QUALITY ASSURANCE PROJECT PLAN QAPP

POST CORRECTIVE MEASURES PROPOSAL (CMP) AND LONG – TERM MONITORING PLAN

PCC-WEST
PONTIAC, MICHIGAN

MID 005 356 902

MARCH 12, 2009
(REVISED JUNE 20, 2012)
REF. NO. 007097 (60)
This report is printed on recycled paper.

QUALITY ASSURANCE PROJECT PLAN (QAPP)

POST CORRECTIVE MEASURES PROPOSAL (CMP) AND LONG-TERM MONITORING
REVITALIZING AUTO COMMUNITIES ENVIRONMENTAL RESPONSE (RACER) TRUST
PONTIAC, MICHIGAN
U.S. EPA ID NUMBER - MID 005 356 902
REVISION NUMBER R4
JUNE 20, 2012

Prepared By: Conestoga-Rovers & Associates (CRA)

Prepared For: RACER Trust

Approved By: _____ Date: 6/28/2012
Deputy Cleanup Manager - RACER
David Favero

Approved By: _____ Date: 6/28/12
Project Manager - CRA
Thomas Kinney

Approved By: _____ Date: 7/2/12
QA Officer – CRA
Paul Wiseman

Approved By: _____ Date: 6/28/12
Field QA Officer - CRA
Michael Coram

Approved By: _____ Date: 7/6/12
Project Manager – TestAmerica
Denise Heckler

QUALITY ASSURANCE PROJECT PLAN (QAPP)

POST CORRECTIVE MEASURES PROPOSAL (CMP) AND LONG-TERM MONITORING
REVITALIZING AUTO COMMUNITIES ENVIRONMENTAL RESPONSE (RACER) TRUST
PONTIAC, MICHIGAN
U.S. EPA ID NUMBER - MID 005 356 902
REVISION NUMBER R4
JUNE 20, 2012

Prepared By: Conestoga-Rovers & Associates (CRA)

Prepared For: RACER Trust

Approved By: Dorothy Leeson Date: 7/5/12
QA Officer – TestAmerica
Dorothy Leeson

Approved By: _____ Date: _____
U.S. EPA Region V
RCRA Project Coordinator
Peter Ramanauskas

Approved By: _____ Date: _____
U.S. EPA Region V
RCRA Quality Assurance Manager

TABLE OF CONTENTS

Page

LIST OF FIGURES
(following text)

LIST OF TABLES
(following text)

LIST OF ATTACHMENTS

QAPP DISTRIBUTION LIST

Peter Ramanauskas	U.S. EPA Region V	1 copy
David Favero	RACER Trust	1 copy
Thomas Kinney	CRA	1 copy
Paul Wiseman	CRA	1 copy
Denise Heckler	TestAmerica	1 copy

1.0 PROJECT DESCRIPTION

The following outlines the overall scope of sampling activities to be performed in accordance with the requirements of the Long-Term Monitoring Plan and any Post Corrective Measures Proposal (CMP) investigations for PCC-West, Pontiac, Michigan facility (Facility). This Quality Assurance Project Plan (QAPP) presents the organization, objectives, planned activities and specific quality assurance/quality control (QA/QC) procedures for this Facility. Specific protocols for sampling, sample handling and storage, chain-of-custody and laboratory and field analyses are described or specifically referenced to related documents. All QA/QC procedures are structured in accordance with applicable technical standards, United States Environmental Protection Agency (U. S. EPA) requirements, regulations, guidance and technical standards. This QAPP has been prepared in accordance with the guidance manual entitled "Region V Model RCRA Quality Assurance Project Plan", May 1993.

1.1 INTRODUCTION

This Revised QAPP has been prepared on behalf of Revitalizing Auto Communities Environmental Response (RACER) Trust by Conestoga-Rovers and Associates (CRA) and includes changes to the August 28, 1998 and March 12, 2009 QAPP.

1.1.1 OVERALL PROJECT OBJECTIVES

The purpose of Post CMP activities is to conduct investigations of any additional suspected areas of concern at the facility to quantify risk to human health and the environment (baseline risk assessment) and to obtain data of sufficient quantity and quality to identify and implement a remedy (if the remedy previously implemented as part of the CMP does not adequately address the risk).

The objectives of Post CMP investigative work plans will be to design the investigations necessary to:

1. characterize the source(s) of hazardous constituents;
2. define the nature and extent of hazardous constituents in environmental media;
3. characterize the potential migration pathways, if any, of hazardous constituents;

4. identify actual or potential environmental receptors;
5. provide the data necessary to complete a risk assessment and the investigation report; and
6. determine whether further remedy implementation is required beyond the remedy previously implemented as part of the CMP is sufficient.

The purpose of the Long-Term Monitoring Plan is to provide the necessary structure for long-term monitoring associated with Corrective Measures at the Facility, as approved by the U.S. EPA Order effective May 24, 2007. Additional sampling may also be associated with any additional investigations and implementing Corrective Measures at the Facility.

1.1.2 PROJECT STATUS/PHASE

A CMP was completed to propose Corrective Measures alternatives for the Facility. The Corrective Measures selected by U.S. EPA were identified in the new Order effective May 24, 2007. The Long-Term Monitoring Plan identifies the long-term monitoring activities required under the new Order. Additional sampling may also be associated with implementing Corrective Measures at the Site, for example monitoring associated with Post-MPE Evaluation.

1.1.3 QAPP PREPARATION GUIDELINES

As previously described, this revision of the QAPP has been prepared in accordance with the "Region V Model RCRA Quality Assurance Project Plan" dated May 1993. In addition, further guidance was received on QAPP preparation at a meeting held with representatives of the U. S. EPA on April 29, 1998.

1.2 SITE/FACILITY DESCRIPTION

The Facility is located in Sections 3 and 4 of Township T2N, Range R10E, City of Pontiac, Oakland County, Michigan. The Facility is generally bordered by South Boulevard to the north, the Grand Trunk Western Railroad to the south, Opdyke Road to the east, and Martin Luther King Jr. Boulevard to the west. Land use to the north of the Facility is

primarily industrial; to the east and south, residential; and to the west, a combination of residential, industrial and commercial.

1.2.1 SURFACE WATER HYDROLOGY

There are no natural surface water bodies at the Facility, but there are two engineered stormwater retention basins (North Retention Pond and Current South Retention Pond). In addition, there was a Former South Retention located on the southern portion of the Facility, but this area was redeveloped in 1995, and the new South Retention Pond was constructed approximately 2,000 feet northwest of the Former South Retention Pond.

There are several natural surface water bodies and intermittent drains surrounding the Facility. In June 2004, the Michigan Department of Environmental Quality (MDEQ) evaluated the stormwater drains located in the vicinity of the Facility (Amy Drain, Hamlin Drain, Levison Drain, and Murphy Creek (Rufe Collier/Bartlett Drain) to determine if these drains are surface waters of the state (MDEQ, 2004). MDEQ did not consider any of these drains to be surface waters of the state at the point they discharge from the Facility.

1.2.2 GEOLOGY

The surficial materials encountered throughout the Facility are comprised of a variable mix of sand, gravel, clay, asphalt, concrete, and other engineering fill. The fill unit ranges in depth from approximately 5 to 15 feet bgs. The fill zones encountered at the Facility are a result of the various phases of construction that have been completed across the Facility since the mid-1920s. Underlying the surficial fill are the extensive glacial clay/till and interbedded sand and gravel units.

A glacial clay/till deposit occurs immediately below the surficial fill materials at the Facility. Based on water well logs of wells at or near the Facility, the clay/till is continuous across the area. The clay/till is comprised of clay, silt, sand, and gravel, and generally displays low to very low hydraulic conductivity.

Consistent with the regional glacial deposition, the lower sand and gravel unit is encountered at the Facility underlying the clay/till and interbedded sand layers. The

lower sand and gravel is identified in both Facility well logs and nearby residential well logs. The unit is at an elevation of approximately 740 feet AMSL, a depth of about 200 to 220 feet below ground surface, and may be as thick as 20 to 80 feet.

The Coldwater Shale is the first bedrock formation encountered below the Facility. The shale is dark brown to black, bituminous, fissile, and finely laminated. Water well records of test wells drilled along the Grand Trunk Western Railroad, south of the Facility, show the shale with associated sandstone and over consolidated clays encountered at a depth of approximately 290 feet below ground surface.

1.2.3 HYDROGEOLOGY

Shallow unconfined perched groundwater has been encountered in several areas of the Facility, generally at depths of approximately 10 to 20 feet bgs. It should be noted, however, that glacial clay till has been encountered in the near surface throughout the Facility. As such, significant groundwater only exists as discontinuous and intermittent perched groundwater. This groundwater is perched above the clay till in layers of engineered fill material or sand (or sand and gravel) seams of limited extent. As the clay till layer is approximately 100 feet thick between the perched groundwater and the interbedded confined sand aquifer, the perched groundwater is not considered to be hydraulically connected with the lower water bearing zones. It is believed that the unconfined water table is not an "aquifer" pursuant to Michigan Act 451, Part 201 and does not exist everywhere at the Facility.

Three sand and sand/gravel aquifers were identified beneath the Facility by Camp Dresser and McKee (CDM) in a report entitled Mathematical Simulation of Groundwater Flow Conditions under GM's Truck and Coach Division, Pontiac, Michigan. These aquifers occur at depths of 120, 150, and 210 feet below ground surface, and are approximately 7, 25, and 50 feet thick, respectively.

The lower sand and gravel aquifer has been encountered underlying the clay/till aquitard at approximately 210 to 220 feet below ground surface, consistent with the regional description of local outwash channels. This aquifer was used to support industrial wells at the Facility and is used by residential wells south of the Facility. The lower sand and gravel aquifer is confined by the clay/till aquitard sequence above. This aquifer may also be confined by the Coldwater Shale below.

The Coldwater Shale is not considered a usable aquifer beneath the Facility. Because it is overlain by the productive lower sand and gravel aquifer, the Coldwater Shale may be considered an aquitard with its relatively low hydraulic conductivity material. Available water well records for wells drilled along the Grand Trunk Western Railroad south of the Facility show the shale encountered at a depth of approximately 290 feet below ground surface (no elevation control was available).

1.3 FACILITY HISTORY

The Facility encompasses approximately 400 acres of land and currently contains the Centerpoint Business Campus, including the Pontiac Assembly Center. The Facility formerly contained the Pontiac Central Manufacturing and Assembly Plant.

Presently, the Facility includes a Validation Center, located at the west end of the Facility; the Pontiac Assembly Center on the eastern portion of the Facility; the Pontiac Centerpoint Campus-Central, which occupies approximately one-third of the former Pontiac Central Manufacturing and Assembly Plant's footprint, a wastewater treatment plant (WWTP) and two stormwater retention ponds.

A summary of historic Facility operations and investigations is presented in the CMP prepared by Conestoga-Rovers & Associates, Inc. and dated April 2006.

1.4 PROJECT OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support decisions made during Post CMP activities and long-term monitoring based on the end uses of the data to be collected. As such, different data uses may require different levels of data quality. There are five analytical levels which address various data uses and the QA/QC effort and methods required to achieve the desired level of quality. Specific laboratory report deliverables and data validation by activity are discussed in Section 9.3.2 and Section 9.2.2, respectively

1.4.1 SPECIFIC OBJECTIVES AND ASSOCIATED TASKS

For Post CMP investigations and long-term monitoring, it will be necessary to gather sufficient information to evaluate the nature and extent of any potential impacts and also to determine whether the potential for health risks via exposure to constituents identified in environmental media at the Facility.

The specific objectives of the data collection at the Facility follow:

Field monitoring will be utilized to determine appropriate sample points, to determine when monitoring wells have stabilized prior to sampling and for health and safety purposes. These types of data include those generated on-site through the use of photoionization, pH/temperature, oxidation-reduction potential (ORP), turbidity, dissolved oxygen, and specific conductance real-time monitoring equipment at the site as well as visual and olfactory evidence. The field data requirements are summarized in Section 1.4.2.1.

Laboratory data will be evaluated as discussed respective work plan(s). The laboratory parameters are summarized in Section 1.4.2.2.

1.4.2 PROJECT TARGET PARAMETERS AND INTENDED DATA USAGES

The following presents the field and laboratory parameters and internal data usages.

1.4.2.1 FIELD PARAMETERS

The field parameters to be measured for groundwater samples consist of pH/temperature, ORP, turbidity, dissolved oxygen, and specific conductance. Soil samples will be screened for volatile organic compounds (VOCs) by monitoring the headspace of a sample using a photoionization detector (HNu or Photovac MicroTip).

1.4.2.2 LABORATORY PARAMETERS

The majority of the laboratory parameters for the Post CMP investigations will consist of the analytes from the U.S. EPA Superfund target compound list (TCL) and target analyte

list (TAL). The TCL list will not include pesticide analysis. The TAL list will not include aluminum, calcium, iron, magnesium, potassium and sodium, which are considered earth metals not related to Facility operations. The Facility TCL/TAL parameter list is presented in Table 1.1. The Long-term Groundwater sampling program will include TCL and select VOC, polynuclear aromatics (PNA), and total lead analysis a subset of the parameters presented in Table 1.1. Sampling parameters associated with the Post-MPE evaluation are also a subset of the parameters presented in Table 1.1. Additional activities requiring laboratory analysis include the characterization of soil drill cuttings and purge water for off-Site disposal. The laboratory parameters include the waste characterization parameters presented in Table 1.2. These parameter tables present the estimated quantitation limits (EQL) for each compound or analyte. All soil data will be reported on a dry weight basis. The EQLs meet the recommended target method detection limits established by the State of Michigan and are supported by the laboratory's method detection limits (MDLs). The Michigan target method detection limits are referenced in absence of any specific U.S.EPA guidance.

1.4.3 DATA QUALITY OBJECTIVES

The intended data quality objectives for this project are presented in Table 1.3.

1.5 SAMPLE NETWORK DESIGN RATIONALE

The Monitoring Program includes groundwater sampling and groundwater elevation monitoring at AOI #53 (former Building 33 Free Product Area), AOI #71 (Burn Pile Area), and AOI #50 (former DUCO Stores tank farm. Additional sampling and analysis at any areas of the Facility will be performed in accordance with this QAPP. Additional details regarding the sample network design rationale and select parameter list are presented in the Long-Term Monitoring Plan. The parameter lists for Post CMP investigations will be developed prior to initiation of investigations.

1.5.1 SAMPLE NETWORK BY TASK AND MATRIX

Sample matrices, analytical parameters and frequencies of sample collection are presented in Table 1.4.

1.6 PROJECT SCHEDULE

Sampling under the Long Term Monitoring Plan will be conducted through 2010. At that time, RACER Trust will re-evaluate the entire Long-Term Monitoring Plan and propose modifications or termination of monitoring if the end points identified in the Long-Term Monitoring Plan have been achieved.

The schedule of analytical activities will include the completion of sample analysis and submittal of preliminary laboratory data within 21 days from laboratory receipt with the final laboratory sample report provided within 28 days of laboratory sample receipt. Data validation will be completed on laboratory data deliverables by CRA within four to six weeks from receipt of the final laboratory report.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

At the direction of the RACER Trust Project Manager, CRA has responsibility for all phases of Post CMP investigations and monitoring activities completed under the Long-Term Monitoring Plan. CRA will perform the field investigation and prepare reports, as required. TestAmerica's Laboratories in North Canton, Ohio (TestAmerica) has been selected as the primary laboratory to provide laboratory analysis in support of Post CMP sampling activities and long-term monitoring. Project management will also be provided by RACER Trust and CRA. The various QA, field, laboratory and management responsibilities of key project personnel are defined below.

2.1 PROJECT ORGANIZATION CHART

The lines of authority for this specific project are presented on Figure 2.1.A1.

2.2 MANAGEMENT RESPONSIBILITIES

Daniel Patulski - U. S. EPA RCRA Project Coordinator

The U. S. EPA RPC is responsible for oversight of the Post CMP investigation and long-term monitoring, and for reviewing and approving this QAPP.

David Favero - RACER Trust Project Manager

The RACER Trust Project Manager is responsible for implementing the project, and has the authority to commit the resources necessary to meet project objectives and requirements. The RACER Trust Project Manager's primary function is to ensure that technical, financial and scheduling objectives are achieved successfully. The RACER Trust Project Manager will provide the major point of contact and control for matters concerning the project. The RACER Trust Project Manager will:

i) define project objectives and develop a detailed work plan schedule;

ii) establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task;

iii) acquire and apply technical and corporate resources as needed to ensure performance within budget and schedule constraints;

iv) orient all field leaders and support staff concerning the projects special considerations;

v) monitor and direct the CRA Project Manager;

vi) develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product;

vii) review the work performed on each task to ensure its quality, responsiveness and timeliness;

viii) review and analyze overall task performance with respect to planned requirements and authorizations;

ix) approve all reports (deliverables) before their submission to U. S. EPA Region V;

x) ultimately be responsible for the preparation and quality of interim and final reports; and

xi) represent the project team at meetings and public hearings.

Thomas Kinney - CRA Project Manager

The CRA Project Manager has overall responsibility for ensuring that the project meets U.S. EPA's objectives and CRA quality standards. The CRA Project Manager or designee will provide assistance to the RACER Trust Project Manager in terms of writing and distributing the QAPP to all those parties connected with the project (including the laboratories). The CRA Project Manager will report directly to the RACER Trust Project Manager and is responsible for technical QC and project oversight. The CRA Project Manager will provide approval of the QAPP.

Michael Coram – CRA Project Coordinator

The CRA Project Coordinator will assist the CRA Project Manager in day-to-day project management. The CRA Project Coordinator is responsible for coordinating the procurement of project subcontractors. The CRA Project Coordinator will:

i) assist the CRA Project Manager in monitoring Post CMP and long-term groundwater monitoring progress and quality;

ii) provide overview of field activities;

iii) prepare and review reports;

iv) provide technical representation of project activities; and

v) coordinate CRA's technical group.

2.3 QUALITY ASSURANCE RESPONSIBILITIES

Paul Wiseman - CRA QA Officer

The CRA QA Officer reports directly to the CRA Project Manager and will be responsible for ensuring that all QA/QC procedures for this project are being followed. The QA Officer will be responsible for the data validation of all sample results from the analytical laboratories. Additional responsibilities include:

i) perform laboratory system audits;

ii) overview and review field QA/QC;

iii) coordinate supply of performance evaluation samples and review results from performance audits;

iv) review laboratory QA/QC;

v) advise on data corrective action procedures;

vi) prepare and review reports;

vii) provide QA/QC representation of project activities; and

viii) approval of the QAPP.

U. S. EPA Region V RCRA QA Manager (RQAM)

The U.S. EPA RQAM's responsibilities for the project include:

i) reviewing and evaluating analytical field and laboratory procedures.

2.4 LABORATORY RESPONSIBILITIES

TestAmerica will perform analytical work in support of the Post CMP activities and the Long-Term Groundwater monitoring.

Denise Heckler - Project Manager – TestAmerica

The Project Manager will report directly to the CRA QA Officer and will be responsible for the following:

i) ensuring all resources of the laboratory are available on an as-required basis;

ii) approving final analytical reports prior to submission to CRA; and

iii) approving the QAPP.

Ray Risden - Operations Manager - TestAmerica

The operation manager will report to the laboratory Project Manager and will be responsible for:

i) coordinating laboratory analyses;

ii) supervising in-house chain-of-custody;

iii) scheduling sample analyses;

iv) overseeing data review;

v) overseeing preparation of analytical reports; and

vi) overview of final analytical reports.

Dorothy Leeson - QA Officer - TestAmerica

The QA Officer has the overall responsibility for data after it leaves the laboratory. The QA Officer will be independent of the laboratory but will communicate data issues through the laboratory Project Manager. In addition, the QA Officer will:

i) overview laboratory QA;

ii) overview QA/QC documentation;

iii) conduct data review;

iv) determine whether to implement laboratory corrective actions, if required;

v) define appropriate laboratory QA procedures; and

vi) approve the QAPP.

Chris Livengood - Sample Custodian - TestAmerica

The Sample Custodian will report to the Operations Manager. Responsibilities of the Sample Custodian will include:

i) receiving and inspecting the incoming sample containers;

ii) recording the condition of the incoming sample containers;

iii) signing appropriate documents;

iv) verifying chain-of-custody and its correctness;

v) notifying Laboratory Manager and Laboratory Supervisor of sample receipt and inspection;

vi) assigning a unique identification number and customer number, and entering each into the sample receiving log;

vii) with the help of the Operations Manager, initiating transfer of the samples to lab sections; and

viii) controlling and monitoring access/storage of samples and extracts.

Final responsibility for project quality rests with CRA's Project Manager. Independent QA will be provided by the project laboratory's Project Manager and QA Officer prior to release of all data to CRA and RACER Trust.

2.5 FIELD RESPONSIBILITIES

Michael Coram - CRA Field QA Officer

The RACER Trust and CRA Project Managers will be supported by the CRA Field QA Officer. The Field QA Officer is responsible for leading and coordinating the day-to-day activities of the field team. The CRA Field QA Officer will report directly to the CRA Project Manager and will have the following responsibilities:

i) providing day-to-day coordination with the CRA Project Manager on technical issues in specific areas of expertise;

ii) developing and implementing field-related work plans, assuring schedule compliance, and adhering to management-developed study requirements;

iii) coordinating and managing of field staff including sampling and drilling;

iv) performing field system audits;

v) overseeing QC for technical data provided by the field staff including field measurement data;

vi) adhering to work schedule;

vii) authoring, writing and approving of text and graphics required for field team efforts;

viii) coordinating and overseeing of technical efforts of subcontractors assisting the field team;

ix) identifying problems at the field team level, resolving difficulties in consultation with the CRA Project Manager, implementing and documenting corrective action procedures and provision of communication between team and upper management;

x) approving the QAPP; and

xi) participating in preparation of the final report.

CRA Field Technical Staff

The field team for this project will be drawn from CRA's pool of corporate resources. The field team will be utilized to gather and analyze data and to prepare various task reports and support materials.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analyses and reporting that will provide results which are legally defensible in a court of law. The purpose of this section is to address the specific objectives for precision, accuracy, completeness, representativeness and comparability.

3.1 PRECISION

3.1.1 DEFINITION

Precision is a measure of degree to which two or more measurements are in agreement.

3.1.2 FIELD PRECISION OBJECTIVES

Field precision is assessed through the collection and measurement of field duplicates at a rate of one duplicate per 10 investigative samples. The precision of the field duplicates is assessed through the calculation of the relative percent difference (RPD). The equation to be used to determine precision for future activities is presented in Section 12.3.1 of this QAPP.

3.1.3 LABORATORY PRECISION OBJECTIVES

Precision in the laboratory is assessed through the calculation of RPD. Precision control limits are presented in Attachment 3.A.

3.2 ACCURACY

3.2.1 DEFINITION

Accuracy is the degree of agreement between a measured value and the true value.

3.2.2 FIELD ACCURACY OBJECTIVES

Accuracy in the field is assessed through the use of equipment and trip blanks and through the adherence to all sample handling procedures, sample preservation requirements and holding time periods.

No contaminants should be found in the equipment or trip blanks. All samples with potential contamination associated with contaminated equipment or trip blanks will be evaluated in the same manner as laboratory blanks.

3.2.3 LABORATORY ACCURACY OBJECTIVES

Laboratory accuracy is assessed through the analysis of matrix spikes (MS) or standard reference materials (SRM) or laboratory control samples and the determination of percent recoveries. The equation to be used to determine accuracy in this project is presented in Section 12.3.1 of this QAPP. Accuracy control limits are presented in Attachment 3.A. and are referenced to the provided Standard Operating Procedures (SOPs) in Attachment 2.

The accuracy of the organics analyses is also monitored through the analysis of system monitoring or surrogate compounds. Surrogate compounds are added to each sample, standard, blank and QC samples prior to sample preparation and analysis. These compounds are not expected to be found naturally occurring in the samples but behave analytically similar to the compounds of interest. Consequently, surrogate compound percent recoveries will provide information on the effect of the sample matrix on the accuracy of the analyses. Attachment 3.A. provides surrogate compound control limits.

3.3 COMPLETENESS

3.3.1 DEFINITION

Completeness is a measure of the amount of valid (usable) data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

3.3.2 FIELD COMPLETENESS OBJECTIVES

Completeness is a measure of the amount of valid measurements obtained from all measurements taken in this project. The equation for completeness is presented in Section 12.1 of this QAPP. Field completeness for this project will be 90 percent or greater.

3.3.3 LABORATORY COMPLETENESS OBJECTIVES

Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The equation for completeness is presented in Section 12.0 of this QAPP. Laboratory completeness for this project will be 90 percent or greater. In addition, overall completeness (field and laboratory) will be 90 percent or greater.

3.4 REPRESENTATIVENESS

3.4.1 DEFINITION

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition or an environmental condition.

3.4.2 MEASURES TO ENSURE REPRESENTATIVENESS OF FIELD DATA

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that a work plan will be developed for any Post CMP investigations, that the Long-Term Monitoring Plan is followed, and that proper sampling techniques are used.

3.4.3 MEASURES TO ENSURE REPRESENTATIVENESS OF LABORATORY DATA

Representativeness in the laboratory is ensured by using the proper analytical procedures, meeting sample holding times and analyzing and assessing field duplicate samples. The sampling network was designed to provide data representative of facility conditions. During development of this network, consideration was given to past waste disposal practices, existing analytical data, physical setting and processes and constraints inherent to the RCRA program. The rationale of the sampling network has been provided in Section 1.5 of this QAPP.

3.5 COMPARABILITY

3.5.1 DEFINITION

Comparability is an expression of the confidence with which one data set can be compared with another.

3.5.2 MEASURES TO ENSURE COMPARABILITY OF FIELD DATA

Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the work plan will be developed for any Post CMP investigations, that the Long-Term Monitoring Plan is followed, and that proper sampling techniques are used.

3.5.3 MEASURES TO ENSURE COMPARABILITY OF LABORATORY DATA

The analytical data to be obtained during any Post CMP investigations and long-term monitoring will be comparable to existing data by using similar analytical methods. Comparability is also dependent on similar QA objectives.

3.6 LEVEL OF QUALITY CONTROL EFFORT

Equipment blank, trip blank, method blank, field duplicate, SRM or QC check samples and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling and laboratory analytical programs. The QC samples described below are not required for samples collected for waste characterization purposes.

Equipment and trip blanks will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Equipment blank samples are analyzed to check for contamination introduced during sampling at the Facility which may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage.

Method blank samples are generated within the laboratory and are used to assess contamination resulting from laboratory procedures. Field duplicate samples are analyzed to check for sampling and analytical reproducibility. Matrix spikes provide information about the effect of the sample matrix on the preparation and measurement methodology. Organic analyses matrix spikes are performed in duplicate. One matrix spike/matrix duplicate (MS/MSD) will be collected for every 20 or fewer investigative samples.

MS/MSD samples are prepared from investigative samples. Soil MS/MSD samples require no extra sample volume to be collected. However, aqueous MS/MSD samples must be collected at double the volume for VOCs and extractable organics. One MS/MSD sample will be collected/designated for every 20 or fewer investigative samples per sample matrix (i.e., groundwater, soil).

The general level of the QC effort will be one field duplicate for every 10 or fewer investigative samples. Equipment blanks will be collected for every 10 or fewer aqueous investigative samples. One VOC trip blank consisting of purified water that is free of target VOC will be included along with each shipment of aqueous VOC samples. Trip blank samples will be supplied by the laboratory and will remain unopened during the sampling event. Trip blank samples will be preserved by the laboratory supplier in the same manner as the investigative samples.

The number of field duplicate, equipment blank, and MS/MSD samples to be collected are presented in Table 1.4. Sampling procedures are specified in Section 4.0 of this QAPP.

4.0 SAMPLING PROCEDURES

The monitoring locations and sampling procedures for long-term monitoring are presented in the Long-Term Monitoring Plan, Post CMP samples will be collected from areas of least contamination to most contamination, if known, and follow the following sampling procedures.

Required sampling containers, sample preservation methods, maximum holding times, packaging and shipping requirements are presented in Table 4.1. Specific packaging procedures are presented in Section 5.1.2.

Refer to the CRA Field Method Guidelines for the following information:

Equipment Cleaning/Decontamination
Soil Sampling Protocols
Monitoring Well Installation Procedures
Well Development Procedures
Groundwater Sampling Procedures

Additional information is provided in the following sections.

4.1 SAMPLE CONTAINERS

The appropriate sample containers will be provided by the project laboratory. The container type and volume, number of containers per analysis and preservation requirements are presented in Table 4.1.

4.1.1 OBTAINING CONTAMINANT-FREE SAMPLE CONTAINERS

The sample containers for TCL/TAL, VOC, SVOC, PCBs, metals, and cyanide will be provided by TestAmerica. TestAmerica will supply containers that are cleaned by the manufacture to meet or exceed the analyte specifications established in the U.S. EPA "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers", April 1992, OSWER Directive #9240.0-.5A. Certificates of analysis will be available upon request for each container lot to document conformance to U.S. EPA specifications.

4.2 SAMPLE LABELING

Each sample will be labeled with a unique sample number that will facilitate tracking and cross-referencing of sample information. The sample numbering system to be used is described as follows:

Example: S-7097-042108-XX-001

S	- designates types of sample (S-soil, SD-sediment, GW-groundwater, SW-surface water)
7097	- site reference number
042108	- designates date of collection presented as month/day/year
XX	- sampler's initials
001	- sequential number starting with 001 at the start of the project

Equipment blank and field duplicate samples also will be numbered with a unique sample number, consistent with the numbering system described above, to prevent laboratory bias of field QC samples. An example of a sample label and directions for its completion are provided in Attachment C-1.

4.3 FIELD QC SAMPLE COLLECTION

4.3.1 EQUIPMENT BLANK SAMPLE COLLECTION

Equipment blank samples will be collected when non-dedicated sampling equipment are used to collect aqueous samples. Equipment blanks consist of distilled water that has been routed through decontaminated sampling equipment and collected into the appropriate containers. The containers will be filled in order of decreasing analyte volatility (i.e., VOCs (including TOC) first, SVOCs second which are followed by the containers for the remaining analyses). Equipment blank samples will be collected for aqueous matrices only.

4.3.2 FIELD DUPLICATE SAMPLE COLLECTION

4.3.2.1 WATER SAMPLES

Field duplicate samples will be collected using the following procedure:

1. The tubing will be placed over the containers to be filled.
2. The groundwater sample is pumped with minimal agitation into the first sample container until it is one-half full. The procedure is repeated for the second sample container.
3. The first sample container is filled to the proper level and sealed. The procedure is repeated for the second sample container.
4. The samples are properly labeled and tagged as specified in Section 4.2.
5. Steps 1 through 4 are repeated for the bottles for each analysis. The samples are collected in order of decreasing analyte volatility as detailed in Section 4.3.1.
6. Chain-of-custody documents are executed (Section 5.0).
7. The samples are packaged as specified in Table 4.1.

4.3.2.2 SOIL/SEDIMENT SAMPLES

Soil/sediment field duplicates will be collected as specified in the following:

1. The split-spoon sampler or trowel is retrieved from the sampling point.
2. Soil for VOC analysis is removed from the sampling device utilizing a specialized core sampling tool (Terracore Sampler™) as specified in Table 4.1. Three aliquots of soil are collected and placed in laboratory supplied 40 milliliter VOA vials containing five (5) milliliters purified volatile grade water (two vials) and one (1) vial containing 10 milliliters of methanol.
3. Soil for non-VOC analysis is removed from the sampling device as individual sub-sample grabs from selected locations within the core based on evidence of potential contamination and placed in sample containers.

4.3.3 MS/MSD SAMPLE COLLECTION

MS/MSD sample collection requires that triple the volume of sample is collected for aqueous samples. The sampling procedure is specified in Section 4.3.2.1 is used to collect aqueous MS/MSD samples with an extra volume being collected for VOC samples.

MS/MSD samples collection for soil VOC requires triple volume. No extra volume of soil is required for remaining parameter MS/MSD samples.

5.0 CUSTODY PROCEDURES

Custody is one of several factors which is necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis and final evidence files. Final evidence files, including all originals of laboratory reports, are maintained under document control in a secure area.

Custody of a sample begins when it is collected by or transferred to an individual and ends when that individual relinquishes or disposes of the sample. A sample or evidence file is under your custody if:

i) the item is in actual possession of a person;

ii) the item is in the view of the person after being in actual possession of the person;

iii) the item was in actual possession but is locked up to prevent tampering; or

iv) the item is in a designated and identified secure area.

5.1 FIELD CUSTODY PROCEDURES

Field logbooks or field forms will provide the means of recording data collecting activities performed. As such, entries will be described in as much detail as possible so that persons going to the Facility could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel and will be stored with the project files when not in use. Each logbook will be identified by the project number which is 7097.

The title page of each logbook will contain the following:

i) person to whom the logbook is assigned;

ii) logbook number;

iii) project name;

iv) project start date; and

v) end date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection being used, and the signature of the person making the entry will be entered. The names of visitors to the Facility during the investigation and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. All entries will be made in ink with no erasures. If an incorrect entry is made, the information will be crossed out with a single strike mark and initialed. Whenever a sample is collected, or a measurement is made, a detailed description of the location of the sampling point, which includes compass direction and distance taken from a reference point will also be noted. All equipment used to make measurements will be identified, along with the date of calibration.

Samples will be collected following the sampling procedures referenced in Section 4.0 and the additional procedures in Section 4.2 and 4.3 of this QAPP. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth from which the sample was collected, volume and number of containers. Sample identification number will be assigned during sample collection. Field QC samples, which will receive an entirely separate sample identification number, will be submitted blind to avoid laboratory bias of field QC samples.

The sample packaging and shipment procedures summarized in the following subsections will ensure that the samples will arrive at the laboratory with the chain-of-custody intact. The protocol for specific sample numbering and other sample designations are included in Section 4.2 of this QAPP. Examples of field custody documents and instructions for completion are presented in Attachment 1.

5.1.1 FIELD PROCEDURES

1. The field sampler is personally responsible for the care and custody of the samples until they are transferred to another individual or secure area or

properly dispatched to the laboratory. As few people as possible should handle the samples.

2. All bottles will be labeled with unique sample numbers. Examples of sample labels are presented in Attachment C-1.

3. Sample labels and tags will be completed for each sample using waterproof ink unless prohibited by weather conditions such as freezing weather precluding the use of a ballpoint pen. In such cases, a pencil will be used and the deviation will be documented in the field logbook.

5.1.2 TRANSFER OF CUSTODY AND SHIPMENT PROCEDURES

1. Samples will be accompanied by a properly completed chain-of-custody record. The sample numbers and requested parameters will be listed on the chain-of-custody record. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the form. This form documents the transfer of custody of samples from the sampler to another person, to the laboratory, or to/from a secure storage area.

2. Samples will be packaged for shipment and shipped to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample cooler. Samples will be packaged on ice and maintained at 4°C ± 2°C during shipment/transportation to the laboratory. Water VOC samples will be placed in foam liners or bubble-wrap bags that that contain three containers per bag while soil VOC samples will be placed in sealed sample pouches. The remaining samples in glass containers will be wrapped in bubble-wrap and placed in the sample cooler. Samples in plastic containers will be placed directly into the sample cooler. All the samples will be placed in an upright position without contacting each other in the cooler and packing will be limited to one layer of samples for water samples. After the containers are placed in the cooler, additional bubble-wrap or styrofoam chips will be added to the void space. Shipping containers will be secured with strapping tape and CRA custody tape for shipment to the laboratory. The procedure includes the use of custody tape attached to the right and left sides of the cooler.

3. Whenever samples are split with U.S. EPA or Facility representatives, a separate chain-of-custody record will be prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the

samples to the Facility or Agency personnel will request the representative's signature acknowledging sample receipt.

4. All shipments will be accompanied by the chain-of-custody record identifying the contents. The original and yellow copies of the chain-of-custody record will accompany the shipment, and the pink and goldenrod copies will be retained by the shipper (if different than the sampler) and the sampler for return to the office where the copies will be kept with the project evidentiary files.

5. If the samples are sent by commercial carrier, a bill of lading will be used. A copy of the bill of lading will be retained as part of the permanent documentation. Commercial carriers are not required to sign the custody record as long as the custody record is sealed inside the sample cooler and the custody tape remains intact.

6. Samples will be picked up by laboratory courier or transported by overnight courier to the laboratories the same day they are collected unless they are collected on a weekend or holiday. In these cases, they will be stored in a secure area until the next business day. Prior to shipment, additional ice will be added to the sample cooler.

5.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

The sample custodian will assign a unique number to each incoming sample for use in the laboratory. The unique number and customer number will then be entered into the sample receiving log. The laboratory date of receipt will also be noted.

Laboratory custody procedures and document control for those samples analyzed by the project laboratory will be carried out using the laboratory's standard operating procedure (SOP) provided in Attachment 2 and the custody sequence provided as Figure 1.4. Examples of the chain-of-custody document(s) and procedures are provided in Attachment 1.

5.3 STORAGE OF SAMPLES

After the sample custodian has completed the sample receiving log, the chain-of-custody will be checked to ensure that all samples are stored in the appropriate location(s). All

samples will be maintained and properly preserved (see Table 4.1) in an access-controlled location (i.e., walk-in-cooler) until completion of all analytical work or, at a minimum, for 30 days after receipt of the final report by CRA. At this time, the samples will be disposed by the laboratory in accordance with all Federal, State and local requirements.

5.4 FINAL EVIDENCE FILES CUSTODY PROCEDURES

The final evidence file will be the central repository for all documents which constitute evidence relevant to sampling and analysis activities as described in this QAPP. CRA is the custodian of the evidence file and maintains the contents of evidence files for Post CMP investigations and long-term monitoring, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports and data reviews in a secured, limited access area and under custody of CRA's project manager or designee. The U. S. EPA will be offered the final evidence file prior to disposal.

The final evidence file will include at a minimum:

i) project plans and drawings;
ii) field log books;
iii) field data records and deliverables;
iv) sample identification documents and soil boring/monitoring well logs;
v) photographs;
vi) all chain-of-custody documentation;
vii) correspondence;
viii) references, literature;
ix) laboratory data deliverables;
x) data validation and assessment reports;
xi) progress reports, QA reports; and
xii) final report.

The laboratory will be responsible for maintaining analytical log books and laboratory data. Raw laboratory data files and copies of hard copy reports will be inventoried and

maintained by the laboratory for a period of five years, at which time the laboratories will notify CRA regarding the need for additional storage.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

This section describes procedures for maintaining the accuracy for all the instruments and measurement equipment which will be used for conducting field tests and laboratory analyses. These instruments and equipment will be calibrated prior to each use or according to a periodic schedule.

6.1 FIELD INSTRUMENTS CALIBRATION

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated as specified in the field SOPs.

The field instruments include pH meters, specific conductance meters and photoionization detectors. Temperature is measured in conjunction with pH using the same instrument and is pre-calibrated by the manufacturer. General cleaning and maintenance will be performed to ensure that reproducible temperature measurements are maintained.

Field instruments will be calibrated prior to use and the calibration will be verified after a maximum of every 10 investigative samples. Specific information concerning calibration frequency, acceptance criteria and the conditions that require more frequent calibration is contained in the field SOPs in Attachment C-2.

6.2 LABORATORY INSTRUMENT CALIBRATION

Calibration procedures for a specific laboratory instrument will consist of initial calibration, initial calibration verification and continuing calibration verification. The SOPs in Attachment C-2 present the specific calibration procedures for each method of analysis. In addition, Table 6.1 provides a summary of calibration frequencies and acceptance criteria.

7.0 ANALYTICAL PROCEDURES

Soil, sediment and groundwater samples collected during the Post CMP investigation will be analyzed selectively for TCL VOC, SVOC, PCB, and/or Site-specific target analyte list inorganics by TestAmerica, Inc. 4101 Shuffel Street, North Canton, Ohio 44720, 330-497-9783. TestAmerica will complete sample analysis of groundwater samples for the long term groundwater monitoring parameters (a subset of Table 1.1) and soil and groundwater waste samples for the waste characterization parameters (Table 1.2).

7.1 FIELD ANALYTICAL PROCEDURES

The standardization and QA information for field measurement of pH/temperature, ORP, turbidity, dissolved oxygen, and specific conductance are described in Section 3.0 of this QAPP. Specific procedures for measurement of these parameters and soil VOC screening are provided as SOPs in Attachment C-2.

7.2 LABORATORY ANALYTICAL PROCEDURES

The laboratory identified in Section 7.0 will use the SOPs provided in Attachment C-2 for the analyses. These SOPs are based on the methods contained in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd Edition, Final Update III, 1996 for TCL VOCs, TCL SVOCs, PCBs, Site-specific TAL metals, cyanide and waste characterization parameters. Methods contained in "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, Revised March 1983 and "Standard Methods for the Examination of Water and Wastewater", APHA, AWWA &WEF, 19th Edition, 1995 will be used for the wastewater discharge monitoring parameters.

7.2.1 LIST OF PROJECT TARGET COMPOUNDS AND LABORATORY DETECTION LIMITS

A complete listing of project target compounds and project quantitation limits for each analyte group listed in Table 7.1 and 7.2 are presented in Tables 1.1 and 1.2. The current laboratory-determined MDLs as presented in Attachment 3.A have been experimentally determined using the method provided in 40 CFR Part 136 Appendix B.

7.2.2 LIST OF ASSOCIATED QC SAMPLES

The laboratory SOPs include a QC section which addresses the minimum QC requirements for the analysis of specific analyte groups. Section 8.0 of this QAPP contains or references a complete listing of the associated QC samples for every analyte group and matrix.

8.0 INTERNAL QUALITY CONTROL CHECKS

This section presents the internal QC checks which will be employed for field and laboratory measurements.

8.1 FIELD QUALITY CONTROL CHECKS

QC procedures for pH/temperature, ORP, turbidity, dissolved oxygen, and specific conductance of water samples will include calibrating the instruments as described in Section 6.1 of this QAPP, measuring duplicate samples and checking the reproducibility of the measurements by taking multiple readings on a single sample the measurement reference standards for pH and conductivity and comparison to an NIST traceable thermometer for temperature measurements. The QC information for field equipment is stated in Section 3.0 of this QAPP. Assessment of field sampling precision and bias will be made by collecting field duplicates and equipment blanks for laboratory analysis. Collection of the samples will be in accordance with the applicable procedures in Section 4.3 of this QAPP at the frequency indicated in Table 1.4.

8.1.1 EQUIPMENT BLANKS SAMPLES

Equipment blank samples will be collected in the field at a minimum frequency of one per every 10 or fewer aqueous investigative samples and will be analyzed for all associated parameters as presented in Table 1.4. Equipment blanks will be used to assess the efficiency of sampling equipment decontamination. The presence of analytes in the equipment blank samples will be indicative of potential cross contamination.

8.1.2 TRIP BLANK SAMPLES

Trip blank samples, supplied by the laboratory with the sample containers, will be submitted with each shipping cooler containing multiple aqueous VOC samples. Trip blank samples are used to assess whether contamination of VOC samples has occurred due to contaminant migration during sample shipment and storage.

8.1.3 FIELD DUPLICATE SAMPLES

Field duplicate samples are collected in a similar fashion to investigative samples at a minimum frequency of one duplicate per every 10 or fewer investigative samples by matrix and will be analyzed for all parameters associated with the investigative sample. Field duplicate samples are analyzed by the laboratory to evaluate matrix, sampling and analytical reproducibility. No data will be qualified based on field duplicate analysis.

8.2 LABORATORY QUALITY CONTROL CHECKS

The laboratories identified in Section 7.0 of this QAPP have QC programs they use to ensure the reliability and validity of the analysis performed at the laboratory. All analytical procedures are documented in writing as SOPs and each SOP includes a QC section which addresses the minimum QC requirements for the procedure. The internal QC checks may vary slightly for each individual procedure but in general will include the QC samples detailed in the following sections.

8.2.1 CALIBRATION STANDARDS

All primary standard materials will be traceable to U.S. EPA or NIST reference standards, if possible. Each calibration standard will receive a reference number that is traceable to the lot number from the primary reference standard from which it was prepared. The procedures for preparing calibration standards are contained within the laboratories applicable SOPs.

8.2.2 INSTRUMENT PERFORMANCE CHECKS - ORGANICS

The compliance requirements for satisfactory instrument performance are established to ensure that the instrument is capable of producing acceptable quantitative data. Instrument tuning for gas chromatography/mass spectrometry (GC/MS) methods of analysis ensure that adequate mass resolution and, to some degree, sensitivity are achieved. The specific acceptance criteria and action requirements for these checks will be as specified by the respective methods presented in Table 7.1 Table 7.2, and the applicable SOPs.

8.2.3 INITIAL AND CONTINUING CALIBRATION CHECKS

The compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable quantitative data. The initial calibration and initial calibration check or verification demonstrates that the instrument is capable of acceptable performance at the beginning of an analysis run, while the continuing calibration checks document that the initial calibration is still valid, and that satisfactory maintenance and adjustment of the instrument on a day-to-day basis is achieved. The specific control criteria and action requirements for these calibrations will be as specified in the applicable SOPs.

8.2.4 INTERNAL STANDARD PERFORMANCE

The internal standard performance criteria ensure that the GC/MS and inductively coupled argon plasma/mass spectrometry (ICP/MS) sensitivities and responses are stable during every run. Acceptance criteria are as specified by the referenced analytical methods and the applicable SOPs.

8.2.5 METHOD BLANK SAMPLES

A method blank sample will be analyzed by the laboratory at a frequency of one blank per 20 analyses or, in the event that an analytical round consists of less than 20 samples, one method blank sample will be analyzed. The method blank sample, an aliquot of analyte-free water, will be carried through the entire analytical procedure.

8.2.6 LABORATORY CONTROL SAMPLES AND QC CHECK SAMPLES

Laboratory control samples (LCS) serve as a monitor of the overall performance of all steps in organic and inorganic analyses including the efficiency of the preparation procedure. The LCS are generally prepared from standards that are from a different source than the calibration standards or are standard reference materials (SRM). The criteria used to evaluate the LCS data will be as specified in the referenced method and applicable SOPs.

8.2.7 MATRIX SPIKE/MATRIX SPIKE DUPLICATES

A matrix spike and matrix spike duplicate (MS/MSD) sample set will be analyzed at a minimum frequency of one per every 20 or fewer investigative samples of a given matrix. Acceptance criteria and compounds that will be used for matrix spikes are identified in the applicable SOPs. Percent spike recoveries will be used to evaluate analytical accuracy while percent difference between the matrix spike and matrix spike duplicate will be used to assess analytical precision.

8.2.8 SURROGATES

Surrogates are used in all GC and GC/MS analyses. Every blank, standard, and environmental sample including MS/MSD samples will be spiked with surrogate compounds prior to purging volatiles or extracting semi-volatiles.

Surrogates will be spiked into samples according to the appropriate analytical methods. Surrogate spike recoveries will fall within the control limits specified by the method for all analyte concentrations that are within the quantitation limits without dilution or method specific corrective action (see SOPs in Attachment C-2) will occur. Dilution of samples to bring the analyte concentration into the linear range of calibration may dilute the surrogates out of the quantitation limit; assessment of analytical quality in these cases will be based in the QC information from the LCS, matrix spike and matrix spike duplicate samples.

8.2.9 PCB – QC ANALYSES

PCBs analysis, if required, second column confirmation for PCB analysis must be communicated upon sample receipt.

8.2.10 ICP INTERFERENCE CHECK SAMPLES (ICS)

To verify that proper interelement and background correction factors have been established by the laboratory, the laboratory must analyze an ICS prior to each analytical sequence run. Percent recovery criteria of the ICS data will be as specified in the referenced method and applicable SOPs.

8.2.11 ICP SERIAL DILUTION

ICP serial dilution analysis is used to determine whether significant chemical or physical interference exists due to the sample matrix. The criteria used to evaluate the ICP serial dilution will be as specified in the applicable SOPs.

8.2.12 ICP AND ICP/MS QC ANALYSIS

The QC scheme used to assess matrix effects on the precision and accuracy of the individual analytical determinations relative to the overall ICP, ICP/MS method precision and accuracy will include a serial dilution test on any new matrix or at a minimum frequency of one per each batch of 20 samples or less and post-digestion spike addition analysis on serial dilution failures. Results from the analytical spikes will be used to determine if the method of standard additions (MSA) is necessary for quantitation. The criteria used to evaluate the ICP, ICP/MS QC scheme will be as specified in the referenced method and SOPs.

8.2.13 REAGENT CHECKS

Reagents prepared for instrumental methods of analysis will be monitored by method blank samples and QC check samples, where appropriate.

8.2.14 BLIND CHECK SAMPLES

As initiated by the U.S. EPA Region V, an analytical batch may contain a blind check sample. In general, the blind check sample may be obtained from a U.S. EPA approved supplier by CRA upon the request of the U.S. EPA Region V. The analytes employed in this check sample will be a representative subset of the analytes of interest.

All data obtained will be properly recorded. The data package will include a full deliverable package capable of allowing the recipient to reconstruct QC information and compare it to QC criteria. The percent recovery of analytes from the check samples will be calculated as defined in Section 12.3.1. The QC acceptance criteria utilized for data evaluation are established by the check sample supplier.

9.0 DATA REDUCTION, VALIDATION AND REPORTING

All data generated in field and laboratory activities will be reduced and validated prior to reporting. No data shall be disseminated by the laboratory until they have been subjected to these procedures which are summarized in the subsections below.

9.1 DATA REDUCTION

9.1.1 FIELD DATA REDUCTION PROCEDURES

Field data reduction procedures will be minimal in scope compared to those implemented for laboratory data. Only direct reading instrumentation will be employed in the field. The use of pH meters, specific conductance meters and photoionization meters will generate measurements directly read from the meters following calibration as outlined in the SOPs in Attachment C-2. Such data will be written into field logbooks immediately after measurements are taken. If errors are made, results will be legibly crossed out, initialed by the field sampler and corrected in a space adjacent to the original (erroneous) entry. The Field QA Officer, identified in Section 2.0 of this QAPP, will periodically review the field logbooks to determine whether any transcription errors have been made by the field crew.

9.1.2 LABORATORY DATA REDUCTION PROCEDURES

Laboratory data reduction procedures will be followed according to the following protocol:

1. Raw data produced and checked by the responsible analyst is turned over for independent review by another analyst.
2. The area supervisor or senior chemist reviews the data for attainment of QC criteria established by the QAPP.
3. Upon completion of all reviews and acceptance of the raw data by the laboratory area supervisor, a report will be generated and sent to the laboratory Project Manager.
4. The laboratory Project Manager will complete a thorough inspection of all reports.

5. The QA Officer and/or area supervisor will decide whether any sample reanalysis is required.
6. Upon acceptance of the preliminary reports by the Project Manager, final reports will be generated and signed by the Operation Manager, while the case narrative is reviewed and signed by the QA Officer.

Specific equations used for data reduction are contained in the SOPs in Attachment C-2.

9.2 DATA VALIDATION

Data validation procedures will be performed for both field and laboratory operations as described in the following subsections.

9.2.1 PROCEDURES USED TO EVALUATE FIELD DATA

Field data validation will be the responsibility of the Field QA Officer and will include the following:

1. An independent review of field log books to result forms;
2. Field log books will be inspected to ensure that field instrumentation calibration and QC checks are conducted and documented at the appropriate frequency; and
3. Determine the level of compliance of calibration and QC check acceptance criteria.

9.2.2 PROCEDURES TO VALIDATE LABORATORY DATA

Validation of the analytical data will be performed by CRA's QA Officer utilizing the "U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-99/008, October 1999 and "U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review", EPA-540/R-94-013, February 1994 (CLP National Functional Guidelines) as a basis establishing the objectives, evaluation and actions of the validation while incorporating the specific QC limits presented in Attachment C-3.A of this QAPP, the calibration

requirements defined in Section 6.2 of this QAPP, and the additional measurements present in the analytical procedures and Laboratory SOPs as outlined in Table 7.1, Table 7.2, and Attachment 2 of this QAPP. The specific data qualifiers used will be as presented and defined in the CLP National Functional Guidelines. Validation will be completed on one of two levels depending on the sampling activity. A full data validation will be completed on Post CMP investigative activities and the first event of Long-Term Monitoring Plan which will include 100 percent of all laboratory calibration, sample, and laboratory QC data while sample result verification will be performed on 10 percent of the data packages. A reduced validation will be completed on subsequent years of the long-term groundwater monitoring program. Waste characterization will not be validated. The specific components reviewed during each validation are summarized below.

The following deliverables will be evaluated during full data validation:

Organic Analyses

i) technical holding times;
ii) GC/MS instrument performance check;
iii) initial and continuing calibration;
iv) blanks;
v) system monitoring compounds (surrogate spikes);
vi) MS/MSD results;
vii) laboratory control samples;
viii) internal standard performance;
ix) target compound identification and quantitation;
x) tentatively identified compounds;
xi) system performance;
xii) GC/ECD instrument performance check (Pesticides/PCBs);
xiii) pesticide cleanup checks, if performed (Pesticides/PCBs); and
xiv) field duplicates.

Inorganic Analyses

i) technical holding times;
ii) initial and continuing calibration;
iii) blanks;
iv) interference check samples;
v) laboratory control samples;
vi) matrix duplicate sample analysis;
vii) matrix spike sample analysis;
viii) ICP interference check sample;
ix) ICP serial dilution;
x) ICP/MS internal standard performance;
xi) sample result verification; and
xii) field duplicates.

The following deliverables will be evaluated during reduced data validation:

Organic Analyses

i) technical holding times;
ii) blanks;
iii) system monitoring compounds (surrogate spikes);
iv) MS/MSD results;
v) laboratory control samples; and
vi) field duplicates.

Inorganic Analyses

i) technical holding times;
ii) blanks;
iii) laboratory control samples;
iv) MS/MSD sample analysis; and

v) field duplicates.

9.3 DATA REPORTING

Data reporting procedures will be carried out for field and laboratory operations as described in the following subsections.

9.3.1 FIELD DATA REPORTING

Field data reporting will be conducted principally through the transmission of report sheets containing tabulated results of all measurements made in the field and documentation of all field calibration activities.

9.3.2 LABORATORY DATA REPORTING

The task of reporting laboratory data (to the U. S. EPA) by RACER Trust begins after the validation activity has been concluded. The laboratory Project Manager will perform a final review of the report summaries and case narratives to determine whether the report meets the project requirements. In addition to the record of the chain-of-custody, the report format shall consist of the following:

Laboratory reports for the sampling activities include two levels of data deliverables depending on the data validation level required. These two report data deliverables are described below:

QC Summary Report - Reduced Data Validation (or no validation)

i) Title Page
- project name and number;
- laboratory project or lot number;
- signature of the Laboratory QA Officer or designee; and
- date issued.

ii) Table of Contents - laboratory report contents

iii) Case Narrative

- number of samples and respective matrices;
- laboratory analysis performed;
- any deviations from intended analytical strategy;
- definition of data qualifiers used;
- QC procedures utilized and references to the acceptance criteria;
- condition of samples "as received";
- discussion of whether or not sample holding times were met;
- discussion of technical problems or other observations which may have created analytical difficulties; and
- discussion of laboratory QC checks which failed to meet project criteria.

iv) Analytical Methods Summary - methods of sample preparation and analyses for samples

v) Analytical Sample Summary - cross-reference table of laboratory sample to project sample identification numbers

vi) Shipping and Receiving Documents

- sample container documentation; and
- sample reception information and original chain of custody record.

vii) Chemistry Data Package by Analysis

- Sample Results
  - CRA and laboratory sample identification numbers;
  - dates and times of sample collection, reception, preparation, and/or analysis;
  - sample specific quantitation (report) limits (RL), reporting MDL and estimated values between the RL and MDL;
  - methods of sample preparation and analyses for samples; and
  - dilution factors.

- QC Summary Data with Current Control Limits
  - method blank results;
  - surrogate recoveries (organics);
  - MS/MSD recoveries;
  - laboratory control samples (laboratory control duplicates); and

- matrix duplicate relative percent differences.

Laboratory QC summary data deliverables will be provided to CRA within 14 days from the date of sample log-in for analysis at the laboratory.

Expanded Report – Full Data Validation

These report deliverables include those in the QC Summary reports identified above with the following additional items in Section VII.

Laboratory expanded data deliverables will be provided to CRA within 21 days from the date of sample log-in for analysis at the laboratory.

i) Chemistry Data Package by Analysis

- QC Summary Data with Current Control Limits
  - GC/MS tuning results (organic);
  - Internal standards;
  - Interference check standards (inorganics); and
  - Serial dilutions.

- Standard Data
  - initial calibration data, initial calibration checks, continuing calibration verification/check standards;
  - initial and continuing calibration blanks; and
  - raw data for calibration data (data chromatograms, parameter specific quantitation reports, mass spectra and instrument printouts.

- Raw Data
  - Dated chromatograms, parameter specific quantitation reports, mass spectra and instrument printouts of all samples and QC samples;
  - Instrument run logs;
  - Sample preparation records; and
  - Instrument conditions.

The expanded data package submitted will be a "CLP-like" data package consisting of all the information presented in a CLP data package but not necessarily on CLP forms. Expanded data packages will be requested for all samples requiring full data validation.

10.0 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the Long-Term Monitoring Plan and QAPP. The audits of field and laboratory activities include two separate, independent parts: internal and external audits.

10.1 FIELD PERFORMANCE AND SYSTEM AUDITS

10.1.1 INTERNAL FIELD AUDIT RESPONSIBILITIES

Internal audits of field activities including sampling and field measurements will be conducted by the CRA Field QA Officer.

10.1.2 INTERNAL FIELD AUDIT FREQUENCY

These audits will verify that all established procedures are being followed. Internal field audits will be conducted at the beginning of the site sample collection activities.

10.1.3 INTERNAL FIELD AUDIT PROCEDURES

The audits will be conducted once during each phase of sampling and at the conclusion of the project. The audits will include the examination of field sampling records, field instrument operating records, sample collection, handling and packaging in compliance with the established procedures, maintenance of QA procedures and chain-of-custody. Follow-up audits will be conducted to correct deficiencies and to verify that QA procedures are maintained throughout the investigations. The audits will involve review of field measurement records, instrumentation calibration records and sample documentation. The field audit checklist to be used for the investigations is presented in Attachment C-1.

10.1.4 EXTERNAL FIELD AUDIT RESPONSIBILITIES

External audits may be conducted by the U. S. EPA RPC.

10.1.5 EXTERNAL FIELD AUDIT FREQUENCY

External field audits may be conducted any time during the field operations. These audits may or may not be announced and are at the discretion of the U. S. EPA.

10.1.6 OVERVIEW OF THE EXTERNAL FIELD AUDIT PROCESS

External field audits will be conducted according to the field activity information presented in this QAPP.

10.2 LABORATORY PERFORMANCE AND SYSTEM AUDITS

10.2.1 INTERNAL LABORATORY AUDIT RESPONSIBILITIES

The internal laboratory audit will be conducted by the CRA QA Officer.

10.2.2 INTERNAL LABORATORY AUDIT FREQUENCY

The internal laboratory system audits will be performed on an annual basis while the internal laboratory performance audits will be conducted once prior to field activities or on a quarterly basis depending on project duration.

10.2.3 INTERNAL LABORATORY AUDIT PROCEDURES

The internal laboratory system audits will include an examination of laboratory documentation on sample receiving, sample log-in, sample storage, chain-of-custody procedures, sample preparation and analysis and instrument operating records. The performance audits will involve preparing blind QC samples and submitting them along with project samples to the laboratory for analysis throughout the project. The CRA QA Officer will evaluate the analytical results of these blind performance samples to ensure

the laboratory maintains acceptable QC performance. The laboratory audit checklist is provided in Attachment C-1.

10.2.4 EXTERNAL LABORATORY AUDIT RESPONSIBILITIES

External audits will be conducted by U. S. EPA Region V personnel.

10.2.5 EXTERNAL LABORATORY AUDIT FREQUENCY

An external laboratory audit may be conducted once prior to the initiation of the sampling and analysis activities. Audits may or may not be announced and are at the discretion of the U. S. EPA.

10.2.6 OVERVIEW OF THE EXTERNAL LABORATORY AUDIT PROCESS

External laboratory audits will include (but not be limited to) review of laboratory analytical procedures, laboratory on-site audits, and/or submission of performance evaluation samples to the laboratory for analysis.

11.0 PREVENTIVE MAINTENANCE

11.1 FIELD INSTRUMENT PREVENTATIVE MAINTENANCE

The field equipment for this project includes pH meters, specific conductance meters and photoionization meters. The field QA officer will be responsible for the maintenance of the field instrumentation. Specific preventative maintenance procedures to be followed for field equipment are those recommended by the manufacturer. Field instruments will be checked and calibrated daily before use. The maintenance schedule and trouble-shooting procedures for field instruments are presented in Table 11.1.

11.2 LABORATORY INSTRUMENT PREVENTATIVE MAINTENANCE

As part of their QA/QC program, a routine preventative maintenance program is conducted by the laboratories to minimize the occurrence of instrument failure and other system malfunctions. Designated laboratory employees will regularly perform routine scheduled maintenance and repair of (or coordinate with the instrument manufacturer for the repair of) all instruments. All maintenance that is performed shall be documented in the laboratory's maintenance logbooks. All laboratory instruments are maintained in accordance with manufacturer's specifications.

Table 11.1 provides the frequency which components of key analytical instruments or equipment will be serviced.

12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS

The following sections include the procedures and formulae utilized to assess the levels of precision, accuracy and completeness achieved during the associated sample analyses.

12.1 FIELD MEASUREMENTS

Field data will be assessed by the CRA Field QA Officer who will review the field results for compliance with the established QC criteria that are specified in Section 3.0 of this QAPP. The accuracy of pH and specific conductance will be assessed using daily instrument calibration, calibration check, and blank data. Accuracy will be measured by determining the percent recovery of calibration check standards as defined in Section 12.2.2. Precision of the pH and specific conductance measurements will be assessed on the basis of the reproducibility of duplicate readings of a single sample and will be measured by determining the relative percent difference of the readings as defined in Section 12.2.1. Accuracy and precision of the soil VOC screening will be determined using duplicate readings of calibration checks. Field data completeness will be calculated using the following equation:

$$\text{Completeness} = \frac{\text{Valid (usable) Data Obtained}}{\text{Total Data Planned}} \times 100$$

12.2 LABORATORY DATA

Laboratory results will be assessed for compliance with required precision, accuracy and completeness detailed in the following subsections:

12.2.1 PRECISION

The precision of laboratory analysis will be assessed by comparing the analytical results between MS/MSD for organic analyses. The relative percent difference (%RPD) will be calculated for each pair of duplicate analyses.

12.2.2 ACCURACY

The accuracy of laboratory results will be assessed for compliance with the established QC criteria that are described in Sections 3.0 and 8.0 of the QAPP using the analytical results of method blanks, reagent/preparation blank, SRMs or QC check samples and MS/MSD samples. The percent recovery (%R) of matrix spike samples and SRMs will be calculated.

12.2.3 COMPLETENESS

Completeness will be assessed by comparing the number of valid (usable) results (as determined by the CRA QA Officer) to the total possible number of results using the formula presented in Section 12.1.

12.3 STATISTICAL EVALUATIONS

In the examination of data and determination of their precision and accuracy, standard statistical formulae will be used. Further details are provided in the following subsections.

12.3.1 PERCENT RECOVERY (%R)

The percent recovery of a parameter is calculated by dividing the amount recovered by the true amount added and multiplying by 100. The percent recoveries of spiked samples are evaluated to establish the analytical accuracy of a measurement. Percent recovery is calculated using the following formula:

$$\%R = \frac{SSR - SR}{SA} \quad X \quad 100$$

where:

SSR	=	Spiked Sample Result
SR	=	Sample Result or Background
SA	=	Spike Added

12.3.2 RELATIVE PERCENT DIFFERENCE (RPD)

The relative percent difference is calculated by dividing the absolute value of the difference between two numbers by their arithmetic mean and multiplying by 100. The RPD is used to evaluate the analytical precision of two replicate measurements (e.g., matrix spike/matrix spike duplicate). RPD is calculated using the following formula:

$$RPD = \frac{(R_1 - R_2)}{R_1 + R_2} \times 200$$

where:

R_1 = value of first result

R_2 = value of second result

13.0 CORRECTIVE ACTION

Corrective action is the process of identifying, recommending, approving and implementing measures to counter unacceptable procedures or out of QC performance which can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation and data assessment. All corrective action proposed and implemented will be documented in the regular QA reports to management. Corrective action should only be implemented after approval by the RACER Trust or CRA Project Manager or designee. If immediate corrective action is required, approvals secured by telephone from the RACER Trust or CRA Project Manager will be documented in an additional memorandum or field logbook.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the CRA or RACER Trust Project Manager, who in turn will notify the U.S. EPA RPC. If the problem is analytical in nature, information on these problems will be promptly communicated to RACER Trust's PM and CRA's QA Officer. Implementation of corrective action will be confirmed in writing through the same channels.

Any nonconformance with the established QC procedures in the QAPP Long-Term Monitoring Plan will be identified and corrected in accordance with the QAPP. The RACER Trust or CRA Project Manager, or designee, will include a nonconformance report for each nonconformance condition in the QA reports to management.

13.1 FIELD CORRECTIVE ACTION

Corrective action in the field may be necessary when the sample network is changed (i.e. more/less samples, sampling locations other than those specified in the QAPP), sampling procedures and/or field analytical procedures require modification, due to unexpected conditions. In general, the field team may identify the need for corrective action. The field team, in consultation with the Field QA Officer, will recommend a corrective action. The Field QA Officer will approve the corrective action which will be implemented by the field team. It will be the responsibility of the Field QA Officer to ensure the corrective action has been implemented following approval of the CRA Project Manager.

If the corrective action will supplement the existing sampling plan (i.e. additional soil borings) using existing and approved procedures in the QAPP, corrective action approved by the Field QA Officer will be documented. If corrective actions resulting in less samples (or analytical fractions) or alternate locations which may cause project QA objectives not be achieved, it will be necessary that all levels of project management including the Field QA Officer and the U. S. EPA RPC concur with the proposed action.

Corrective action resulting from internal field audits will be implemented immediately if data may be adversely affected due to unapproved or improper use of approved methods. CRA's Field QA Officer will identify deficiencies and recommended corrective action to CRA's Project Manager. Implementation of corrective actions will be performed by CRA's Field QA Officer and field team. Corrective action will be documented in QA reports to management.

Corrective actions will be implemented and documented in the field logbook. No staff member will initiate corrective action without prior communication of findings through the proper channels. If corrective actions are insufficient, work may be stopped by the U. S. EPA RPC.

13.2 LABORATORY CORRECTIVE ACTION

Corrective action in the laboratory may occur prior to, during and after initial analyses. A number of conditions such as broken sample containers, multiple phases, low/high pH readings, potentially high concentration samples may be identified during sample log-in or just prior to analysis. Following consultation with analysts and section leaders, it may be necessary for the laboratory QA Officer to approve the implementation of corrective action. The submitted SOPs specify some conditions during or after analysis that may automatically trigger corrective action or optional procedures. These conditions may include dilution of samples, additional sample extract cleanup, automatic reinjection/reanalysis when certain QC criteria are not met.

The bench chemist will identify the need for corrective action. The Laboratory Project Manager, in consultation with the laboratory supervisor and staff, will approve the required corrective action to be implemented by the laboratory staff. The laboratory QA Officer will ensure implementation and documentation of the corrective action. If the

nonconformance causes project objectives not be achieved, it will be necessary to inform all levels of project management including U. S. EPA RPC to concur with the corrective action.

These corrective actions are performed prior to release of the data from the laboratory. The corrective action will be documented in both the laboratory's corrective action report and the narrative data report sent from the laboratory to CRA's QA Officer. If corrective action does not rectify the situations, the laboratory will contact CRA's QA officer.

13.3 CORRECTIVE ACTION DURING DATA VALIDATION AND DATA ASSESSMENT

The CRA QA Officer may identify the need for corrective action during either the data validation or data assessment. Potential types of corrective action may include resampling by the field team or re-injection/reanalysis of samples by the laboratory.

These actions are dependent upon the ability to mobilize the field team and whether the data to be collected is necessary to meet the required QA objectives (e.g., the holding time for samples is not exceeded). When CRA's QA Officer identifies a corrective action situation, RACER Trust 's Project Manager will be responsible for approving the implementation of corrective action, including resampling, during data assessment. All corrective actions of this type will be documented by the CRA Project Manager.

14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The CRA Project Manager, the RACER Trust Project Manager and U.S. EPA RPC will receive reports on the performance of the measurement system and data quality following each sampling round and at the conclusion of the project.

Minimally, these reports will include:

1. assessment of measurement quality indicators, i.e., data accuracy, precision and completeness;
2. results of system and performance audits; and
3. QA problems, corrective action taken and resolutions.

The CRA QA Officer will be responsible within the organizational structure for preparing these reports for submission the progress reports generated upon completion of each round of sampling activities. The preceding sentence is garbled. Is it supposed to be two sentences? The final report for the project will also include a separate QA section which will summarize data quality information contained in the periodic QA reports to management, and provide an overall data assessment and validation in accordance with the data quality objectives outlined in Section 1.4.3 of this QAPP.

15.0 REFERENCES

1. United States Environmental Protection Agency "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations", EPA QA/R-5, Draft Interim Final, August 1994.
2. United States Environmental Protection Agency "Region 5 Model RCRA Assurance Project Plan (QAPP)", U.S. EPA Region V, Revision, May 1993.
3. United States Environmental Protection Agency "Preparation Aids for the Development of Category I Quality Assurance Project Plans", EPA/600/8-91/003, Risk Reduction Engineering Laboratory, Office of Research and Development, Cincinnati, Ohio, February 1991.
4. United States Environmental Protection Agency "Data Quality Objectives Process for Superfund, Interim Final Guidance", EPA 540/R-93-071, Office of Solid Waste and Emergency Response, September 1993.
5. United States Environmental Protection Agency "Specifications and Guidance for Contaminant-Free Sample Containers", OSWER Directive #9240.0-05A, April 1992.
6. United States Environmental Protection Agency "U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA 540/R-99-002.
7. United States Environmental Protection Agency "U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA 540/R-94-013.

TABLES

TABLE 1.1

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST
PCC-WEST
PONTIAC, MICHIGAN

	TestAmerica Estimated Quantitation Limits (EQL) [1]		
Compound	*Water (µg/L)*	*LNAPL (µg/kg)*	*Soil (µg/kg)*
Target Compound List (TCL) Volatile Organic Compounds (VOC) [3]			
Acetone	25	2,500	20
Benzene	1	620	5
Bromodichloromethane	1	620	5
Bromoform	1	620	5
Bromomethane	1	1,200	5
2-Butanone	25	2,500	20
Carbon disulfide	5	620	5
Carbon tetrachloride	1	620	5
Chlorobenzene	1	620	5
Chloroethane	1	1,200	5
Chloroform	1	620	5
Chloromethane	1	1,200	5
Cyclohexane	1	2,500	10
Dibromochloromethane	1	620	5
1,2-Dibromo-3-chloropropane	1	1,200	10
1,2-Dibromoethane	1	620	5
1,2-Dichlorobenzene	1	1,200	5
1,3-Dichlorobenzene	1	1,200	5
1,4-Dichlorobenzene	1	1,200	5
Dichlorodifluoromethane	1	1,200	5
1,1-Dichloroethane	1	620	5
1,2-Dichloroethane	1	620	5
1,1-Dichloroethene	1	620	5
cis-1,2-Dichloroethene	1	310	2.5
trans-1,2-Dichloroethene	1	310	2.5
1,2-Dichloropropane	1	620	5
cis-1,3-Dichloropropene	1	620	5
trans-1,3-Dichloropropene	1	620	5
Ethylbenzene	1	620	5
2-Hexanone	50	2,500	20
Isopropylbenzene	5	1,200	5
Methyl acetate	10	1,200	10
Methylene chloride	5	620	5
Methylcyclohexane	1	620	10
4-Methyl-2-pentanone	50	2,500	20
Methyl tert-butyl ether	5	2,500	20
Styrene	1	620	5
1,1,2,2-Tetrachloroethane	1	620	5
Tetrachloroethene	1	620	5
Toluene	1	620	5
1,2,4-Trichlorobenzene	5	620	5
1,1,1-Trichloroethane	1	620	5
1,1,2-Trichloroethane	1	1,200	5
Trichloroethene	1	620	5

TABLE 1.1

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST
PCC-WEST
PONTIAC, MICHIGAN

Compound	*TestAmerica Estimated Quantitation Limits (EQL)* [1] *Water (µg/L)*	*LNAPL (µg/kg)*	*Soil (µg/kg)*
TCL VOC (continued)			
Trichlorofluoromethane	1	1,200	5
1,1,2-Trichloro-1,2,2-trifluoroethane	1	2,500	5
Vinyl chloride	1	1,200	5
Xylenes (total)	2	620	10
1,2,4-Trimethylbenzene	1	620	5
1,3,5-Trimethylbenzene	1	620	5
TCL Semi-Volatile Organic Compounds (SVOC)			
Acenaphthene	5	20,000	264
Acenaphthylene	5	20,000	264
Acetophenone	5	20,000	264
Anthracene	5	20,000	264
Atrazine	5	20,000	40
Benzo(a)anthracene	1	20,000	264
Benzo(a)pyrene	1	20,000	264
Benzo(b)fluoranthene	1	20,000	264
Benzo(g,h,i)perylene	1	20,000	264
Benzo(k)fluoranthene	1	20,000	264
Benzaldehyde	10	20,000	264
1,1'-Biphenyl	10	20,000	264
bis(2-Chloroethoxy)methane	5	20,000	264
bis(2-Chloroethyl)ether	1	20,000	264
bis(2-Ethylhexyl)phthalate	5	20,000	264
4-Bromophenylphenyl ether	5	20,000	264
Butylbenzylphthalate	5	20,000	264
Caprolactam	10	20,000	150
Carbazole	10	20,000	264
4-Chloroaniline	20	20,000	80
4-Chloro-3-methylphenol	5	20,000	264
2-Chloronaphthalene	5	20,000	264
2-Chlorophenol	5	20,000	264
4-Chlorophenyl phenyl ether	5	20,000	264
Chrysene	1	20,000	264
Dibenz(a,h)anthracene	4	20,000	264
Dibenzofuran	5	20,000	264
3,3'-Dichlorobenzidine	4	96,000	264
2,4-Dichorophenol	10	20,000	1600
Diethylphthalate	5	20,000	264
2,4-Dimethylphenol	5	20,000	264
Dimethylphthalate	5	20,000	264
di-n-Butyphthalate	5	20,000	264
4,6-Dinitro-2-methylphenol	20	96,000	150
2,4-Dinitrophenol	20	96,000	150
2,4-Dinitrotoluene	5	20,000	264

TABLE 1.1

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST
PCC-WEST
PONTIAC, MICHIGAN

Compound	*TestAmerica Estimated Quantitation Limits (EQL)* [1] *Water (µg/L)*	*LNAPL (µg/kg)*	*Soil (µg/kg)*
TCL SVOC (continued)			
2,6-Dinitrotoluene	5	20,000	264
di-n-Octylphthalate	5	20,000	264
Fluoranthene	1	20,000	264
Fluorene	5	20,000	264
Hexachlorobenzene	0.2	20,000	264
Hexachlorobutadiene	1	20,000	40
Hexachlorocyclopentadiene	5	96,000	264
Hexachloroethane	5	20,000	264
Indeno(1,2,3-cd)pyrene	2	20,000	264
Isophorone	5	20,000	264
2-Methylnaphthalene	5	20,000	264
2-Methylphenol	5	20,000	264
4-Methylphenol	5	20,000	264
Naphthalene	5	20,000	264
2-Nitroaniline	20	96,000	200
3-Nitroaniline	20	96,000	200
4-Nitroaniline	20	96,000	200
Nitrobenzene	3	20,000	264
2-Nitrophenol	5	20,000	264
4-Nitrophenol	20	96,000	330
N-Nitroso-di-n-propylamine	5	20,000	264
N-Nitrosodiphenylamine (diphenylamine)	5	20,000	264
2,2'-oxibis(1-Chloropropane)	5	20,000	264
Pentachlorophenol	5	20,000	150
Phenanthrene	2	20,000	264
Phenol	5	20,000	264
Pyrene	5	20,000	264
2,4,5-Trichlorophenol	5	20,000	264
2,4,6-Trichlorophenol	4	20,000	264

Compound	*TestAmerica Estimated Quantitation Limits (EQL)* [1] *Water (µg/L)*	*LNAPL (µg/kg)*	*Soil (µg/kg)*
TCL Polychlorinated Biphenyls (PCB)			
Aroclor 1016	0.1	1000	33
Aroclor 1221	0.1	1000	33
Aroclor 1232	0.1	1000	33
Aroclor 1242	0.1	1000	33
Aroclor 1248	0.1	1000	33
Aroclor 1254	0.1	1000	33
Aroclor 1260	0.1	1000	33

TABLE 1.1

TARGET COMPOUND AND TARGET ANALYTE PARAMETER LIST
PCC-WEST
PONTIAC, MICHIGAN

Compound	*TestAmerica Estimated Quantitation Limits (EQL)* [1] *Water (µg/L)*	*LNAPL (mg/kg)*	*Soil (µg/kg)*
Site-specific Target Analyte List (TAL) Inorganics			
Antimony	2	6	240
Arsenic	5	30	80
Barium	100	20	800
Beryllium	1	0.5	400
Cadmium	1	0.5	160
Chromium	10	1	1,600
Cobalt	20	5	400
Copper	4	2.5	800
Lead	3	10	800
Manganese	50	1.5	800
Mercury	0.2	0.1	40
Nickel	20	4	800
Selenium	5	25	160
Silver	0.2	1	80
Thallium	2	200	400
Vanadium	4	5	800
Zinc	50	2	1,000
Cyanide (amenable)	5	NA	NA
Cyanide (total)	NA	NA	100

Notes:

[1] - Please note that these are estimated quantitation limits and are presented for guidance only. Actual quantitation limits are highly matrix dependent and may be elevated due to matrix effects, QA/QC problems and high concentrations of target and non-target analytes.

[3] - U.S. EPA Contract Laboratory Program, "Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration", OLM4.2, May 1999 Target Compound List.

TABLE 1.2

WASTE CHARACTERIZATIONPARAMETER LIST
PCC-WEST
PONTIAC, MICHIGAN

Compound	*Estimated Quantitation Limits (EQL)* [1] *Waste Leachate (mg/L)*
Toxic Characteristic Leachate Procedure (TCLP) VOC	
Benzene	0.025
2-Butanone	0.050
Carbon tetrachloride	0.025
Chlorobenzene	0.025
Chloroform	0.025
1,2-Dichloroethane	0.025
1,1-Dichloroethene	0.07
Tetrachloroethene	0.07
Trichloroethene	0.05
Vinyl chloride	0.025
TCLP SVOC	
m-Cresols & p-Cresol	0.04
o-Cresol	0.004
1,4-Dichlorobenzene	0.004
2,4-Dinitrotoluene	0.02
Hexachlorobenzene	0.02
Hexachlorobutadiene	0.02
Hexachloroethane	0.02
Nitrobenzene	0.004
Pentachlorophenol	0.04
Pyridine	0.02
2,4,5-Trichlorophenol	0.02
2,4,6-Trichlorophenol	0.02
TCLP Metals	
Arsenic	0.02
Barium	10
Cadmium	0.005
Chromium	0.5
Lead	0.1
Mercury	0.002
Selenium	0.05
Silver	0.1

TABLE 1.2

WASTE CHARACTERIZATIONPARAMETER LIST
PCC-WEST
PONTIAC, MICHIGAN

	Estimated Quantitation Limits (EQL) [1]
	Waste (mg/kg)
Waste Characteristics	
Ignitablilty (flashpoint)	NA
Corrosivity (pH)	NA
Cyanide, total	0.5
Sulfide, total	100

Notes:

[1] - Please note that these are estimated quantitation limits and are presented for guidance only. Actual quantitation limits are highly matrix dependent and may be elevated due to matrix effects, QA/QC problems and high concentrations of target and non-target analytes.

TABLE 1.3

LEVELS OF DATA QUALITY OBJECTIVES (DQO)
PCC-WEST
PONTIAC, MICHIGAN

Matrix	*Analysis*	*Analytical Support* [1]
Groundwater	pH/Temperature	Level I
	Specific Conductance	Level I
	Dissolved Oxygen	Level I
	Turbidity	Level I
	Oxydation-Reduction Potential	Level I
	Water Level	Level I
	Temperature	Level I
	TCL VOC	Level III
	TCL SVOC	Level III
	TCL PCBs	Level III
	TAL Metals	Level III
	Amenable Cyanide	Level III
Soil/Sediment	PID VOC Screen	Level I
	TCL VOC	Level III
	TCL SVOC	Level III
	TCL PCBs	Level III
	TAL Inorganics	Level III
Long Term Groundwater	pH/Temperature	Level I
	Specific Conductance	Level I
	Dissolved Oxygen	Level I
	Turbidity	Level I
	Oxydation-Reduction Potential	Level I
	Water Level	Level I
	TCL VOC	Level II/III
	PNA	Level II/III
	Lead, total	Level II/III
Post-Corrective Measures	Select VOC	Level III
Waste Characterization	TCLP VOC	Level II
	TCLP SVOC	Level II
	TCLP Metals	Level II
	PCB	Level II
	Reactivity	Level II
	Corrosivity	Level II

TABLE 1.3

LEVELS OF DATA QUALITY OBJECTIVES (DQO)
PCC-WEST
PONTIAC, MICHIGAN

Notes:

[1] - Analytical support deliverables are discussed in Section C.9.3.2

Definition of DQO Levels

Level I - Fieldscreening analysis

Level II - Fixed laboratory analysis by EPA Methods with Quality Control Summary Report Deliverables

Level III - Fixed laboratory analysis by EPA Methods with Expanded Report Deliverables

Level IV - Fixed laboratory analysis by EPA Superfund (CLP) Mehtods with Expanded Report Deliverables.

TABLE 1.4

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
PCC-WEST
PONTIAC, MICHIGAN

AOI #	*Description*	*Sample Matrix*	*Field Parameters*	*Laboratory Parameters*	*Investigative Samples*	*Quality Control Samples* [1]			*Total*
						Equipment Blanks [2]	*Field Duplicates*	*MS/MSD* [3]	
Post-Corrective Measures Evaluation - Post MPE at Former Building 33									
53	LNAPL Area 1	Soil	Soil Gas - % LEL	Select VOC[4]	19	0	2	1	22
		Groundwater	pH, Temperature, Specific Conductance, Turbidity, ORP, DO	Select VOC[4]	11	2	2	1	16
		LNAPL	Product Thickness	Select VOC[4]	4	0	0	0	4
Long Term Monitoring									
52	Former Building 35 Tank Farm	Groundwater	pH, Temperature, Specific Conductance, Turbidity, ORP, DO	TCL VOC, PNA, Lead	7	1	1	1/20	[5]
53	Former Building 33 Free Product Area	Groundwater	pH, Temperature, Specific Conductance, Turbidity, ORP, DO	Select VOC[4]	7	1	1	1/20	[5]
71	Burn Pile Area	Groundwater	pH, Temperature, Specific Conductance, Turbidity, ORP, DO	TCL VOC	8	1	1	1	[5]

TABLE 1.4

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
PCC-WEST
PONTIAC, MICHIGAN

AOI #	*Description*	*Sample Matrix*	*Field Parameters*	*Laboratory Parameters*	*Investigative Samples*	*Quality Control Samples* [1]			*Total*
						Equipment Blanks [2]	*Field Duplicates*	*MS/MSD* [3]	
Post-CMP Investigations									
	Soil Borings	Soil	PID Screen	TCL VOC, TCL SVOC, PCB, SS-TAL Metals, Total Cyanide	TBD	1/10	1/10	1/20	[5]
	Groundwater	Groundwater	pH, Temperature, Specific Conductance, Turbidity, ORP, DO	TCL VOC, TCL SVOC, PCB, SS-TAL Metals, Amenable Cyanide	TBD	1/10	1/10	1/20	[5]
Waste Characterization									
	Containerized Purge Water and Drill Cuttings	Soil/Water	NA	TCLP VOC, TCLP SVOC, TCLP Metals, PCB, Corrosivity, Ignitibility	TBD	0	0	0	TBD

TABLE 1.4

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
PCC-WEST
PONTIAC, MICHIGAN

						Quality Control Samples [1]			
AOI #	*Description*	*Sample Matrix*	*Field Parameters*	*Laboratory Parameters*	*Investigative Samples*	*Equipment Blanks* [2]	*Field Duplicates*	*MS/MSD* [3]	*Total*

Notes:

[1] - A Laboratory trip blank will be submitted with each group of multiple aqueous Sample for TCL VOC analysis.

[2] - Equipment\ blank samples will not be required if dedicated or disposable sampling equipment is used.

[3] - Matrix Spike/Matrix Spike duplicate (MS/MSD) analyses are required for samples submitted for organic and inorganic analyses are to be analyzed at a frequency of one per group of twenty (20) or fewer investigative samples of a given matrix.

[4] - Select VOC include benzene, toluene, ethylbenzene, and xylenes (BTEX); 1,2,4-trimethylbenzene amd 1,3,5-trimethylbenzene (TMBs); and methyl tert-butylether (MTBE) .

[5] - The total quantity will depend on the number of quality control samples collected.

AOI = Area of Interest
ORP = Oxidation Reduction Potential
DO = Dissolved Oxygen
TCL = Target Compound List
VOC = Volatile Organic Compounds
LNAPL = Light Non-Aqueous Phase Liquid
SVOC = Semi-volatile Organic Compounds
PNA = Polynucler Aromatics
PCB = Polychlorinated Biphenyls
SS TAL = Site-specific Target Analyte List
TTO = Total Toxic Organics
TPH = Total Petroleum Hydrocarbons
G = Gasoline
D = Diesel
HEM = Hexane Extractable Material
NMOC = Non-methane Organic Compounds

TABLE 4.1

CONTAINER, PRESERVATION, SHIPPING AND PACKAGING REQUIREMENTS
PCC-WEST
PONTIAC, MICHIGAN

Analyses	*Sample Containers (1)*	*Preservation*	*Maximum Holding Time from Sample Collection (2)*	*Volume of Sample*	*Shipping*	*Normal Packaging*
WATER (Groundwater, Surfacewater, Wastewater)						
VOC, TPH-Gas	Three 40 mL teflon-lined septum vials per analysis	HCl to pH < 2 Iced, 4 ±2° C	14 days for analysis	Fill completely, no air bubbles	Overnight or Hand Deliver	Foam Liner or Bubble-wrap
SVOC, PNA, PCB, Pesticides	Two 1 liter amber glass bottles per analysis	Iced, 4 ±2° C	7 days for extraction 40 days after extraction for analysis	Fill to neck of bottle	Overnight or Hand Deliver	Bubble Pack or Foam Chips
TPH-Diesel	Two 1 liter amber glass bottles per analysis	HCl to pH < 2 Iced, 4 ±2° C	7 days for extraction 40 days after extraction for analysis	Fill to neck of bottle	Overnight or Hand Deliver	Bubble Pack or Foam Chips
Metals	One 1 liter plastic bottle	HNO_3 to pH < 2 Iced, 4 ±2° C	180 days (mercury-28 days) for analysis	Fill to neck of bottle	Overnight or Hand Deliver	Bubble Pack or Foam Chips
Cyanide, amenable	One 500 ml plastic bottle	NaOH to pH>12 ascorbic acid (3) Iced, 4 ±2° C	14 days for analysis	Fill to neck of bottle	Overnight or Hand Deliver	Bubble Pack or Foam Chips
Phenolics, total	One 1 liter amber glass bottles	H_2SO_4 to pH < 2 Iced, 4 ±2° C	28 days for analysis	Fill to neck of bottle	Overnight or Hand Deliver	Bubble Pack or Foam Chips
HEM	One 1 liter amber glass bottles	H_2SO_4 to pH < 2 Iced, 4 ±2° C	28 days for analysis	Fill to neck of bottle	Overnight or Hand Deliver	Bubble Pack or Foam Chips

TABLE 4.1

CONTAINER, PRESERVATION, SHIPPING AND PACKAGING REQUIREMENTS
PCC-WEST
PONTIAC, MICHIGAN

Analyses	*Sample Containers (1)*	*Preservation*	*Maximum Holding Time from Sample Collection (2)*	*Volume of Sample*	*Shipping*	*Normal Packaging*
WATER (Groundwater, Surfacewater, Wastewater) (Continued)						
TCLP VOC	One 250 ml glass bottle	Iced, 4 ± 2° C	14 days for TCLP and 14 days for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
TCLP SVOC, TCLP Pesticides, TCLP Herbicides	Two 1 liter amber glass bottles per analysis	Iced, 4 ± 2° C	7 days for TCLP, 7 days for preparation and 40 days for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
TCLP Metals	Two 1 liter amber glass bottles	Iced, 4 ± 2° C	180 days (mercury 28 days) for TCLP and analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
Corrosivity, Ignitibility	One 1 liter plastic bottle	Iced, 4 ± 2° C	14 days for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
SOLID (Soil/Sediment)						
TCL VOC - Low Level	Two 5g aliquots per analysis (4) One 10 gram aliquot per analysis (4)	5 milliter purified water 10 milliters methanol Iced, 4 ±2° C	48 hours until frozen 14 days for analysis 14 days for analysis	Fill completely	Overnight or Hand Deliver	Bubble Pack or Foam Chips
TCL SVOC, TCL PCB	One 16-ounce glass jar per analysis	Iced, 4 ±2° C	14 days for extraction 40 days after extraction for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
SOLID (Soil/Sediment) (Continued)						

TABLE 4.1

CONTAINER, PRESERVATION, SHIPPING AND PACKAGING REQUIREMENTS
PCC-WEST
PONTIAC, MICHIGAN

Analyses	*Sample Containers (1)*	*Preservation*	*Maximum Holding Time from Sample Collection (2)*	*Volume of Sample*	*Shipping*	*Normal Packaging*
SVOC, PCB	One 16-ounce glass jar	Iced, 4 ±2° C	14 days for extraction 40 days after extraction for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
TAL Metals,	One 16-ounce glass jar per analysis	Iced, 4 ±2° C	180 days (mercury-28 days) for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
Cyanide	One 4-ounce glass jar	Iced, 4 ±2° C	14 days for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
Sulfide	One 4-ounce glass jar	Iced, 4 ±2° C	7 days for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
TCLP VOC	One 4-ounce glass jar (5)	Iced, 4 ± 2° C	14 days for TCLP and 14 days for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
TCLP SVOC	One 4-ounce glass jar (5)	Iced, 4 ± 2° C	14 days for TCLP, 7 days for preparation and 40 days for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
TCLP Metals	One 4-ounce glass jar (5)	Iced, 4 ± 2° C	180 days (mercury 28 days) for TCLP and analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
Corrosivity	One 4-ounce glass jar (5)	Iced, 4 ± 2° C	14 days for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips
SOLID (Soil/Sediment) (Continued)						
Ignitibility	One 4-ounce glass jar (5)	Iced, 4 ± 2° C	14 days for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Bubble Pack or Foam Chips

TABLE 4.1

CONTAINER, PRESERVATION, SHIPPING AND PACKAGING REQUIREMENTS
PCC-WEST
PONTIAC, MICHIGAN

Analyses	*Sample Containers (1)*	*Preservation*	*Maximum Holding Time from Sample Collection (2)*	*Volume of Sample*	*Shipping*	*Normal Packaging*
Light Non-Aqueous Phase Liquid (LNAPL)						
VOC	One 4-ounce glass jar (5)	Iced, 4 ± 2° C	14 days for analysis	Fill completely	Overnight or Hand Deliver	Foam Liner or Bubble-wrap
SVOC, PCB	One 4-ounce glass jar (5)	Iced, 4 ± 2° C	14 days for extraction 40 days after extraction for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Foam Liner or Bubble-wrap
Metals	One 4-ounce glass jar (5)	Iced, 4 ± 2° C	180 days (mercury 28 days) for analysis	Fill to shoulder of jar	Overnight or Hand Deliver	Foam Liner or Bubble-wrap

Notes:

(1) Multiple parameters on a single sample may not require separate additional containers for each parameter.
(2) These are technical holding times, i.e., are based on time elapsed from time of sample collection.
(3) If sulfides are present as determined by lead acetate field test, ascorbic acid will be added.
(4) Soil sample percent moisture will be determined from other sample aliquots collected. If VOCs are the only parameter a separate container will be collected for percent moisture determination.
(5) - The NAPL and Waste Characterization samples may be combined into single containers of different volume depending on the parameters required and the material sampled.

TABLE 6.1

INSTRUMENT CALIBRATION REQUIREMENTS
PCC-WEST
PONTIAC, MICHIGAN

Instrument(1)	*Method Reference*	*# Standards Initial Calibration*	*Acceptance/ Rejection Criteria - Initial Calibration*	*Frequency of Calibration*	*Frequency of Initial Calibration Verification*	*Acceptance/ Rejection Criteria- Initial Calibration Verification*	*Frequency of Continuing Calibration Verification*	*Acceptance/ Rejection Criteria- Continuing Calibration Verification*
GC/MS - VOCs	SW-846 8260B	5	% RSD <30% (CCC): 1,1-dichloroethene; chloroform, 1,1-dichloro-propane; toluene; ethyl benzene; vinyl chloride RF>( )(SPCC): chloromethane (0.10); 1,1-dichloro-ethane (0.10); bromoform(0.10); 1,1,2,2-tetrachloroethene (0.30); chlorobenzene (0.30)	As Needed when daily CCC & SPCC cannot meet the spec. System is recalibrated	When daily CCC & SPCC cannot meet the spec. System is recalibrated	CCC %D <20% same as SPCC criteria as initial calibration	Every 12 hrs	See CAS SOP VOC8260B Table 3 for Tuning Criteria
GC/MS - SVOCs	SW-846 8270C	5	%RSD <30%(CCC): acenapthene; 1,4-dichlorobenzene; hexachloro-butadiene; diphenylamine; di-octylphthalate; fluoranthene; benzo(a)pyrene; 4-chloro-3-methylphenol; 2,4-dichlorophenol; 2-nitrophenol; phenol; pentachlorophenol; 2,4,6-tri-chlorophenol; RF >0.05(SPCC): N-nitrosodipropylamine; hexachlorocyclopentadiene; 2,4-dinitrophenol; 4-nitrophenol	As needed when daily CCC & SPCC cannot meet the spec. System is recalibrated	When daily CCC & SPCC cannot meet the spec. System is recalibrated	CCC %D <20% same as SPCC criteria as initial calibration	Every 12 hrs	See CAS SOP SOC8270C Table 2 for Tuning Criteria.

TABLE 6.1

INSTRUMENT CALIBRATION REQUIREMENTS
PCC-WEST
PONTIAC, MICHIGAN

Instrument(1)	*Method Reference*	*# Standards Initial Calibration*	*Acceptance/ Rejection Criteria - Initial Calibration*	*Frequency of Calibration*	*Frequency of Initial Calibration Verification*	*Acceptance/ Rejection Criteria- Initial Calibration Verification*	*Frequency of Continuing Calibration Verification*	*Acceptance/ Rejection Criteria- Continuing Calibration Verification*
GC - ECD TCL PCB	SW-846 8081/8082	5	Linearity < 20% RSD COD ≥0.99 for non-linear calibration curve	As needed	Beginning of 12-hr analytical shift	Primary column %D <15. Conf. column %D <15. R.T. Shift <0.3%. Breakdown criteria: DDT	Every 12 hrs verified at start and end of each analytical shift	RF <15%
ICPMS	SW-846 6020	Blank plus one standard	Correlation coefficient ≥ 0.995	At least daily, or as required (when CCV or ICV fails acceptance criteria)	Every calibration	90 - 110%R	Every 10 analytical samples	90 - 110%R
CVAA	SW-846 7470A/7471A	Blank plus 4 standards	Correlation coefficient ≥ 0.995	At least daily, or as required (when CCV or ICV fails acceptance criteria)	Every calibration	80 - 120%R	Every 10 analytical samples	80 - 120%R
ICP	SW-846 6010B	Blank plus one standard	Correlation coefficient ≥ 0.995	At least daily, or as required (when CCV or ICV fails acceptance criteria)	Every calibration	90 - 110%R	Every 10 analytical samples	90 - 110%R
Spectrophotometer (Lachat Autoanalyzer)	SW-846 9030A, SW-846 9010A	Blank plus 5 standards	Correlation coefficient ≥ 0.995	At least daily	Every calibration	90-110%R	Every 10 analytical samples	90-110%R

TABLE 7.1

SUMMARY OF ANALYTICAL METHODS - TESTAMERICA
PCC-WEST
PONTIAC, MICHIGAN

Parameter [1]	*Preparation Method* [2]	*Laboratory Preparation SOP*	*Cleanup Method* [2]	*Laboratory Cleanup SOP*	*Analytical Method* [2]	*Laboratory Analytical SOP*
Groundwater and Surface Water Samples						
TCL VOC[4]	SW-846 5030B	NC-MS-019	--	--	SW-846 8260B	NC-MS-019
TCL SVOC and PNAs	SW-846 3510C	NC-OP-032	--	--	SW-846 8270C	NC-MS-018
TCL PCB	SW-846 3520C	NC-OP-032	SW-846 3665/3660 (5)	NC-OP-0025	SW-846 8082	NC-GC-038
TAL Inorganics						
ICP Metals[4]	SW-846 3010A	NC-IP-011	--	--	SW-846 6010B	NC-MT-012
ICPMS Metals[4]	SW-846 3010A	NC-IP-011	--	--	SW-846 6020	NC-MT-0002
mercury	SW-846 7470A	NC-MT-014	--	--	SW-846 7470A	NC-MT-014
cyanide (amenable)	SW-846 9012A	NC-WC-0032	--	--	SW-846 9012A	NC-WC-0031
Soil and Sediment Samples						
TCL VOC[4]	SW-846 5035	NC-MS-019	--	--	SW-846 8260B	NC-MS-019
TCL SVOC	SW-846 3550B	NC-OP-032	SW-846 3640A	NC-OP-0025	SW-846 8270C	NC-MS-018
TCL PCB	SW-846 3540/3550B	NC-OP-032	SW-846 3665/3660 (5)	NC-OP-0025	SW-846 8082	NC-GC-038
TAL Inorganics						
ICP Metals[4]	SW-846 3050A	NC-IP-010	--	--	SW-846 6010B	NC-MT-012
ICPMS Metals[4]	SW-846 3050A	NC-IP-010	--	--	SW-846 6020	NC-MT-0002
mercury	SW-846 7471A	NC-MT-0011	--	--	SW-846 7471A	NC-MT-0011
cyanide (total)	SW-846 9012A	NC-WC-0032	--	--	SW-846 9012A	NC-WC-0031
LNAPL Samples						
VOC	SW-846 5030B	NC-MS-019	--	--	SW-846 8260B	NC-MS-019
SVOC	SW-846 3550B	NC-OP-032	--	--	SW-846 8270C	NC-GC-038
PCB	SW-846 3550B	NC-OP-0032	--	--	SW-846 8082	NC-GC-038
Metals						
ICP Metals	SW-846 3050A	NC-IP-010	--	--	SW-846 6010B	NC-MT-012
ICP/MS Metals	SW-846 3050A	NC-IP-010	--	--	SW-846 6020	NC-MT-0002
Mercury	SW-846 7471A	NC-MT-011	--	--	SW-846 7471A	NC-MT-011

TABLE 7.1

SUMMARY OF ANALYTICAL METHODS - TESTAMERICA
PCC-WEST
PONTIAC, MICHIGAN

Parameter [1]	*Preparation Method* [2]	*Laboratory Preparation SOP*	*Cleanup Method* [2]	*Laboratory Cleanup SOP*	*Analytical Method* [2]	*Laboratory Analytical SOP*
Waste Characterization Parameters						
TCLP	SW-846 1311	NC-OP-033	NA	NA	NA	NA
TCLP VOC	SW-846 5035/8260B	NC-MS-019	--	--	SW-846 8260B	NC-MS-019
TCLP SVOC	SW-846 3500B/3550B	NC-OP-032	SW-846 3640A	NC-OP-0025	SW-846 8270C	NC-MS-018
PCB (solids)	SW-846 3500C/3550B	NC-OP-032	SW-846 3665/3660 (5)	NC-OP-0025	SW-846 8082	NC-GC-038
PCB (waters)	SW-846 3500C	NC-OP-032	SW-846 3665/3660 (5)	NC-OP-0025	SW-846 8082	NC-GC-038
TCLP Metals						
ICP Metals	SW-846 3050B	NC-IP-011	--	--	SW-846 6010B	NC-MT-012
mercury	SW-846 7471A	NC-MT-014	--	--	SW-846 7471A	NC-MT-014
Cyanide	SW-846 9010B/9012A	NC-WC-0032	--	--	SW-846 9010B/9012A	NC-WC-0031
Sulfide	SW-846 9030A	NC-WC-0060	--	--	SW-846 9030A	NC-WC-0060
Ignitibility (flashpoint)	--	--	--	--	SW-846 1010	NC-WC-0034
Corrosivity (pH)	SW-846 9040/9045	NC-WC-0010			SW-846 9040/9045	NC-WC-0010

TABLE 7.1

SUMMARY OF ANALYTICAL METHODS - TESTAMERICA
PCC-WEST
PONTIAC, MICHIGAN

Parameter [1]	*Preparation Method* [2]	*Laboratory Preparation SOP*	*Cleanup Method* [2]	*Laboratory Cleanup SOP*	*Analytical Method* [2]	*Laboratory Analytical SOP*

Notes:

[1] Refer to Tables C.1.1, C.1.2, C.1.3, C.1.4 for the compounds/elements of each parameter group.

[2] Preperation and Analytical Method References:
- SW-846 - "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods ", SW-846, 3rd Edition, and Promulgated Updates, November 1986.
- EPA-WW - "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, Revised March 1983.
- SM - "Standard Methods for the Examination of Water and Wastewater", APHA, AWWA & WEF, 19th Edition, 1995

[3] TCL VOC and Select VOC

[4] Metals by Method - Aluminum and Iron will be analyzed by the most appropriate method depending on sample concentrations.

Water ICP: Aluminum, Barium, Beryllium, Chromium, Cobalt, Copper, Iron, Magnesium, Manganese, Nickel, Vanadium.

Water ICP/MS Antimony, Arsenic, Cadmium, Lead, Selenium, Silver, Thallium, Zinc.

Soil ICP: Aluminum, Antimony, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Nickel, Selenium, Silver, Vanadium, Zinc.

Soil ICP/MS: Arsenic, Thallium.

[5] Clean-up methods are performed on an as needed basis.

TCL = Target Compound List
TAL = Target Analyte List
PCB = Polychlorinated Biphenyls
VOC = Volatile Organic Compounds
SVOC = Semi-Volatile Organic Compounds
TCLP = Toxicity Characteristics Leachating Procedure
ICP = Inductively Coupled Plasma
ICP/MS = Inductively Coupled Plasma/Mass Spectrometer

TABLE 11.1

ROUTINE MAINTENANCE PROCEDURES AND SCHEDULES
PCC-WEST

Instrument/Equipment	*Maintenance Procedures/Schedule*	*Spare Parts in Stock*
Gas Chromatograph/Mass Spectrometer	1. Check gas supplies daily, replace when pressure reaches 50 psi 2. Change in-line filters quarterly or after 30 tanks of gas. 3. Change septum daily. 4. Change injection port liner weekly or as needed. 5. Clip first foot of capillary column as needed. 6. Change guard column as needed. 7. Replace analytical column as needed when peak resolution fails. 8. Clean jet separator as needed. 9. Clean source as needed when tuning problems. 10. Change pump oil every six months. 11. Oil wick every six months.	1. Syringes 2. Septum 3. Various electronic components 4. Glass jet splitter 5. GC column 6. Glass liners 7. Guard columns 8. Gas filters 9. Pump oil
Gel-Permeation Chromatographs	1. Clean and repack column as needed. 2. Backflush valves as needed.	
Purge and Trap Sample Concentrator	1. Change trap every four months or as needed. 2. Decontaminate the system after running high concentration samples or as required by blank analysis. 3. Change transfer lines every six months or as needed. 4. Clean purge vessel daily. 5. Check daily to ensure the pressure on the primary regulator never run below 50 psi.	1. Spare traps 2. Spare sparger vessels 3. Various electronic components/ circuits 4. Plumbing supplies - tubing, fittings

TABLE 11.1

ROUTINE MAINTENANCE PROCEDURES AND SCHEDULES
PCC-WEST

Instrument/Equipment	*Maintenance Procedures/Schedule*	*Spare Parts in Stock*
Inductively Coupled Plasma Spectrometer (ICP)	1. Check argon dewar daily. 2. Replace peristaltic pump tubing daily. 3. Check daily to ensure the gas supply is sufficient for the day's activity pressures are set as described in the SOP. 4. Empty wast container weekly. 5. Clean nebulizer, spray chamber, and torch every two weeks. 6. Replace water filter quarterly. 7. Replace vacuum air filters monthly.	1. Spare torch and mixing chambers 2. Spare nebulizer 3. Spare peristaltic pump tubing 4. Water filters 5. Vacuum air filters
Flow Injection Analyzer	1. Inspect pump tubes after each 8-hour run; replace if discolored or distorted 2. Check daily to ensure the gas supply is sufficient for the day's activity, and the delivery pressures are set as described in the SOP. 3. Check valve flares and ports monthly. 4. Check light counts monthly. 5. Check flow cell flares monthly. 6. Change bulb every six months. 7. Check manifold tubing every six months. 8. Check T's and connectors evey six months.	1. Pump tubing 2. Colorimeter lamps
Refrigerators and Coolers	1. Record temperature daily. 2. Clean coils annually. 3. Check coolant annually if temperature outside limits.	
Ovens	1. Monitor temperature daily. 2. Clean as needed or if temperature outside limits.	
Vacuum Pumps	1. Clean and change pump oil every month or as needed.	1. Pump oil
Fume Hoods	1. Face velocity measured quarterly. 2. Sash operation as needed. 3. Change filters annually.	1. Spare filters

TABLE 11.1

ROUTINE MAINTENANCE PROCEDURES AND SCHEDULES
PCC-WEST

Instrument/Equipment	*Maintenance Procedures/Schedule*	*Spare Parts in Stock*
	4. Inspect fan belts annually.	
Water Baths	1. Record temperatures daily, morning and evening. 2. Wash with disinfectant solution when water is murky, dirty, or growth appears.	
Analytical Balances	1. Check alignment before every use. 2. Check calibration before every use. 3. Clean pans and compartment after every use.	
pH Meter	1. Condition probe when fluctuations occur 2. Check digestion/condensation vessels each use. 3. Keep electrode properly filled with appropriate filling electrolyte solution. 4. Check battery (if used in field); and replace if discharged.	1. Standard buffers 2. Electrolyte filling solution 3. Spare electrode
Specific Conductivity Meter	1. After use in samples containing free oil, wash the electrode in soap and rinse thoroughly with water. 2. Check battery (if used in field); and replace if discharged.	1. Standard solution 2. Spare electrodes
Photoionization Detector (HNU)	1. Check battery and recharge when low 2. Clean UV lamp; ion chamber, and fan if calibration cannot be achieved, or if readings are erratic.	1. Battery charger 2. Spare lamps