tekmar/Dohrmann	88341012				V4	VOA

Spectrum RI
Equipment List **Department : VOA**

Equipment	Manufacturer	Serial #	Date Received	Date in Service	Condition New/Used	Equipment ID	Location
GC/MS	Hewelett Packard	US00007055				V5	VOA
Auto sampler	OI	13462				V5	VOA
Concentrator	OI	J651460769				V5	VOA
GC/MS	Hewelett Packard	US00031343				V6	VOA
Auto sampler	OI	B03745A407				V6	VOA
Concentrator	OI	J651460769				V6	VOA
GC	Hewelett Packard	3140A37463				V7	VOA
Auto sampler	Tekmar/Dohrmann	US01170015				V7	VOA
GC/MS	Hewelett Packard	CN10411124	Oct-10	Nov-10	NEW	V10	VOA
Auto sampler	Tekmar/Dohrmann	US01157003	Oct-10	Nov-10	USED	V10	VOA
Concentrator	Tekmar/Dohrmann	US02021003	Oct-10	Nov-10	NEW	V10	VOA

Weight Sets

Laboratory weights for daily calibration use:

1. WT1-Organic Prep Weight Set
2. WT2-Organic Prep 100g
3. WT3-Organic Prep 300g
4. WT4-Organic Prep 1kg
5. WT5-Inorganics Weight Set
6. WT6-VOA Weight Set
7. WT7-Unit 3 Weight Set

NIST Class 1 Weight sets:

1. W-01 Denver Instrument set: Serial number 98-121303 Class 1
2. W-03 Troemner set: Serial number 7283 Class 1

Spectrum Analytical, Inc. Rhode Island Division

CONFIDENTIALITY, ETHICS, and DATA INTEGRITY AGREEMENT

APPENDIX B

CONFIDENTIALITY, ETHICS, AND DATA INTEGRITY

The confidentiality, ethics, and data integrity agreement attached must be signed and dated by all new personnel associated with the data generated by Spectrum Analytical, Inc. Rhode Island Division. All said personnel will complete a training course and understand the information stated in the agreement. The course must include the ethical and legal responsibilities including the potential punishments and penalties for improper, unethical, or illegal actions. In addition, personnel are instructed on the importance of data confidentiality in both hard copy and digital forms. All personnel must fully understand this information before signing the agreement. A separate form is used for subcontractors and external auditors that request data for review.

Data Integrity training will be done on an annual basis. All employees are required to attend a training session or read a refresher document and sign off in hardcopy or through the digital SOP Database. All hard copy documents are stored in the employee's personnel file located in the QA Department.

All upper management personnel are required to sign a Non-disclosure Agreement which covers protecting confidentiality and proprietary rights. This Agreement is kept on file at the Spectrum Analytical, Inc., main offices in Agawam, Massachusetts.

SPECTRUM ANALYTICAL, INC.
FEATURING HANIBAL TECHNOLOGY
Rhode Island Division

CONFIDENTIALITY, ETHICS AND DATA INTEGRITY AGREEMENT

I. I, _____ *(Name)*, state that I understand the standards of confidentiality, ethics and data integrity required of me with regard to the duties I perform and the data I report in connection with my employment at Spectrum Analytical, Inc. Rhode Island Division.

II. I agree that in the performance of my duties at Spectrum Analytical, Inc. Rhode Island Division. :

A. I shall not improperly use manual integrations to meet calibration or method QC criteria, such as peak shaving or peak enhancement.

B. I shall not intentionally misrepresent the date or time of analysis by resetting computer or instrument date/time.

C. I shall not falsify analytical results.

D. I shall not report analytical results without proper analysis documentation to support the results; dry-labbing.

E. I shall not selectively exclude data to meet QC criteria, such as calibration points, without technical or statistical justification.

F. I shall not misrepresent laboratory performance by presenting calibration data or QC limits within data reports that are not linked to the data set reported.

G. I shall not represent matrix interference as basis for exceeding acceptance criteria in interference-free matrices, such as method blanks and Laboratory Control Standards (LCS).

H. I shall not manipulate computer software for improper background subtraction or chromatographic baseline manipulations.

I. I shall not alter analytical conditions such as EM voltage, GC temperature program, etc. from standards analysis to sample analysis.

J. I shall not misrepresent QC samples such as adding surrogates after sample extraction, omitting sample preparation steps, or over-spiking/under-spiking.

K. I shall not report analytical results from the analysis of one sample for those of another.

L. I shall not intentionally represent another individual's work as my own.

III. I agree to report immediately any accidental or intentional reporting of non-authentic data by myself. Such report must be made to any member of Spectrum Analytical, Inc. Rhode Island Division Management or the QA Director (Hanibal Tayeh, Yihai Ding, Edward Lawler, Cinde Gomes, Sharyn Lawler) both orally and in writing.

IV. I agree to report immediately any accidental or intentional reporting of non-authentic data by other employees. Such report must be made to any member of Spectrum Analytical, Inc. Rhode Island Division Management or the QA Director (Hanibal Tayeh, Yihai Ding, Edward Lawler, Cinde Gomes, Sharyn Lawler) both orally and in writing.

V. Questions pertaining to confidentiality, ethics, and integrity may be posed to any of the above individuals.

VI. I agree not to divulge any pertinent confidential information including but not limited to data and any other information about a project to outside sources without the prior consent from the client.

I understand that failure to comply with the above confidentiality, ethics and data integrity agreement can result in my immediate dismissal from Spectrum Analytical, Inc. Rhode Island Division.
.

_____ _____

(Signature) *(Date)*

_____

(Print Name)

Training Session Record

Please read, sign and follow the instruction (s) below.

Subject: Confidentiality, Ethics and Integrity Training to include proper laboratory practices with an understanding of examples and consequences for falsifying data or sharing confidential information. Falsifying data can lead to written warning, termination, business closure, and/or civil or criminal prosecution. It is my responsibility to report to my supervisor (anonymously if I prefer) any acts that could lead to the falsifying of data.

I agree that I understand the procedure referenced above and have attended a training session for its proper implementation.

Staff Member Name	Date	Signature	Staff Member Name	Date	Signature

SUBCONTRACTORS

CONFIDENTIALITY, ETHICS AND DATA INTEGRITY AGREEMENT

I. I, _____ *(Name)*, authorized representative of

_____(Subcontractor) state that I understand the standards of integrity required of me and the Subcontractor with regard to the duties performed and the data reported in connection with the analysis/analyses contracted by Spectrum Analytical, Inc. Rhode Island Division.

II. Subcontractor agrees that in the performance of analysis for Spectrum Analytical, Inc. Rhode Island Division:

A. Subcontractor shall not intentionally report data values or results that are not the actual values measured or observed;

C. Subcontractor shall not modify data values unless the modification can be technically justified through a measurable analytical process;

D. Subcontractor shall not intentionally report the dates and times of data analyses that are not the true and actual dates and times of analyses; and

D. Subcontractor shall not intentionally represent another's work as its own.

III. Subcontractor agrees to report immediately any accidental or intentional reporting of non-authentic data to Spectrum Analytical, Inc. Rhode Island Division.

IV. Subcontractor agrees not to divulge any pertinent information including but not limited to data and information about any Spectrum Analytical, Inc. Rhode Island Division projects to outside sources without the prior consent from Spectrum or its clients.

I understand that failure to comply with the above ethics and data integrity agreement can result in immediate termination of the subcontract relationship with Spectrum Analytical, Inc. Rhode Island Division.

_____ _____

(Signature) *(Date)*

_____

(Name)

_____

(Title)

Confidentiality Agreement for External Audits

During the course of the laboratory audit/assessment certain information may become available to the auditor/assessor that is confidential.

All sample-related and project-related information at Spectrum Analytical, Inc. Rhode Island Division is confidential between Spectrum Analytical, Inc. Rhode Island Division and its client.

Any information obtained during the course of this audit/assessment may be used for audit/assessment purposes only.

No information obtained during the course of this audit/assessment may be disclosed by the auditor/assessor to any outside party, regardless of affiliation with the auditor/assessor.

Auditor/Assessor (signature): _____

(Print name): _____

(Date):_____

Company/organization name: _____

QAF.0014

Spectrum Analytical, Inc. RI Division
Resumes of Key Personnel

APPENDIX C

YIHAI DING
Laboratory Director

Mr. Ding has experience in a wide variety of analytical chemistry techniques, including GC, GC/MS, HPLC and FTIR. His expertise includes the operation, calibration and maintenance of sophisticated analytical instrumentation, and the efficient operation of state of the art environmental service laboratories.

Mr. Ding's responsibilities as Laboratory Director at Spectrum Analytical, Inc. Featuring Hanibal Technology Rhode Island Division, involves the daily coordination of all laboratory sections to insure the production of high quality data meeting customer's technical and schedule requirements. His duties in this role include overseeing department supervisors and analysts in the daily calibration, maintenance and troubleshooting of analytical instruments, monitoring schedules and holding times, analysis of samples, review of sample and QC data. He also is involved with the implementation of Standard Operating Procedures, documentation of instrument and method QC criteria and development of new methods and implementation of new analytical technology.

Mr. Ding's prior experience includes research into the mechanisms and kinetics of various biochemical processes. A large portion of this research has required the analysis of reactants and products using state-of-the-art chemical instrumentation. Mr. Ding has also taught chemistry and biochemistry laboratory courses at the university level.

EDUCATION

MIDDLE TENNESSEE STATE UNIVERSITY
Murfreesbro, Tennessee
- Chemistry, MS

JILIN UNIVERSITY
Changchun, China
- Biochemistry, BS

RELATED EXPERIENCE

2005-present

Spectrum Analytical, Inc., Featuring Hanibal Technology, Rhode Island Division (formerly Mitkem)
- Laboratory Director

2005 **STL LABORATORIES**
Savannah, Georgia
- Supervisor of Semi-Volatile GC and GC/MS
- GC/MS Analyst
- GC/ECD Analyst

1998-2005 **MITKEM CORPORATION**
Warwick, Rhode Island
- GCMS Supervisor for both Volatile Organics and Semi-Volatile Organics Laboratories
- GC/MS Analyst

1994-1998 **MIDDLE TENNESSEE STATE UNIVERSITY**
Murfreesboro, Tennessee
- Researcher
- Laboratory Instructor, chemistry and biochemistry

1993-1994 **NATIONAL ENZYME ENGINEERING LAB**
Changchun, China
- Researcher

SHARYN B. LAWLER

Quality Assurance Director

Ms. Lawler has over twenty years of experience in the environmental laboratory industry. She has experience in implementation, operation and management of QA systems operating under USEPA, US Army Corps of Engineers and NELAC programs.

Ms. Lawler's responsibilities as Quality Assurance Director include development and implementation of the Quality Assurance Plan and Standard Operating Procedures. Her duties include interacting with federal and state regulatory officials in the acquisition and maintenance of laboratory certifications. She is also responsible for managing Spectrum Analytical, Inc. Rhode Island Division's document control program. Ms. Lawler performs both internal and external audits as well as overseeing the corrective action system, training program and evaluating QC check samples.

Previously Ms. Lawler was a senior data reviewer, where she was responsible for final QA/QC review of organic, metals and wet chemistry data. She insured final data met all method and in-house QC criteria prior to release to the customer, and that any issues were documented and described for inclusion in case narratives. A significant portion of this work involved review of full CLP-format data deliverables packages, both for standard as well as non-routine analyses. Prior to Spectrum Analytical Inc., Ms. Lawler worked for two CLP laboratories where she held positions including senior data review specialist, CLP Organics Task Manager and analyst in several laboratory sections.

EDUCATION:

UNIVERSITY OF MASSACHUSETTS
Amherst, Massachusetts
Independent Conc., Coastal Plant Ecology, BS

RELATED EXPERIENCE:

1997-Present

Spectrum Analytical Inc., Featuring Hanibal Technology, RI Division (formerly Mitkem)
- QA Director
- Senior Data Reviewer

1988-1997 **NATIONAL ENVIRONMENTAL TESTING**
Bedford, Massachusetts
- Senior Data Reviewer
- CLP Organic Task Manager

1983-1988 **CAMBRIDGE ANALYTICAL ASSOCIATES**
Boston, Massachusetts
- CLP Organic Task Manager
- Semivolatiles Analyst
- Preparation Laboratory Analyst

EDWARD A. LAWLER

Business Development Coordinator /Sr. Project Manager

Mr. Lawler has over thirty years of experience in environmental laboratory operations. He has extensive experience in managing laboratory workflow and in establishing and maintaining customer relationships. He also has considerable experience in a wide range of environmental chemical analyses, with a concentration in trace level volatile organics analysis.

As Business Development Coordinator, Mr. Lawler is responsible for securing contracts and BOA agreements with clients as well as pursuing new contracts and bids. He also works closely with lab staff to ensure they are aware of specific data deliverable requirements for new projects.

As Senior Project Manager, Mr. Lawler manages certain significant analytical testing programs, acting as principal technical liaison with the client. His extensive experience in laboratory data review allows him to ensure QA/QC criteria have been achieved, as well as preparing project narratives detailing these findings to the client.

Mr. Lawler's past responsibilities as Deputy Director for Quality Services included the prioritization of all analytical chemistry testing at Spectrum Analytical, Inc. Rhode Island Division. This included daily meetings with laboratory supervisors and managers to insure all technical and schedule requirements were met.

Mr. Lawler's previous experience includes various staff, management and senior management positions at several environmental testing laboratories. Direct project experience includes EPA CLP, Army MRD, Navy NEESA and NFESC, DOD HAZWRAP and New York DEC ASP programs. Mr. Lawler has also provided expert testimony at several Superfund trials including pre-trial consulting and trial witness services.

EDUCATION: **UNIVERSITY OF MASSACHUSETTS**
Amherst, Massachusetts
Environmental Sciences, BS 1977

RELATED EXPERIENCE:

1997- Present	**Spectrum Analytical Inc., Featuring Hanibal Technology, Rhode Island Division (formerly Mitkem)** - Business Development Coordinator - Senior Project Manager - Deputy Director for Quality Services - Operations Manager
1989-1997	**NATIONAL ENVIRONMENTAL TESTING, CAMBRIDGE DIVISION** Bedford, Massachusetts - Division Manager - Proposal/Contract Manager - Director of Project Management
1983-1989	**CAMBRIDGE ANALYTICAL ASSOCIATES, INC.** Boston, Massachusetts - Project Manager - Volatile Organic Laboratory Manager
1978-1983	**ENERGY RESOURCES COMPANY, INC. - ERCO** Cambridge, Massachusetts - Volatile Organics (GC) Manager - Analytical Chemist-Volatile Organics Lab - Analytical Chemist-Organic Preparation Lab
1978	**LAPUCK LABORATORIES, INC.** Watertown, Massachusetts - Analytical Chemist-Wet Chemistry & Metals - Microbiologist

SCOTT P. HUNTLEY

IT Manager

Mr. Huntley has over twenty years experience in the environmental testing field. He has considerable experience in computer sciences and had been involved, throughout his career, in the setup and implementation of several Laboratory Information Management Systems (LIMS) and automated data reduction systems. Mr. Huntley's responsibilities include the set-up and validation of automated data transfer, reduction, storage, evaluation and reporting programs within Spectrum Analytical, Inc. RI Division's LIMS. He also is responsible for set-up of the electronic data delivery capabilities as well as the control charting capabilities of this system.

Previously Mr. Huntley has held several supervisory positions in environmental laboratories focusing on CLP and other DOD analytical programs. He has a wide range of experience in routine and state of the art analytical programs and methods. Mr. Huntley is experienced in the use of automated data transfer and reduction systems and laboratory automation techniques.

EDUCATION:

RHODE ISLAND COLLEGE
Providence, Rhode Island
Chemistry, BS
Computer Science, BS

RELATED EXPERIENCE:

1999-Present	**Spectrum Analytical, Inc., Featuring Hanibal Technology, RI Division (formerly Mitkem)** MIS Senior Systems Analyst
1996-1999	**MITKEM CORPORATION** Warwick, RI - Senior Chemist - Organic Lab Manager
1991-1996	**EA LABORATORIES** Sparks, MD

- Supervisor of Organic Chemists

1989-1991 **CEIMIC CORPORATION**
Narragansett, RI
- Night shift supervisor

1986-1989 **RI ANALYTICAL LABORATORIES**
Providence, RI
- GC Chemist

Catherine L. Mosher

Organics (SVOA/VOA) Department Manager

Ms. Mosher has experience in a wide variety of analytical chemistry techniques, including GC/FID and GC/MS. Her expertise includes the operation, calibration and maintenance of sophisticated, computer controlled instrumentation. Her expertise also includes analyses and QA review of forensics extended alkylated PAH and Biomarker analyses.

Ms. Mosher is employed as the Organics Department Manager in Spectrum Analytical Inc. Rhode Island Division, and oversees both the Volatile and Semivolatile departments. Ms. Mosher's responsibilities involve the coordination of organics analyses using GC/MS and GC instrumentation following both US EPA CLP and SW846 protocols. Her duties in this role include supervising analysts in the daily calibration, maintenance and troubleshooting of analytical instruments, monitoring schedules and holding times, analysis of samples, review of sample and QC data. She is involved with the implementation of Standard Operating Procedures, documentation of instrument and method QC criteria and development of new methods and implementation of new analytical technology. Ms. Mosher also insures the production of organic data is coordinated with other laboratory sections.

EDUCATION

Community College of Rhode Island
Warwick, Rhode Island
Certificate of Chemical Technology - 1991

RELATED EXPERIENCE

02/2007-Present

Spectrum Analytical Inc., Featuring Hanibal Technology, Rhode Island Division (formerly Mitkem)
- Manager, SVOA Department
- Senior Scientist, SVOA Laboratory

05/2005 – 12/2006

Alpha Woods Hole Laboratories
Raynham, MA
- Development of Volatile Air Laboratory

- Supervisor for Organics analyses including GC/MS VOA and SVOA, ECD's and FIDs
- Forensic Team Leader

03/1997 – 05/2005 **Woods Hole Group Laboratories**
Raynham, MA
- Forensic Team Leader
- GC/MS Group Leader

04/1996 – 03/1997 **Inchcape Testing**
New Bedford and Raynham, MA
- Semivolatile analyst
- Volatile analyst

09/1991 – 04/1996 **Energy and Environmental Engineering Inc.**
Somerville, MA
- Semivolatile GC/MS Supervisor
- GC-Pesticide/PCB analyst

01/1989 – 09/1991 **New England Testing Laboratory**
North Providence, RI
- Senior Chemical Technician - including Organic, Inorganic, Metals, and Microbiology analyses

10/1987 – 09/1988 **Rhode Island Analytical Laboratory**
Warwick, RI
- Chemical Technician

HUIYAN HEATHER ZHAO-ANDERSON
Inorganics Department Manager

Ms. Zhao-Anderson is employed as the Manager in Spectrum Analytical Inc. Rhode Island Division's Inorganics Department. Ms. Zhao-Anderson's responsibilities involve the coordination of metals and wet chemistry analyses using ICP/MS, ICP/AES and a variety of other instrumentation following both US EPA CLP and SW846 protocols. Her duties in this role include supervising analysts in the daily calibration, maintenance and troubleshooting of analytical instruments, monitoring schedules and holding times, analysis of samples, review of sample and QC data. She is involved with the implementation of Standard Operating Procedures, documentation of instrument and method QC criteria and development of new methods and implementation of new analytical technology. Ms. Zhao-Anderson also insures the production of inorganics organic data is coordinated with other laboratory sections. Prior to managing the inorganic department, Ms Zhao-Anderson was the department manager of our volatile organics laboratory for several years.

EDUCATION

Yale University
New Haven, CT
School of Forestry and
Environmental Study, MS 2005

Peking University
Beijing, China
Environmental Science and Economics
BS 2002

RELATED EXPERIENCE

09/2005 -Present

Spectrum Analytical Inc., Featuring Hanibal Technology, Rhode Island Division (formerly Mitkem)
- Manager, Inorganic Department
- Manager, VOA Department
- GC/MS Chemist, VOA Laboratory

DAWNE SMART

Data Reviewer, Project Manager, Data Reporting Supervisor

Ms. Smart's responsibilities as project manager involve the management of Spectrum Analytical Inc. Rhode Island Division's EPA Contract Laboratory Program (CLP) analytical services contract for ISM. This includes the daily oversight of incoming samples, maintenance of chain of custody documentation and communication records and resolution of any discrepancies or other issues involving CLP ISM sample assignments. Her responsibilities also include ongoing communication with EPA, sampler and CSC personnel, as well as monitoring data delivery schedules, writing project narratives and finalizing case communication.

Ms. Smart also is currently supervising the Data Reporting staff. She oversees the staff that generates data packages for all inorganic and organic fractions for different levels of report packages that will then go to data review personnel. Additionally, she and her staff are responsible for final report generation when all fractions of a project are completed, including bookmarking, pagination, final package posting to the website and hard copy report mailing if applicable.

Ms Smart also reviews sample and QC data, and completed CLP data packages for both organic and inorganic programs. Ms. Smart has extensive experience in Data Review as well as Quality Assurance. A significant portion of her previous employment included management of the Data Review department as well as the on-site QA Specialist for a major specialized laboratory.

EDUCATION

COMMUNITY COLLEGE of RHODE ISLAND
Warwick, Rhode Island
Certificate of Chemical Technology - 1991
Associate in Applied Science - 1997

RELATED EXPERIENCE

2007-Present

Spectrum Analytical Inc., Featuring Hanibal Technology, Rhode Island Division (formerly Mitkem)
- Data Reporting Supervisor
- ISM Contract manager

	-Manager, Metals Department -Supervisor, Inorganic Department
1999 – 2007	**ALPHA WOODS HOLE LABORATORIES** Raynham, Massachusetts -QA Specialist -Manager, Data Review Department
1996 – 1999	**ANALYTICAL BALANCE COMPANY** Middleboro, Massachusetts - Department Head, Metals Analysis
1995 – 1996	**FOXBORO COMPANY** West Bridgewater, Massachusetts - Chemist
1988 – 1995	**NEW ENGLAND TESTING LABORATORY** North Providence, RI - Senior Laboratory Technician - Laboratory Technician
1987 – 1988	**RHODE ISLAND ANALYTICAL LABORATORIES** Warwick, RI - Metals Preparation Technician - Laboratory Assistant -

AGNES R. HUNTLEY

Project Manager

Ms. Huntley has gained extensive and diversified experience in environmental laboratories using U.S. EPA CLP and SW846 methodologies, as well as participating in US Navy and Army analytical services programs.

Ms. Huntley's responsibilities involve the management of Spectrum Analytical Inc. Rhode Island Division's EPA Contract Laboratory Program (CLP) analytical services contracts. This includes the daily oversight of incoming samples, maintenance of chain of custody documentation and communication records and resolution of any discrepancies or other issues involving CLP sample assignments. Her responsibilities also include ongoing communication with EPA, sampler and CSC personnel, as well as monitoring data delivery schedules, writing project narratives and finalizing case communication. Ms. Huntley has managed four contracts with the EPA, which included one Organics Low Concentration (OLC), two Organics Low/Medium Concentration (OLM) and one Inorganics Low/Medium Concentration (ILM) analytical services contracts. At present Ms. Huntley manages the Organics Multi-Media, Multi-Concentration (SOM01.2) Analytical Services Contract.

Previously, Ms. Huntley held the position of QA/QC Manager where her responsibilities included the development and implementation of Standard Operating Procedures, documentation of instrument and method performance using Method Detection Limit studies, and routine review of final laboratory data reports, review of analyst training and performance data and management of the corrective action system. Her duties also included interaction with federal and state regulatory officials in the acquisition and maintenance of laboratory certifications.

Prior experience includes management of the daily operations of the Organic Preparation Laboratory. Duties in this position included monitoring sample backlog, holding times, process work flow, and delivery due dates. Ms. Huntley also developed and implemented new test methods, trained laboratory staff, performed instrument maintenance and reviewed sample and QC data. Prior to joining Spectrum Analytical Inc. Ms. Huntley worked as an analytical chemist at NET Cambridge Division performing analyses under a wide variety of programs including Army COE, Navy NEESA, DOE HAZWRAP and EPA CLP.

EDUCATION

SIMMONS COLLEGE
Boston, Massachusetts
- Chemistry, BS
- Mathematics, BS

RELATED EXPERIENCE

1997-Present	**Spectrum Analytical, Inc., Featuring Hanibal Technology, Rhode Island Division (formerly Mitkem)** - Project Manager, SOM Contract manager - Supervisor, Sample Receiving Department
1997-2008	**MITKEM CORPORATION** Warwick, Rhode Island - CLP Project Manager - QA/QC Manager - Manager, Sample Preparation Laboratory
1995-1997	**NATIONAL ENVIRONMENTAL TESTING** Bedford, Massachusetts - Chemist, Organic Preparation
1992-1995	**SIMMONS COLLEGE CHEMISTRY DEPT.** Boston, Massachusetts - Teaching Assistant, Chemistry Department

QAP Revision Page:

Rev 1 (02/01/2013): Included Facility floor plan, Updated Org Chart, updated equipment list, DW metals reporting requirements per 310 CMR 42

APPENDIX C

EDV's Quality Assurance/Quality Control Plan
and
Dr. Maxine Wright-Walters Curriculum Vitae.

QUALITY ASSURANCE/QUALITY CONTROL PLAN FOR DATA VALIDATION SERVICES

EDV, INC
ENVIRONMENTAL DATA VALIDATION, INC

Corporate
1326 Orangewood Avenue
Pittsburgh, PA 15216
Phone-412-341-5281
Fax- 412-571-1932

Office Location
7712 Tuscarora Street
Pittsburgh, PA 15221
Phone-412-242-5200
Fax-412-242-5210

WEB PAGE: http://www.edv-inc.com

QUALITY ASSURANCE/QUALITY CONTROL PLAN FOR DATA VALIDATION SERVICES

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QUALITY ASSURANCE/QUALITY CONTROL PLAN FOR DATA VALIDATION SERVICES

OVERVIEW

Environmental Data Validation Inc. (hereinafter referred to as EDV) is a certified small, woman-owned, disadvantaged, data validation and consulting business specializing in Environmental, Public Health and Scientific Research, Analytical data validation, Environmental consulting and Total environmental quality. Our motto is to deliver quality work on a timely basis. Established in 1990, EDV has kept its pace with changes and procedures in the environmental arena.

EDV is comprised of scientists and technical experts who specialize in environmental health and safety training & occupational health and safety consulting, building inspections, environmental site assessments, chemical and radiochemical data validation, environmental health and safety consulting, risk assessment, hazard assessment, exposure assessments, environmental health assessments, ecological risk assessments, epidemiological/environmental study design and quality consulting. Our consultants are from the academic arena or private sector and include; environmental scientists, industrial hygienists, epidemiologists, toxicologist, public health specialists and environmental engineers, chemists, biologists and health and safety specialists.

As part of our commitment to quality and the environment, EDV established an Environmental Management System based on the ISO 14000 standard and an Environmental Policy Statement; the blue print on which the company operates, and the basis for the environmental management system. The Environmental Policy Statement in integrated in our QA/QC program.

ENVIRONMENTAL POLICY STATEMENT

Environmental Data Validation Inc is committed to developing, implementing, reviewing and maintaining an environmental management system, wherein the organizational structure, processes and resources are sufficient to continually measure, monitor and improve our environmental performance.

EDV understands that all activities, products or services can impact the environment. It is our policy to use practices and materials that can reduce, avoid or control pollution, which may include recycling, efficient use of resources and material substitution.

EDV will:

- adhere to all relevant environmental regulations and laws
- integrate this policy with its Quality policy
- seek to continually improve our overall environmental impact to our customers and the community
- adhere to integrity and high ethical standards

QUALITY ASSURANCE/QUALITY CONTROL PLAN FOR DATA VALIDATION SERVICES

INTRODUCTION

Quality Assurance (QA) plays a critical role in the generation and use of environmental data. QA activities ensure that the environmental sampling and analysis process is verified and documented so that the uncertainties in the resulting data can be controlled and quantified. In this way, the information gained from QA activities allows a data end user to determine whether the data are good enough to support their intended use.

Our motto is to deliver quality work on a timely basis. Our size and technical expertise has allowed us to accommodate our clients on very short notices and quick turnaround times. Our Quality Assurance/Quality Control program was established so as to give our clients formal documentation as to how we perform our validation efforts and the added security of knowing that their data is being handled professionally. As part of our commitment to quality and the environment, EDV established an Environmental Management System based on the ISO 14000 standard and an Environmental Policy Statement, the blue print on which the company operates, and the basis for the environmental management system. The Environmental Policy Statement in integrated in our QA/QC program.

QUALITY ASSURANCE/QUALITY CONTROL PLAN FOR DATA VALIDATION SERVICES

POLICY AND OBJECTIVES

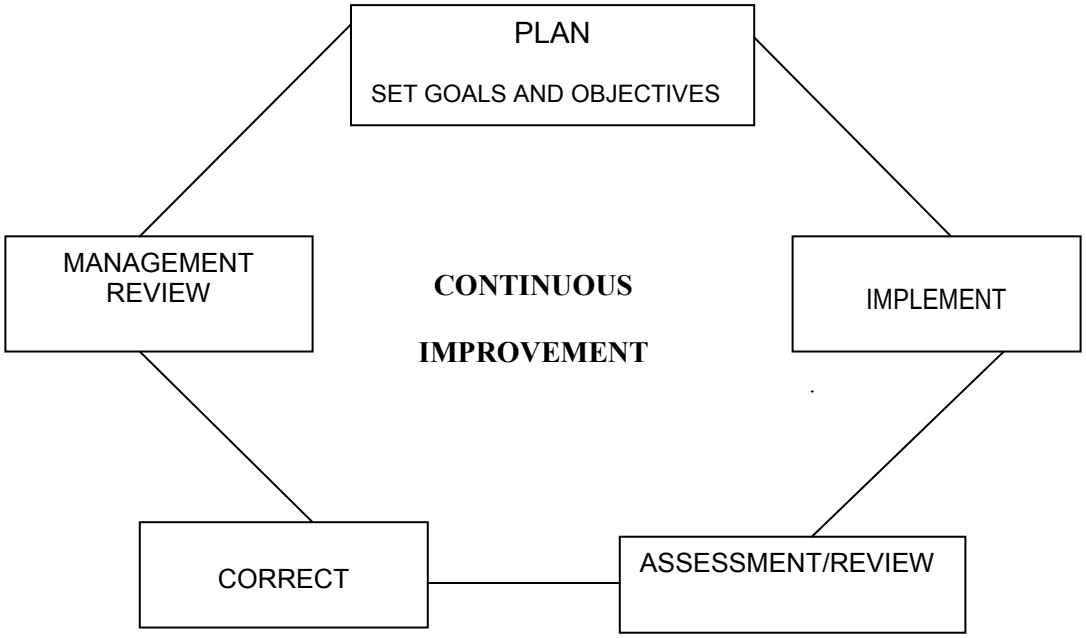
EDV's Quality Assurance/Quality Control (QA/QC) program was established to ensure quality and, validity to the work performed. The **quality assurance program** provides the structure, policies and responsibility for the execution of quality control and quality assessment operations, to assure our clients that defined standards and quality of a stated confidence level are met. The quality **control program** ensures maintenance of the controlled validation, review and data management process. The quality **assessment program** incorporates all the necessary elements to ensure that the quality control system is functioning effectively. To ensure that the highest standard of work is accomplished, EDV strictly adheres to QA/QC guidelines for data validation established by the EPA, in the National Functional Guidelines for Organic Analyses, and the National Functional Guidelines for Inorganic Analyses. Modifications to these guidelines established by various EPA regions or other governing bodies such as NEESA, DOE and AFCEE are utilized on a project specific basis. Our objective is to stay within the limits of data validation as we perform our tasks.

The satisfaction of our clients is most important to us; for this reason, we like to earn their confidence in the work performed by EDV. Our QA/QC program was so designed. This **Quality Assurance Project Plan** (QAPP) is designed based on the QA/QC program. It is important to us that our clients know, EDV's QA/QC system is in place so that their data can be accounted for, at all times, while it is in our hands and, that a thorough and complete job is done in validating the data.

It is the objective of the QAPP to ensure that quality results are produced by our validation efforts and that there is documentation every step of the way to verify this. It is also our objective and, policy to ensure that the results from the validation process are traceable. Our reports are written for easy understanding by the data end user.

QA/QC PROGRAM CYCLE

EDV QA/QC program is based on Continuous Improvement and is reflected in the program's cycle for which the key elements of the system are listed below.



QUALITY ASSURANCE/QUALITY CONTROL PLAN FOR DATA VALIDATION SERVICES

Plan - This is important so that the each department implement the quality policy in accordance with its guiding principles. Here objectives and goals/targets are identified.

Implement - This is necessary to effectively carry out the objectives of the QA/QC program,

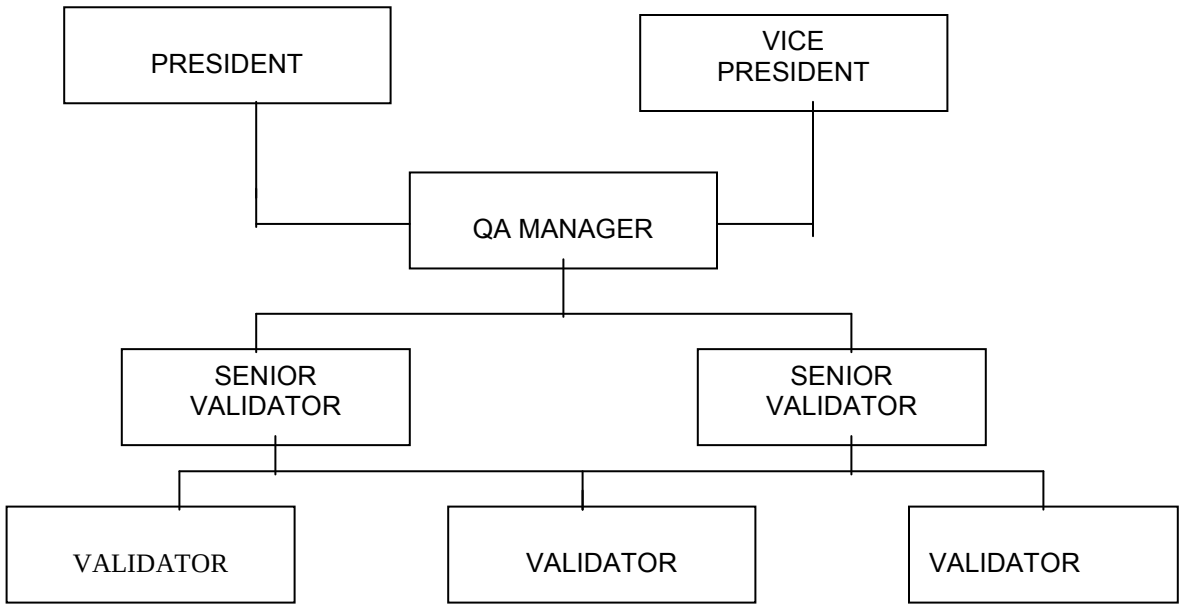
Assess/Review - This is where the policy and objectives of the program are reviewed.

Correct - This is the action necessary to ensure that the policy goals/targets and objectives are met.

Management Review - This is the overall assessment of the QA/QC program by management. From here deficiencies are corrected and continuous improvement enhanced.

QUALITY ASSURANCE/QUALITY CONTROL PLAN FOR DATA VALIDATION SERVICES

QA MANAGEMENT



QA Responsibilities and Reporting Relationships

The QA Management team is reflected above. Reporting goes up the chain of command, that is, the validators report to the senior validators who in turn report to the QA manager who reports to the president or vice president (in the event that the president is absent).

The QA manager is responsible for the overall QA/QC program and implements procedures, changes and corrective actions. The senior validators oversee or mentor the validators. The validators are responsible for data tracking, and overall smooth running of the QA/QC system on a day to day basis.

QA Document Control

This is executed from the time the data package gets to EDV. It is highly important to have this so that we know where things are at all times. We understand the confidential nature of this subcontract and so, a data package or SDG will be assigned to a validator and remain in his/her possession until completed. The assigned validator is responsible for that package until its review is completed

A specific file cabinet will be designated for each subcontract. All documents pertaining to the subcontract will be stored here. The cabinet is fire proof and will be kept locked. The QA manager will hold the keys.

Only validators assigned to the subcontract will handle these data packages. All transfer of data packages will require a signature. When the review process is completed the Log-In notebook, shipping/mailing logbooks will be completed to reflect this. Once the report is received and approved by

the client, the data generated from the package will be backed up electronically and stored for two (2) years. A hard copy will also be stored.

QA Program Assessment Procedures

The QA program will be assessed periodically by the QA manager to ensure that all parameters are within control. Corrective action measures will be taken to remedy any out of control criteria. The program will be assessed to ensure that it is fulfilling its intended purpose. The goal of the program will be reviewed and such items as logbooks, worksheets, reports and re-submittals. The results of our assessment will be tallied and statistically assessed to see if there are any established trends.

PERSONNEL

EDV hires qualified professionals. Each validator holds at least a bachelor's degree and has extensive laboratory experience. These validators are highly trained and are competent and fully experienced to work on any subcontract. Upon hire validators embark upon an extensive training program which includes such topics as: quality assurance project plan (QAPP), chain of custody, laboratory procedures, sample preparation methods, analytical methods, instrumentation, chromatogram interpretation and report writing.

Training Progress

Once every six months a refreshers training program is provided for our validators.

FACILITIES AND EQUIPMENT

EDV has the necessary equipment to successfully perform on any subcontract. We are equipped with computers, calculators, adding machines, a typewriter, a copier, a fax machine and scientific calculators. Our computers have a battery operated backup system in the event of a power failure. Our fax machine is operational 24 hours per day, 7days per week.

These equipments are maintained on a schedule of once per year, or on the manufacturer's suggested schedule. All validators utilize a password to log on to the computer system. This password expires every thirty (30) days, at which point a new one must be selected. All electronic files are backed up on a daily basis. All file cabinets will be locked and the keys secured by the QA manager.

INTERNAL DATA VALIDATION (IDV) PROCEDURES

WHAT IS ANALYTICAL DATA VALIDATION

Analytical data validation is defined as an independent ***systematic*** process for reviewing a body of data against a set of criteria to provide assurance that the level of quality of the data are known and ***documented***. It consists of data screening, checking, auditing, verification and review. It serves two important management functions. First, it reviews the entire data collection, reduction and management process and identifies any errors in the flow of data from the point of generation to the final laboratory report. Second, it compares analytical precision as measured by laboratory duplicates, spikes and calibration standards against guidelines that are available from either analytical method or documents

such as EPA's Functional Guidelines

DOCUMENT CONTROL

Tracking Custody-and Storage

For the SDGs and Certificate of Analysis herein after referred to as Data Package, once received by EDV it will be stamped "received" and dated. The data package will then be logged in the Data Package Log-In notebook. It is also logged into the computer system. It will be logged by client's name, contract number, number of samples, sample matrix(ces), analysis type/parameter, date received, turnaround time and validation protocol to be utilized. All this will be done on the same day that the data package is received by EDV. For data packages received on a Saturday, the same process will be in effect.

Upon completion of the receipt process, the data package will then be distributed to tile relevant data validator(s), who must sign to the receipt of the data package and the number of samples in receipt. The validator will then check with the Data Log-In notebook as well as the computer log-ln for such information as turnaround time, validation protocol and any other pertinent information related to the Data Package. Based on the sample type/parameters, the validator will then obtain the required data validation protocol and worksheets to be used for the project. For this project, general data validation worksheets will be used.

The Data Package can be tracked at all times from the Data Log-In notebook or the computer Data Package Log-In The Data Package remains in the custody of the validator until the data review process is completed. The data packages, when not in use and at the end of each workday, will be locked in the designated file cabinet(s). No outdated SOPs will be utilized for validation.

Logbook Maintenance and Archiving Procedures

Logbooks are maintained as per EDV's in house guidelines for Log Book Maintenance. The guidelines are:

No white outs or erasers of any form are to be used in the logbooks.
All errors must be lined through and the corrected item written above.
All corrections must be initialed and dated.
All entries in the logbooks must be signed
All logbook pages must have a heading and the pages sequentially numbered

All logbooks when full are labeled in bold letters across the cover as to the period for which it was used, that is, the start and end date of the logbook. The full (completed) logbook is stored in fire-proof cabinets, which are stored in the Data Storage room.

SOPs Review, Distribution and Revision

All SOPs for the validation process are reviewed periodically and revised when necessary. The revised edition will clearly state what revision number it is. For every revision done, the same number is

assigned with the letter R# indicating revision number (e.g. SOP LG 3005 at second revision would be LG3005R2). The numbers are assigned in numeric order starting with the number one. The QA manager must approve the revised and original SOPs. A copy of each SOP is distributed to tile data validators for their files.

Documentation or Technical procedures will be revised as necessary. The QA manager will do all revision. Each revision will be stated on the document. Before any revision can take place management personnel must first discuss it. Once a consensus is reached then the QA manager will perform the revision.

INTERNAL DATA VALIDATION (IDV) METHODOLOGY

IDV Procedures

Upon receipt of the data package from the client, the QA manager will check that the work Release is both technically and contractually correct in its entirety. EDV will verify/ that no conflicting information is present. If conflicting information is found EDV will immediately notify the client in writing (within 48 hrs of discovery) before proceeding further. The data package will be stamped "received" and dated. Once all conflicting information is resolved, the data package will then be logged in the Data Package Log-ln notebook. It will be logged by client's name, contract number, number of samples, sample matrix (ces), analysis type/parameter, date received, turnaround time and validation protocol to be utilized.

Upon completion of the receipt process, the data package will then be assigned and distributed to a qualified data validator to perform data validation on each applicable package. The data validator must sign to the receipt of the data package and the number of samples in receipt. **(Only the data validators listed in the Proposal will be allowed to work on the data** packages}. The validator at this point would have already been briefed on the requirements of this subcontract and will then check with the Data Package Log-In notebook for such information as turnaround time, validation protocol, and any other pertinent information related to the data package. The validators will also cross-check the information with the computer Log-In.

Data is generally validated according to the EPA's National Functional Guidelines for Organic Data Review, National Functional Guidelines for Inorganic Data Review, DOE Rocky Flats Plant "Radiochemical Data Validation Guidelines – Gross Alpha/Beta by Gas Proportional Counters", DOE Rocky Flats "Radiochemical Data Validation Guidelines-Analyses by High Resolution Gamma Spectroscopy" and any other relevant modifications of these protocols.

The extent of data validation will be at level IV, which is CLP. All our validation efforts will be documented on worksheets to allow traceability and ensure thoroughness. The worksheets will document any criteria out of limits. Flagging will be done according to the guidelines referenced above. The client will be notified in writing of any contract and or quality assurance criteria, which were not met within 48 hours of discovery. Any corrections made will be done in red ink by drawing a line through the incorrect item, writing the corrected item above, initialing and dating the item.

At the end of the IDV review process, the validation findings will be cross-checked by a secondary validator. If there are discrepancies that cannot be resolved, then a senior validator will check the data package for completeness and accuracy. In the event that the senior validator is unable to find a resolve then, the QA manager will check the package and make a decision. The QA manager will check

all data packages. All corrective action measures will be approved by the QA manager regardless of who initiated them. On this subcontract any one of the assigned validators can initiate a corrective measure after discussion with the QA manager.

DATA VALIDATION REPORT

The data validation report will be prepared based on findings. It will then be reviewed and approved by the Project/QA Manger.

'The data validation report will be in a narrative form and will describe justification of the proposed rejection of any results, problems encountered in the preparation of samples, during data validation and associated corrective actions (including telephone logs for the analytical laboratory and EDV/client). A checklist that inventories the major types of documents received for each SDG from the laboratory, as well as any missing documents will be included in the data validation report. The final data validation report will be paginated and will contain the signature of the Project Manager documenting her review and approval of the data package.

DELIVERY OF SUPPLIES/SERVICES (DELIVERABLES)

The client will receive deliverables based on the turnaround times on the data packages. This could be 3, 7, 14 or 30 days.

QA OVERSIGHT

Data QA is assured through various steps that are in place. The purpose of QA is to ensure that the required elements of the quality control plan are met. Spot checks (internal audits) will be done on notebooks, worksheets and data summary tables. Corrective actions are in place for any inconsistencies found during this internal audit. When an internal audit is done, a report is generated and presented to every validator. (In the case of this subcontract, the report will only be presented to the validators assigned to this project)

Once every six months a performance audit will be done; the validators assigned to this subcontract will be given a set of data (of known results) to evaluate and generate a data validation report and data qualification summary, If the outcome is unsatisfactory, then, the deficient areas are identified and corrective action measures taken. These measures could include retraining.

Within the realm of QA, proper reporting procedures must be adhered to. QA reporting goes up the chain of command (see QA management chart). The QA manager has full responsibility of the QA program and has the power to designate responsibilities to each validator.

QUALITY ASSURANCE/QUALITY CONTROL PLAN FOR DATA VALIDATION SERVICES

Corporate Qualifications

Maxine Walters

Maxine Walters has 21 years extensive experience in analytical chemistry. Her expertise in data validation includes all types of parameters such as volatile target compounds (TCL), semi-volatile target compounds, pesticide/PCBs, dioxins & furans, conventional general/wet chemistry, TAL metals, leachate and reactivity characteristics (TCLP) priority pollutants-metals & organics; radiological parameters including gross alpha/beta, gamma spectroscopy parameters; thermal ionization mass spectroscopy, fluorometric uranium, alpha spectroscopy-strontium 89/90; alpha spectrometry- thorium-237, uranium-234, 238, neptunium-237, plutonium-238, 239, 240, americium-241 and curium-242, 243, 244 and, liquid scintillation counting parameters-tritium.

Her other experience includes QA/QC consulting for a variety of private sector clients as well as for state and federal programs, development of QAPPs, SAPs and SOPs for standard and non-standard methods, laboratory training, data usability assessment and general project management.

Professional Qualifications

Ms. Walters has 21 years experience in environmental/analytical chemistry. This includes 16 years extensive experience in analytical data validation (CLP and non-CLP), development of Data Quality Objectives, development of QA/QC and laboratory training programs, remedial investigation/feasibility studies (RI/FS), QAPPs and SAPs development. Ms Walters has 19 years project management experience and 9 years in depth research experience, which includes instrumentation and advance organic chemistry.

Linda Wright

Linda Wright has 15 years extensive experience in analytical chemistry. Her expertise in data validation includes all types of parameters such as volatile target compounds (TCL), semi-volatile target compounds, pesticide/PCBs, dioxins & furans, conventional general/wet chemistry, TAL metals, leachate and reactivity characteristics (TCLP) priority pollutants-metals & organics; radiological parameters including gross alpha/beta gamma spectroscopy parameters; thermal ionization mass spectroscopy, fluorometric uranium, alpha spectroscopy-strontium 89/90; alpha spectrometry- thorium-237, uranium-234, 238, neptunium-237, plutonium-238, 239, 240, americium-241 and curium-242, 243, 244 and, liquid scintillation counting parameters-tritium.

Her other experience includes QA/QC consulting for private sector clients as well as for state and federal programs, development of SOPs for standard and non-standard methods, laboratory training and chemical analyses.

Professional Qualifications

Ms. Wright has 15 years experience in environmental/analytical chemistry. This includes 12 years extensive experience in analytical data validation (CLP and non-CLP). Ms Wright has 7 years project management experience and 5 years environmental/radiochemical analytical chemistry experience, which includes instrumentation and advance organic chemistry.

QUALITY ASSURANCE/QUALITY CONTROL PLAN FOR DATA VALIDATION SERVICES

Gay Webber

Gay Webber has 13 years extensive experience in environmental/analytical chemistry. Her expertise in data validation includes all types of parameters such as volatile target compounds (TCL), semi-volatile target compounds, pesticide/PCBs, PCB-congeners, dioxins & furans, conventional general/wet chemistry, TAL metals, leachate and reactivity characteristics (TCLP) priority pollutants-metals & organics; radiological parameters including gross alpha/beta, gamma spectroscopy parameters; thermal ionization mass spectroscopy, fluorometric uranium, alpha spectroscopy-strontium 89/90; alpha spectrometry- thorium-237, uranium-234, 238, neptunium-237, plutonium-238, 239, 240, americuium-241 and curium-242, 243, 244 and, liquid scintillation counting parameters-tritium.

Professional Qualifications

Ms. Webber has 12 years experience in environmental/analytical chemistry. This includes 7 years extensive experience in analytical data validation (CLP and non-CLP). Ms Webber has 7 years project management experience and 7 years radiochemical data validation experience, which includes instrumentation.

Beverly King

Beverly King has 15 years extensive experience in environmental/analytical chemistry. Her expertise in data validation includes all types of parameters such as volatile target compounds (TCL), semi-volatile target compounds, pesticide/PCBs, PCB-congeners, dioxins & furans, conventional general/wet chemistry, TAL metals, leachate and reactivity characteristics (TCLP) priority pollutants-metals & organics. Radiological parameters including gross alpha/beta and liquid scintillation counting parameter-tritium.

Professional Qualifications

Ms. King has 15 years experience in environmental/analytical chemistry. This includes 12 years extensive experience in analytical data validation (CLP and non-CLP). Ms. King has 7 years project management experience and 4 years radiochemical data validation experience, which includes instrumentation.

Denise L. McGuire

Experience Summary

Denise McGuire has 15 years extensive experience in analytical chemistry, laboratory audits and general QA/QC data management. Her expertise in data validation includes all types of parameters such as volatile target compounds (TCL), semi-volatile target compounds, pesticide/PCBs, PCB-congeners, dioxins & furans, conventional general/wet chemistry, TAL metals, TCLP, priority pollutants-metals & organics; radiological parameters including gross alpha/beta gamma spectroscopy parameters; thermal ionization mass spectroscopy, fluorometric uranium, alpha spectroscopy-strontium 89/90; alpha spectrometry- thorium-237, uranium-234, 238, neptunium-237, plutonium-238, 239, 240, americium-241 and curium-242, 243, 244 and, liquid scintillation counting parameters-tritium.

She has extensive experience in the environmental consulting and laboratory services field. This experience has included data validation experience interpreting organic, inorganic, radiological, and chemical warfare agent analytical data; managing and procuring subcontracted analytical laboratories; coordinating field sampling crews; generation and review of site-specific Field Sampling Plans, Quality

QUALITY ASSURANCE/QUALITY CONTROL PLAN FOR DATA VALIDATION SERVICES

Assurance Project Plans (QAPPs), Standard Operating Procedures (SOPs), and Remedial Investigation/Feasibility Study (RI/FS) and Data Validation reports; field data collection and environmental sampling; training and supervision of technical personnel; and field and laboratory auditing. In addition, I have designed a data management system for all projects producing analytical data. The data management system ensures quality data by incorporating quality assurance procedures, data tacking, documentation, and multitask data usage.

CURRICULUM VITAE

Maxine Wright-Walters, PhD

Educational Background

University of Pittsburgh Graduate School of Public Health Pittsburgh, PA	2008 PhD. Environmental and Occupational Health (EOH)/Environmental Health Sciences (EHS) Dissertation Topic: Exposure Concentrations of Pharmaceutical Estrogens and Xenoestrogens in Municipal Wastewater Treatment Plant Sources, the Aquatic Environment and an Aquatic Health Risk Assessment of Bisphenol-A: Implications for Wildlife and Public Health
Duquesne University Pittsburgh, PA	1997 MSc. Environmental Science & Management Internship: Allegheny County Emergency Preparedness, and Response Center, Pittsburgh PA
New York Institute of Technology, Old Westbury, NY	1989 BS, Chemistry,
University of Technology (College of Arts Science and Technology) Jamaica W.I.	1986 Diploma in Pharmacy Thesis: Antimicrobial Properties of the *Mimosa Pudica* and its effect on the *neissera gonorrhea* organism.

Additional Training

RAB Certified EMS Lead Auditor	1998
American Chemical Society's short course in Microwave Enhanced Chemistry	1997
ISO 14000 Lead Auditor	1997
ISO 9000 auditor	1997
PACS data Validation	1997
Radiochemistry	1989
Radioactivity safety	1989
OSHA 40hr Health and Safety	1987
Data Validation	1987

Employment History

1991-present — President/Project Manager, EDV, Inc., PA

Responsible for the day to day operation and management of this small environmental consulting business. Duties include: Recruiting and mentoring of staff, budgeting, marketing, environmental consulting to include development of Data Quality Objectives (DQOs), development of QA/QC and laboratory training programs and manuals, laboratory auditing, remedial investigation/feasibility studies (RI/FS), QAPPs and SAPs development. Environmental Health Assessments and Risk Assessments, ISO 9000 consulting to include implementation, training and auditing of quality systems, ISO 14000 consulting to include implementation, training and auditing of Environmental Management Systems (EMS). Environmental Health and Occupational Safety training and consulting. Laboratory consulting to include development of Good Laboratory Practices (GLP), methods development, auditing and training. Data validation of all types of parameters such as volatile target compounds (TCL), semi-volatile target compounds, pesticide/PCBs, dioxins & furans, conventional general/wet chemistry, TAL metals, leachate and reactivity characteristics (TCLP) priority pollutants-metals & organics; radiological parameters including gross alpha/beta,. gamma spectroscopy parameters; thermal ionization mass spectroscopy, fluorometric uranium,, alpha spectroscopy-strontium 89/90; alpha spectrometry- thorium-237, uranium-234, 238, neptunium-237, plutonium-238, 239, 240, americium-241 and curium-242, 243, 244 and, liquid scintillation counting parameters-tritium. QA/QC consulting under various programs such as CERCLA (superfund), RCRA and Brownfield. Sales, proposal writing, and general project management. Conduct training courses at college and professional levels in areas such as: QMS (ISO 900:2000), EMS (ISO 14001) implementation, Introduction to ISO 14001, ISO14001 Internal auditing, laboratory auditing, organic/inorganic and radiochemical data validation and many others.

1990-1991 — Senior Chemist, Ecotek LSI, GA

As a senior chemist responsibilities included; method development, troubleshooting, writing of SOPs for Sample Preparation laboratory and QC department, writing of training manuals; QC compliance and surveillance audits; radiological and chemical data validation for parameters such gross alpha/beta, . gamma spectroscopy parameters; thermal ionization mass spectroscopy, fluorometric uranium spectroscopy-strontium 89/90; alpha spectrometry- thorium-237, uranium-234, 238, neptunium-237, plutonium-238, 239, 240, americium-241 and curium-242, 243, 244 and, liquid scintillation counting parameters-tritium; volatile target compounds (TCL), semi-volatile target compounds, pesticide/PCBs, dioxins & furans, conventional general/wet chemistry, TAL metals, leachate and reactivity characteristics (TCLP) priority pollutants-metals & organics.

1989-1990 — Chief Chemist/Safety Officer, Syosset Labs, NY.

Responsibilities for this position included Quality Control, research, method development and validations. Training of new chemists to ensure familiarity and understanding of USP and In House methods. Testing of raw materials, in-process and finished products to confirm non-compliant results obtained by other chemists. Monitor the set-up and testing of all stability samples. Familiar with FDA regulations. Write SOPs, implementation of a Health and Safety program. Ensure the general safety of the building and all its employees within as per OSHA guidelines.

1987-1989 QC Chemist, Nytest Environmental, Port Washington, NY.
As a QC chemist duties included; wet chemistry analysis, organic and inorganic sample extraction and preparation, preparation of base-neutral, acid and pesticide spikes. Analysis of organic compounds via GC/GCMS, data validation of organic compounds such as BNAs, VOAs, Pest/PCBs.

Research

"Antimicrobial Properties of the *Mimosa Pudica* and its effect on the *neissera gonorrhea* organism." Researched the Mimosa Pudica for its antimicrobial properties and looked at its effects on the *neissera gonorrhea* organism. This research was done in 1986 at the Microbiology Department of the University of the West Indies. It was a requirement for final year pharmacy students at the College of Arts Science and Technology.

Research in Organic Chemistry, investigating the different pathways in the synthesis of organic compounds with emphasis on Opium compounds. This Research was done in 1985-1986 at the College of Arts Science and Technology-Pharmacy Department.

Instrumentation research, working specifically with the Gas Chromatograph in determining the relationship between peak areas and concentrations of compounds. This research was done in 1988 and funded by the Life Science Department, New York Institute of Technology.

Professional Training/Teaching

Consad Research, Pittsburgh, PA
Risk Assessment Expert for Department of Labor (DOL) review of risk assessment best practices within various agencies of the Federal government. Consult on drafting an exposure factors and risk characterization handbook that will be used to assist DOL in its risk assessment practices. 2008

GlaxoSmithKline, Pittsburgh, PA
Implementation of a complete ISO 14001 EMS to include executive briefings, baseline assessment, identification of aspects and impacts and chemical inventory and waste management. Internal and Lead auditor EMS training. Environmental Health and Occupational Safety training and consulting. 2006.

United States Department of Energy -National Environmental Technology Laboratory (NETL)
ISO 14001 training course in Implementation, Identifying Aspects and Impacts and Internal and Lead auditing. Environmental Health and Safety training course. 2003.

Tech-Seal, WV
Implementation of a complete EHS program. Auditor internal auditor training. Implementation of an ISO 9000 Quality Management System.2002.

Jefferson Community College, OH
ISO14001/EHS Implementation Consulting and Auditing as part of an ISO9000/14000 Consortia provided by the college to local businesses in the Weirton, WV area. 1998-2002.

Cutler-Hammer Technology, Center, Pittsburgh, PA (A former Westinghouse/DOD facility)
Implementation of a complete ISO 14001 EMS to include; executive briefings, baseline assessment, identification of aspects and impacts, and waste management. Internal and Lead auditor EMS training. Environmental Health and Safety Implementation, training and consulting. Conducted Chemical inventory and audit. The site has been certified in ISO 9001 and 14001. 2001.

Cutler-Hammer, Horsehead, NY (A former Westinghouse/DOD facility):
Implementation of a complete ISO 14001 EMS to include executive briefings, baseline assessment, identification of aspects and impacts and waste management. Internal and Lead auditor EMS training. Environmental Health and Safety training and consulting. The site has been certified in ISO 9001 and 14001. 2001.

Curtiss-Wright, EMD, Cheswick, PA (A former Westinghouse/DOD facility)
Planned and implemented records management system for Marketing, Engineering, and Human Resources using standardized databases for all functions. 2001.

Graduate Appointments

Graduate Assistant: Research Assistant for the Center for Healthy Communities. 2008

Graduate Assistant: Research Assistant for the Community Awareness Allegheny River Stewardship Project. 2007-2008

Graduate Research Assistant: Teaching and Research Assistant for the department of Environmental and Occupational Health 2001-2007

Public Teaching Experience (Public Courses)

Organic Data Validation, 1999-2006
Environmental Health and Safety Program Implementation, 1997-2007
Inorganic/Inorganic Data Validation, 1999-present
Radiochemical Data Validation, 2000-2006
ISO 14001 Implementation, 2002-2005
Environmental Management Systems Auditing, 2000-2004
Quality Management Systems, 2002

Academic Teaching Experience

University of Pittsburgh, PA. Co-Presenter/Co-Instructor: Community Awareness Presentation of the Allegheny River Stewardship Project, Alle-Kiski Health Foundation, Heinz Endowments and Highmark Foundation, 2007

University of Pittsburgh, PA. Guest Lecturer. Exposure Assessment, 2007

University of Pittsburgh, PA. Guest Lecturer. Dose-response Assessment, 2007

University of Pittsburgh, PA. Guest lecturer. Exposure Assessment for Baseline Risk Assessment for Superfund Sites, 2005

University of Pittsburgh, PA. Guest Lecturer. Risk Assessment. 2004-2005

University of Pittsburgh, PA. Guest Lecturer. Risk Communication. 2005

University of Pittsburgh, PA. Guest Lecturer. Chemical Fate and Transport in the Environment, 2004-2005

Duquesne University, PA. Co-instructor. Environmental Management Systems, 1998

Jefferson Community College, OH. Guest Lecturer. ISO 14000 Implementation. 1998-1999

Publication

Maxine Wright-Walters and Conrad Volz. Exposure of aquatic receptors to Bisphenol A: Evidence that current risk models may not be sufficiently protective. Ohio River Basin Conference, Pittsburgh,2008.

Maxine Wright-Walters and Conrad Volz. Pharmaceutical Estrogens and Xeno Estrogens in Municipal Wastewater Treatment Plants: Implications for Wildlife and Humans. Third National Conference on Environmental Science

and Technology. North Carolina A&T State University on September, 2007.pp.80. Abstracts Issue.

Maxine Wright-Walters and Conrad Volz. Pharmaceutical Estrogens and Xeno Estrogens in Municipal Wastewater Treatment Plants: Implications for Wildlife and Humans. "Proceedings of the 2007 National Conference on Environmental Science and Technology", p 103-113. Springer 2009.

Volz, CD., Dabney, B.,Cohen, P., Cude, C., Dooly, I., Kyprianou, R., Malecki, K., Richter, W., Schulman, A., Shaw, S., Vanderslice, J., **Walters, M.**, and Vyas, V., September 2007. Handling Left Censored Water Contaminant Data for Descriptive Statistics and (CDC), Environmental Public Health Tracking Network (EPHT) from the Water Working Group, Non-Detect Subgroup.

R.S. Carruth; **M. Wright-Walters**; N. B. Sussman; B.D. Goldstein. The Use of Relative Risk Greater Than 2.0 in the American Court System. August 2004. International Society of Environmental Epidemiology (ISEE) Conference Proceedings, New York, NY.

Maxine M. Wright-Walters, Nancy B. Sussman, Roger S. Day, Russellyn S. Carruth and Bernard D. Goldstein An Alternative Approach to Determining the Legal Criterion of "More likely than Not" in the Absence of Statistical Significance December 2004. Society of Risk Analysis (SRA) Conference Proceedings, Baltimore, MD.

Charles Tomljanovic, **Maxine Wright-Walters** & Jules Stephensky Anthropogenic Electromagnetic Fields (EMFs) and Cancer: A Perspective. "Risk: Health Safety & Environment "- Vol 8. Pp 287-289. Summer 1997.

Additional Skill

Knowledge and ability to operate the following instruments: GC, GC/MS, ICPMS, HPLC, AA, Potentiometer, Osmometer, Ion Analyzer, UV/IR Spectrophotometer, Mass Spectrophotometer and GPC (automated and manual). Knowledge in ISO 9000, ISO 14000 and regulatory programs such as CWA, CAA, TSCA, FIFRA RCRA, NEPA and CERCLA. Familiar with FDA, DOD, DOE and other federal programs. Proficient in the use of Statistical programs such as SAS and Stata.

Professional Affiliation

Member of the American Chemical Society
Member of the Air and Waste Management Association.
Member of the American Society for Quality
Society of Risk Analysis